AEROSPACE MEDICINE
AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES
This issue of Aerospace Medicine and Biology (NASA SP-7011) lists 152 reports, articles and other documents originally announced in May 1991 in Scientific and Technical Aerospace Reports (STAR) or in International Aerospace Abstracts (IAA). The first issue of Aerospace Medicine and Biology was published in July 1964.

Accession numbers cited in this issue are:

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\begin{align*}
\text{STAR (N-10000 Series)} & \quad \text{N91-16988 \text{ -- } N91-19023} \\
\text{IAA (A-10000 Series)} & \quad \text{A91-24169 \text{ -- } A91-28400}
\end{align*}
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In its subject coverage, Aerospace Medicine and Biology concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by STAR categories 51 through 55, the Life Sciences division. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract, report number, and accession number—are included.


Information on availability of documents listed, addresses of organizations, and NTIS price schedules are located at the back of this issue.
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Three areas related to human orientation control are investigated: (1) reflexes associated with the control of eye movements and posture; (2) the perception of body rotation and position with respect to gravity; and (3) the strategies used to resolve sensory conflict situations which arise when different sensory systems provide orientation cues which are not consistent with one another or with previous experience. Of particular interest is the possibility that a subject may be able to ignore an inaccurate sensory modality in favor of one or more other sensory modalities which do provide accurate orientation reference information. This process is referred as sensory selection. This proposal will attempt to quantify subject's sensory selection abilities and determine if this ability confers some immunity to the development of motion sickness symptoms.

Mars crews will undergo prolonged periods of isolation and confinement, travel unprecedented distances from earth and be subjected to formidable combinations of hardships and dangers. Some of the biomedical, psychological and social challenges of the first manned Mars expedition are reviewed and means of aligning humans, technology and space habitats in the interests of mission success are identified.
AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 350)

JUNE 1991

51
LIFE SCIENCES (GENERAL)

A91-25297*

POTENTIAL OF THE REDOX STATE OF THE RABBIT BRAIN CORTEX UNDER HYPNOSIS (IMMOBILIZATION STRESS)

[Copyright]

A91-25329#

EFFECTS OF COLD, NOISE AND WHOLE BODY VIBRATION STRESS ON NEUROTRANSMITTERS IN THE RAT BRAIN

[Copyright]

A91-26538

LARGEST KNOWN MICROBIALITES DISCOVERED IN LAKE VAN, TURKEY

[Copyright]

A91-24780*

FLORIDA STATE UNIV., TALLAHASSEE.

MICROFILAMENTS DURING SEA URCHIN FERTILIZATION - FLUORESCENCE DETECTION WITH RHODAMINYL PHALLOIDIN

[Copyright]

A91-24781*

FLORIDA STATE UNIV., TALLAHASSEE.

MOTILITY AND CENTROSOMAL ORGANIZATION DURING SEA URCHIN AND MOUSE FERTILIZATION

[Copyright]

A91-24784*

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION.

BIOCONVECTIVE PATTERNS, SYNCHRONY, AND SURVIVAL

[Copyright]

A91-26800#

DAY-NIGHT VARIATION OF HEAT LOSS RESPONSE TO INTERNAL BODY HEATING IN FREELY MOVING RATS

[Copyright]
C. CARTER (NASA, Marshall Space Flight Center, Huntsville, AL),
CRYSTALLIZATION OF THE FAB FROM A HUMAN
ELENA CASALE, XIAO-MIN HE, ROBERT S. SNYDER, DANIEL
IMMUNODEFICIENCY VIRUS TYPE I
MONOCLONAL ANTIBODY AGAINST GP 41 OF HUMAN
A91-28158* National Aeronautics and Space Administration.

Toward Modeling a Dynamic Biological Neural Network
M. D. ROSS (NASA, Ames Research Center, Moffett Field, CA),
J. E. DAYHOFF (Judith Dayhoff and Associates, Mountain View,
CA), and D. H. MUGLER (Akon, University, OH) Mathematical
and Computer Modelling (ISSN 0895-7177), vol. 13, no. 7, 1990,
p. 97-105. refs
(COntact NCC2-220)

The basic issue that drives all concerns about biodiversity is
the accelerating and irreparable loss of genes, species,
populations, and ecosystem through environmental degradation
such as deforestation, strip mining and other developmental
projects. Associated with these losses are reduced options for
cultural and biological adaptation to an uncertain and ever changing
environment; possible disruption of essential ecological processes
and services; and loss of products obtained from nature (presently or
potentially). In addition, it is suggested that species, ecosystems,
and other elements of biodiversity are valuable in and of themselves
and thus should be protected and enhanced. Biodiversity values
can be categorized as human utilitarian; ecological utilitarian;
cultural, recreational, and esthetic; and ethical or intrinsic.

A91-28158* National Aeronautics and Space Administration.
CRISTALIZATION OF THE FAB FROM A HUMAN
MONOCLONAL ANTI-ENVELOPE GP 41 OF HUMAN
IMMUNODEFICIENCY VIRUS TYPE 1
ELENA CASALE, XIAO-MIN HE, ROBERT S. SNYDER, DANIEL
C. CARTER (NASA, Marshall Space Flight Center, Huntsville, AL),
ELISABETH WENISCH, ALOIS JUNGBAUER, CHRISTA TAUER,

The test proved that 2G acceleration increased the cockerels' bone strength, bone density, and bone protein, and increased both RNA and protein in the muscle.

A91-27964* Wright State Univ., Dayton, OH.
HABITUATION OF MOTION SICKNESS IN THE CAT
GEORGE H. CRAMPTON and JAMES R. LUCOT (Wright State
University, Dayton, OH) Aviation, Space, and Environmental
refs

Spectroscopic studies are described of DNA which were undertaken to better understand a physical basis for microwave absorption by this molecule. Three types of studies are described. The low frequency scattered light spectrum of DNA was studied by two methods. First, Raman scattering of the vibrational modes of DNA films was studied down to about 4 wavenumbers/cm using a high contrast grating monochrometer. The lowest lying vibrational mode was found at frequencies between 12 and 30/cm, depending upon the specific water content, counter-ion, and crystal structure. Second, a tandem interferometer was used to study the spectrum from about 0.1 to 10/cm (3 to 300 GHz). Studies of Li-DNA films and solutions of the plasmid pUC8 found no evidence of GHz resonances in the scattered light spectrum or in the Brillouin linewidths. The coupling of GHz acoustic modes to the hydration shell of DNA was studied via a coupled mode analysis of Brillouin spectra. The primary hydration shell relaxes at about 40 ps at room temperature and might permit resonances at frequencies between 20 and 200 GHz. However, none were observed. Attempts to repeat experiments that appeared to show a resonance mode near 0.6 GHz were unsuccessful.

N91-17529* Arizona State Univ., Tempe. Dept. of Physics.
MICROWAVE RESONANCES IN DNA
S. M. LINDSAY Aug. 1990 29 p Sponsored in part by Health Effects Research Lab., Research Triangle Park, NC
(Contract EPA-68-02-4105)

A91-28158* National Aeronautics and Space Administration.
CONTINUOUS CENTRIFUGATION ON BONE STRENGTH AND
THE BIOCHEMICAL EFFECTS OF 2G THREE-WEEK
MARCELLE R. CORDIE (NASA, Kennedy Space Center, FL),
A CULTURE VESSEL WITH LARGE PERFUSION AREA TO
M. D. ROSS (NASA, Ames Research Center, Moffett Field, CA),
L. K. S. ZOU (Albany Medical College, Albany, NY
CRISTALIZATION OF THE FAB FROM A HUMAN
IMMUNODEFICIENCY VIRUS TYPE 1
ELENA CASALE, XIAO-MIN HE, ROBERT S. SNYDER, DANIEL
C. CARTER (NASA, Marshall Space Flight Center, Huntsville, AL),
ELISABETH WENISCH, ALOIS JUNGBAUER, CHRISTA TAUER,

FLORIAN RUHER (University of Agriculture and Forestry, Vienna,
Austria), and PIER GIORGIO RIGHETTI (Milano, Universita, Milano,
Italy) Journal of Molecular Biology (ISSN 0022-2836), vol. 216, 1990, p. 511, 512. Research supported by ASI, NASA, and BMFW.

A monoclonal IgG antibody directed against gp 41 from the human immunodeficiency virus (HIV-1) has been crystallized in both intact and Fab forms. Crystals of the intact antibody grow as tetragonal-like prisms too small for conventional X-ray analysis. However, the Fab portion of the antibody produces suitable plate-like crystals which belong to the space group P2(1)2(1)2(1) with unit cell constants of a = 66.5 A, b = 74.3 A, and c = 105.3 A. There is one molecule of Fab in the asymmetric unit. The Fab crystals show diffraction to d-spacings less than 3.0 A. Author

Copyright
P\textsuperscript{(sup +)}l\textsuperscript{(sup minus)} to P\textsuperscript{(sup +)}Q\textsuperscript{(sup minus)} or restricting interactions to the secondary radical pair, P\textsuperscript{(sup +)}Q\textsuperscript{(sup minus)}. Others allow interactions on both the primary and secondary radical pairs with various transfer rates.

N91-18570# Brandeis Univ., Wattham, MA.
CARBON AND HYDROGEN METABOLISM OF GREEN ALGAE IN LIGHT AND DARK Progress Report 1990 5 p
(Contract DE-FG02-86ER-13486)
(DE91-006542; DOE/ER-13486/5) Avail: NTIS HC/ MF A01

The focus of this project was the elucidation of anaerobic metabolism in cyanocytic green algae, chlamydomonas reinhardii. Chlamydomonas is a versatile organism that can grow under disparate conditions such as fresh water lakes and sewage ponds. The cell photoassimilates CO2 aerobiocally and anaerobiocally, the latter after adaptation to a hydrogen metabolism. It can recall the knaligas or oxyhydrogen reaction and utilize hydrogen the simplest of all reducing agents for the dark assimilation of CO2 by the photosynthetic carbon reduction cycle. The dark reduction with hydrogen lies on the border line between autotrophic and heterotrophic carbon assimilation. Both autotrophic and heterotrophic bacteria are known in which molecular hydrogen can replace either inorganic or organic hydrogen donors. Here the dark reduction of CO2 acquires a particular importance since it occurs in the same cell that carries on photoreduction and photosynthesis. It is demonstrated that the algae chloroplast possesses a respiratory capacity. It seems likely that Chlamydomonas may have retained the chloroplastic respiratory pathway because of the selective advantage provided to the algae under a wide range of environmental conditions that the cells experience in nature. The ability to cycle electrons and poise the reduction level of the photosynthetic apparatus under aerobic and microaerobic conditions could allow more efficient CO2 fixation and enhanced growth under unfavorable conditions or survival under more severe conditions.

DOE

N91-18571# Clemson Univ., SC. Dept. of Biological Sciences.
THE MAGNESIUM CHELATION STEP IN CHLOROPHYLL BIOSYNTHESIS
JON WEINSTEIN Nov. 1990 8 p
(Contract DE-FG09-88ER-13989; DE-FG09-87ER-13768)
(DE91-006619; DOE/ER-13989/2) Avail: NTIS HC/ MF A02

In photosynthetic organisms, the biogenesis of energy transducing membranes requires the coordinate synthesis of protein groups, prodromic and various lipids. Two of the major prosthetic groups, chlorophyll and heme, share a common biosynthetic pathway that diverges at the point of metal insertion into protoporphyrin IX (Proto). Insertion of iron leads to the formation of hemes, while insertion of magnesium is the first step unique to chlorophyll formation. This project is directed toward identifying the enzyme(s) responsible for magnesium chelation and elucidating the mechanism which regulates the flux of precursors through the branch point enzymes in isolated chloroplasts. Using intact chloroplasts from greening cucumber cotyledons, the ATP requirement for Mg-Proto formation was confirmed. Use of non-hydrolyzable ATP analogs, uncouplers and ionophores has led to the conclusions that ATP hydrolysis is necessary, but that this hydrolysis is not linked to the requirement for membrane intactness by transmembrane ion gradients or electrical potentials. The enzyme(s) are flexible with respect to the porphyrin substrate specificity, accepting porphyrins with vinylethyl or H substituents at the 2 and 4 positions. The activity increases approximately four-fold during greening. Possible physiological feedback inhibitors such as heme, protoclorophyllide, and chlorophyllide have no specific effect on the activity. The activity has now been assayed in barely, corn and peas, with the system from peas almost ten-fold more active than the cucumber system. Work is continuing in pea chloroplasts with the development of a continuous assay and investigation of the feasibility of characterizing an active, organelle-free preparation.

DOE
THE EFFECT OF PROGRESSIVE NORMOCAPNIC HYPOXIA ON THE NASAL AND PHARYNGEAL RESISTANCE IN HUMAN SUBJECTS

**Aerospace Medicine**

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

**A91-25210**

**MEDICAL SUPPORT OF PARACHUTE JUMPS**

Y.P.Q.

**APPLIED PHYSIOLOGY**

**A91-25220**

**FUNCTIONAL ASYMMETRY OF PAIRED ORGANS AND THE PROFESSIONAL EFFICIENCY OF PILOTS**

...
EVIDENCE FOR HYPOXIC DEPRESSION OF CO2-VENTILATION RESPONSE IN CAROTID BODY-RESECTED HUMANS
YOSHIYUKI HONDA and IKKO HASHIZUME (Chiba University, Japan) Journal of Applied Physiology (ISSN 0161-7567), vol. 70, Feb. 1991, p. 590-593. refs
Copyright
The effect of a carotid-body resection in humans on the CO2-ventilation response was investigated by comparing the steady-state CO2-ventilation response curves with hyperoxia and mild hypoxia in five carotid-body-resected (BR) patients with those of control patients. It was found that, compared with control patients, the hypoxic CO2-ventilation response in BR patients was significantly depressed. It is suggested that the depression resulted, at least in part, from a modulation of the brain-stem neural mechanism due to the loss of afferent discharges from the carotid body.
I.S.

CLASSICAL CONDITIONING OF VENTILATORY RESPONSES IN HUMANS
JORGE GALLEGOS and PIERRE FERRUCHET (Paris VI, Universite, France) Journal of Applied Physiology (ISSN 0161-7567), vol. 70, Feb. 1991, p. 676-682. Research supported by the Institut National de la Santé et de la Recherche Medicale. refs
Copyright
The effect of classical conditioning on the ventilatory responses in humans was examined in subjects, assigned either to an experimental or a control group, in whom an auditory and hypoxic stimuli were either paired or not paired, respectively. The results on the patterns of breathing obtained in two groups of subjects provide evidence that an auditory stimulus that was paired repeatedly with a hypoxic stimulus may acquire the ability to elicit a ventilatory response due, specifically, to pairing. It is suggested that conditioned vegetative responses may considerably enhance the adaptability of organisms to varying environmental conditions.
I.S.

ATTENUATED CAROTID BODY HYPOXIC SENSITIVITY AFTER PROLONGED HYPOXIC EXPOSURE
KOICHIRO TATSUMI, CHERYL K. PICKETT, and JOHN V. WEIL (Colorado, University, Denver; Chiba University, Japan) Journal of Applied Physiology (ISSN 0161-7567), vol. 70, Feb. 1991, p. 745-755. refs
Copyright
The relative importance of the central and the peripheral mechanisms in the decreased hypoxic ventilatory response (HVR) that accompanies prolonged exposure to hypoxia was investigated in cats exposed to simulated altitude of 5500 m for 3-4 weeks. The ventilatory responses to hypoxia were measured in each cat before and after the exposure, while the carotid sinus nerve (CSN) responses (which had to be measured by an invasive technique) in experimental group were compared to those in the control group. It was found that a decreased HVR response to hypoxia was associated with a parallel decrease in the CSN response. It is suggested that the depression resulted, at least in part, from a modulation of the brain-stem neural mechanism due to the loss of afferent discharges from the carotid body.
I.S.

AIR TRAVEL ACROSS FOUR TIME ZONES IN COLLEGE SWIMMERS
PATRICK J. O'CONNOR, WILLIAM P. MORGAN, KELLI F. KOLTYN, JOHN S. RAGLIN, JOEL G. TURNER (Arizona State University, Tempe; Wisconsin, University, Madison; W.S. Middleton Memorial Veterans Administration; Indiana University, Bloomington) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 70, Feb. 1991, p. 756-763. Research supported by the U.S. Olympic Committee. refs
Copyright
The effect of air travel across several time zones on the athletic performance and the physiological parameters of trained athletes was investigated in 18 female and 22 male college swimmers flown across four time zones in the east-to-west (E-W) direction and, three weeks later, in the west-to-east (W-E) direction. Results of two-way repeated-measured analyses of variance showed that, in comparison to preflight values, the pre- and postexercise cortisol levels decreased after the E-W travel and increased after the W-E travel. The resting and exercise heart-rate responses to air travel were small in magnitude, with their significance dependent on the direction of travel. However, the effort sense was not altered by air travel, and there were significant improvements in terms of the mood and the reduction in muscle soreness after both the E-W and the W-E travel. Responses of male and female subjects to air travel were similar.
I.S.
ALTERATION OF CIRCADIAN RHYTHM OF PLASMA CORTISOL AFTER EASTWARD FLIGHT AND THE EFFECT OF LIGHT EXPOSURE
NAOKO TAJIMA, AKIRA SASAKI, HIROFUMI OKKOSHI, MIKIO UEMATSU, ICHIRO ASUKATA (Japan Airlines, Flight Crew Medical Service Dept., Tokyo, Japan) et al. Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723), vol. 27, June 1990, p. 35-41. *refs
The study aims to clarify the effect of time zone flight on circadian rhythm of plasma cortisol and to investigate the influence of light exposure on the resynchronization. Twelve healthy male volunteers aged 20-26 years underwent an eastward 8 h time shift by jet from Tokyo to San Francisco and spent strictly scheduled 10 days. Control group (n = 6), who lived under the natural sun light condition with more than 10,000 lux for 3 hours in the morning for days two to four showed a recovery of the circadian rhythm of plasma cortisol by day seven. However, the artificial light group (n = 3), who were exposed to 3000 lux fluorescent lamp in a room, and the dim light group (n = 3), who wore eye masks during the same time frame, did not show resynchronization within 10 days. The results indicate that the bright light exposure seems to have some effects on the faster resynchronization of plasma cortisol.

IMPLICATIONS OF THE NEW RADIATION EXPOSURE LIMITS ON SPACE STATION FREEDOM CREWS
Copyright
Levels of acceptable risk of radiation exposure for SSF crews have been studied. Since the cancer risk per dose equivalent has increased over the last decade, new dose-equivalent limits have been recommended. An astronaut may not receive more than a depth-dose equivalent of 50 rem/year. It is found that a 180-day stay aboard Freedom could result in a worst case depth-dose of 30 rem, and a 180-day mission in a nominally shielded spacecraft in a constant atmospheric density orbit with a varying altitude could result in a depth-dose equivalent of 10 rem. This is twice the annual allowable dose-equivalent for terrestrial radiation workers. It is noted that the present understanding of the biological effectiveness of high-LET radiation is not adequate for accurate health risk assessments and that further research is necessary.

PREDICTION OF SPACE MOTION SICKNESS SUSCEPTIBILITY BY DISCONJUGATE EYE TORSION IN PARABOLIC FLIGHT
SHIRLEY G. DIAMOND and CHARLES H. MARKHAM (California, University, Los Angeles) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, March 1991, p. 201-205. *refs
Copyright
The hypothesis of asymmetric otolith function asserts that physiological or anatomical differences in the two sides of the bilateral gravity-sensing otolith apparatus of the inner ear may be well compensated on earth, but when exposed to novel gravitational states, the prior compensatory stratagems may be ineffective, leading to unstable vestibular responses and causing the phenomenon of space motion sickness. To investigate this hypothesis, spontaneous eye torsion, a reflex governed by the otolith organs, was examined in the upright position during the hypogravity of parabolic flight aboard NASA's KC-135 aircraft in nine former astronauts whose history of space motion sickness was revealed after data analysis had been completed. Results showed that astronauts who had been sick in space had significantly higher scores of disconjugate eye torsion in parabolic flight, and that their responses were consistently different in 1.8 G relative to 0 G compared to astronauts who had not been sick in space. In 1 G, there were no differences in disconjugate eye torsion between the subjects. The results support the asymmetry hypothesis and offer a possible predictive test of space motion sickness.

DECREASED SUSCEPTIBILITY TO MOTION SICKNESS DURING EXPOSURE TO VISUAL INVERSION IN MICROGRAVITY
JAMES R. LACKNER and PAUL DIZIO (Brandeis University, Waltham, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, March 1991, p. 206-211. *refs
Copyright
Head and body movements made in microgravity tend to bring on symptoms of motion sickness. Such head movements, relative to comparable ones made on earth, are accompanied by unusual combinations of semicircular canal and otolith activity owing to the unloading of the otoliths in 0G. Head movements also bring on symptoms of motion sickness during exposure to visual inversion (or reversal) on earth because the vestibulo-ocular reflex is rendered anti-compensatory. Here, evidence is presented that susceptibility to motion sickness during exposure to visual inversion is decreased in a 0G relative to 1G force background. This difference in susceptibility appears related to the alteration in otolith function in 0G. Some implications of this finding for the etiology of space motion sickness are described.
rate proved that hypoxia existed during exercise in the 12-percent O2 condition.  

Author

A91-27967* National Aeronautics and Space Administration.  
Ames Research Center, Moffett Field, CA.  
EFFECTS OF ALCOHOL ON PILOT PERFORMANCE IN SIMULATED FLIGHT  
Copyright

Ethyl alcohol’s known ability to produce reliable decrements in pilot performance was studied in a design evaluated to produce objective methods for assessing pilot performance. Four air carrier pilot volunteers were studied during eight simulated flights in a B727 simulator. Total errors increased linearly and significantly with increasing blood alcohol. Planning and performance errors, procedural errors and failures of vigilance each increased significantly in one or more pilots and in the group as a whole.  

Author

A91-27968 RELATIONSHIPS OF ANXIETY SCORES TO SCREENING AND TRAINING STATUS OF AIR TRAFFIC CONTROLLERS  
Copyright

The present study assessed the relationship between anxiety, as measured by the state-trait personality inventory (STPI), and success of post-strike air traffic control specialist (ATCS) trainees at the FAA Academy and during field training. Results support the operation of some personality-related self-selection among ATCS applicants regarding anxiety and the importance of the low anxiety characteristic for ATCS job success.  

Author

A91-27969 EFFECTS OF WATER TEMPERATURE ON PERFORMANCE - A PRACTICAL EVALUATION OF A NEUTRAL BUOYANCY FACILITY  
GRETA BOLSTAD, EIRIK MYRSETH, BARD HOLAND, and ARVID PASCHE (Foundation for Scientific and Industrial Research, Trondheim, Norway) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, March 1991, p. 241-245. EAA-supported research.  
Copyright

Manual and cognitive performance of two female and four male divers was evaluated in "cold" and "warm" water in a neutral buoyancy facility. A test battery of six manual and cognitive tests was applied in a fixed sequence in three separate, 3-h dives: (1) water temperature 18-19 C, wet suit 3-5 mm thick, and (3) water temperature 18-19 C, tailor made wet suit 6.5 mm thick. No significant differences in performance between the three conditions were recorded. Mean rectal temperature decreased by 1 C in all dive conditions, except in females in dive 2. Ventilation was significantly higher in dive 1 than in dives 2 and 3. Thermal discomfort was reported only after 2 h in dive 1. It is suggested that support divers may work safely, comfortably, and effectively for at least 2 h in water of 18-19 C, if dressed in thermal protective wet suits.  

Author

A91-27970 National Aeronautics and Space Administration.  
Ames Research Center, Moffett Field, CA.  
POSTURAL RESPONSES OF HEAD AND FOOT CUTANEOUS MICROVASCULAR FLOW AND THEIR SENSITIVITY TO BED REST  
Copyright

To explore the mechanism for facial puffiness, headache, and nasal congestion associated with microgravity and cephalad fluid shifts, the postural responses of the cutaneous microcirculation (CMC) in the forehead and dorsum of the foot of eight healthy men were studied by changing body position on a tilt table and measuring blood flows with a laser Doppler flowmeter. Increasing arterial pressure in the feet by moving from a -6-deg head-down tilt to a 60-deg head-up posture decreased foot CMC by 46.5 +/- 12.0 percent. Raising arterial pressure in the head increased forehead CMC by 25.5 +/- 0.7 percent (p less than 0.05). To investigate the possibility that these opposite responses could be modified by simulated microgravity, tilt test were repeated after 7 d of -6-deg head-down-tilt bed rest. The responses were not significantly different from those recorded before bed rest. Therefore, CMC in the feet is well regulated to prevent edema when shifting to an upright position, whereas there is less regulation in the head CMC.  

Author

A91-27971 STEADY STATE AND TRANSIENT G-EXCESS EFFECTS  
Copyright

Acceleration forces of flight are associated with a number of spatial orientation illusory effects. This note focuses on two effects, both called the 'G-excess effect'. A distinction between steady-state and transient G-excess effects is important because prescriptions for preventive management of effects in flight will differ.  

Author

A91-27972 REDUCED CONTRAST SENSITIVITY WHEN VIEWING THROUGH AN AIRCRAFT WINDSCREEN  
PHILIP K. HUGHES (Department of Defence, Aeronautical Research Laboratory, Melbourne, Australia) and ALGIS J. VINGRYS (Melbourne, University, Parkville, Australia) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, March 1991, p. 254-257.  
Copyright

The contrast sensitivity function (CSF) of an experienced observer was measured under normal viewing conditions, when looking through an aircraft windscreen and when looking through the windscreen in the presence of a glare source. It is found that contrast sensitivity was significantly reduced for frequencies above about 6 cycles/degree viewed through the windscreen and that the addition of a glare source further reduced contrast sensitivity for all spatial frequencies greater than 1 cycle/degree. These results demonstrate that the CSF is a sensitive metric of degraded visual performance when viewing through optical transparencies.  

Author

A91-27974 ERRORS IN MEASUREMENT OF +GZ ACCELERATION TOLERANCE  
DAVID A. LUDWIG (North Carolina, University, Greensboro) and LARRY P. KROCK (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, March 1991, p. 261-265. USAF-supported research.  
Copyright

Most acceleration studies estimate a subject's G-level tolerance by taking only one determination (test) for a given condition. The purpose of this study was to examine the error structure and reliability of an individual's acceleration tolerance and to provide design considerations for future experimentation. A hierarchical (nested) design was used to estimate the sources of variation in measuring G-level tolerance. Six males rode relaxed in the USAF School of Aerospace Medicine human-use centrifuge and were exposed to a 0.1 G/s onset rate profile until greyout. Each subject
was tested on three randomly selected days with three repeated determinations within a day. This design allowed for an estimate of both day-to-day and measurement error within a testing session. A single +Gz tolerance determination was found to be moderately unreliable (reliability coefficient = 0.74). Under the best of circumstances a subject's G-level tolerance cannot be estimated with any more accuracy than about + or - 0.3 G with 95 percent confidence. This degree of accuracy can only be obtained with multiple measurements. 

Author A91-27975
THE USE OF THE PRESSURE CUFF TEST IN THE DIAGNOSIS OF DECOMPRESSION SICKNESS
FREDERICK W. RUDGE and JEFFREY A. STONE (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0035-6562), vol. 62, March 1991, p. 266, 267. refs Copyright
Records at the Hyperbaric Medicine Division, United States Air Force School of Aerospace Medicine, were reviewed to determine the utility of the pressure cuff test as an aid in the diagnosis of Type I decompression sickness (DCS). Applying local pressure with a blood pressure cuff has been described as a useful test to differentiate the pain of DCS from that of other musculoskeletal conditions. Records were reviewed from January 1985 to December 1989. During this period 179 patients were treated with recompression for extremity pain. Application of a blood pressure cuff to the painful area was used as a diagnostic aid in 87 patients. Only 53 patients (61 percent) with DCS had a positive test (relief of pain with local pressure). Results did not correlate with the rapidity of relief of symptoms during recompression. It is concluded that the failure to respond to the application of local pressure should not be used to rule out the presence of DCS - this must be done with a test of pressure in a hyperbaric chamber. 

Author A91-28163* Toronto Univ. (Ontario).
COMPARISON OF SMOOTH PURSUIT AND COMBINED EYE-HEAD TRACKING IN HUMAN SUBJECTS WITH DEFICIENT LABYRINTHINE FUNCTION
R. J. LEIGH, S. E. THRUSTON (Cleveland, University Hospitals; USVA, Medical Center, OH), J. A. SHARPE, P. J. RANALLI (Toronto Western Hospital, Canada), and M. A. HAMID (Cleveland Clinic Foundation, OH) Experimental Brain Research (ISSN 0014-4819), vol. 66, 1987, p. 458-464. Research supported by USVA, Evenor Armiton Fund, Toronto Western Hospital, and Medical Research Council of Canada. refs (Contract NIH-EY-06717; NAS9-17439) Copyright

The effects of deficient labyrinthine function on smooth visual tracking with the eyes and head were investigated, using ten patients with bilateral peripheral vestibular disease and ten normal controls. Active, combined eye-head tracking (EHT) was significantly better in patients than smooth pursuit with the eyes alone, whereas normal subjects pursued equally well in both cases. Compensatory eye movements during active head rotation in darkness were always less in patients than in normal subjects. These data were used to examine current hypotheses that postulate modulation of the vestibulo-ocular reflex (VOR) during EHT. A model that proposes summation of an integral smooth pursuit command and VOR/compensatory eye movements is consistent with the findings. Observation of passive EHT (visual fixation of a head-fixed target during en bloc rotation) appears to indicate that in this mode parametric gain changes contribute to modulation of the VOR. 

A.F.S. A91-28164* Akron Univ., OH.
FREQUENCY AND VELOCITY OF ROTATIONAL HEAD PERTURBATIONS DURING LOCOMOTION
G. E. GROSSMAN, R. J. LEIGH, D. J. LANSKA, S. E. THRUSTON (Cleveland, University Hospitals; USVA, Medical Center, OH), and L. A. ABEL (Akron, University, OH) Experimental Brain Research (ISSN 0014-4819), vol. 70, 1988, p. 470-476. Research supported by USVA and Evenor Arminton Fund. refs (Contract PHS-EY-00288; PH5-EY-06717; NAS9-17439) Copyright

The magnetic search coil technique was used to record horizontal (yaw) and vertical (pitch) head rotations of 20 normal subjects during walking in place, running in place, vigorous voluntary horizontal head rotation, and vigorous voluntary vertical head rotation. Data are presented to show that (1) during locomotion, the head is stabilized in space incompletely but adequately so that the vestibuloocular reflex (VOR) is not saturated; (2) during vigorous, voluntary head rotations, the maximum head velocity exceeds the range where the VOR can stabilize gaze; and (3) the frequencies of head rotations that occur during locomotion greatly exceed frequencies conventionally used in the laboratory for testing the VOR. 

Author A91-28170*
BEHAVIOR OF HUMAN HORIZONTAL VESTIBULO-OCULAR REFLEX IN RESPONSE TO HIGH-ACCELERATION STIMULI
E. F. MAAS, W. P. HUEBNER, S. H. SEIDMAN, and R. J. LEIGH (Cleveland, University Hospitals; USVA, Medical Center, OH) Brain Research (ISSN 0006-8993), vol. 499, 1989, p. 159-156. Research supported by USVA and Evenor Arminton Fund. refs (Contract NIH-EY-06717; NAS9-17439) Copyright

The horizontal vestibulo-ocular reflex (VOR) during transient, high-acceleration (1900-7100 deg/sec-squared) head rotations was studied in four human subjects. Such stimuli perturbed the angle of gaze and caused illusory movement of a viewed target (oscillopsia). The disturbance of gaze could be attributed to the latency of the VOR (which ranged from 6-15 ms) and inadequate compensatory eye rotations (median VOR gain ranged from 0.61-0.83). 

Author N91-17533# Texas Univ. Health Science Center, Houston. School of Public Health.
HYPERBARIC OXYGENATION (HBO) CLINICAL TRIALS: A REVIEW M.S. Thesis
JAMES ROY KNOWLES May 1990 48 p Sponsored by AFIT, Wright-Patterson AFB, OH (AD-A227901; AFIT/CSI/CIA-90-097) Avail: NTIS HC/MF A03 CSDL 06/5

Hyperbaric oxygenation (HBO) has been used as a medical intervention for the treatment or prophylaxis of numerous conditions in humans. There is an accumulation of pre-clinical and clinical data supporting its use in humans. It has been asserted that the clinical data are largely derived from anecdotal, uncontrolled observations. The call for reliable data from good clinical trials has sounded forth both from within and from outside the HBO community. A logical question is: What clinical trials have actually been done to assess the efficacy of HBO, how good were they, and what did they find. This thesis will present a review of HBO clinical trials which will help answer the above question. The review will identify HBO clinical trials in the general medical literature, assess their methodologic content, and list the reported efficacy of HBO in the various trials. Lastly, the review will briefly discuss its findings as they relate to future clinical research involving the use of HBO. 

GRA N91-17534# Naval Medical Research Inst, Bethesda, MD.
EFFECTS OF MULTIPLE COLD AIR EXPOSURES ON DELAYED MATCHING TO SAMPLE PERFORMANCE Interim Report
DAVID W. ARMSTRONG and JOHN R. THOMAS 2 Apr. 1990 19 p (AD-A228390; NMRI-90-87) Avail: NTIS HC/MF A03 CSDL 06/10

Acute exposure to moderate cold impairs delayed matching to sample (DMS) performance in both animal and man. The effect of multiple cold air (2.6 ± 0.6 C) exposures on DMS performance was investigated. Twelve men performed the DMS task during a 45 min exposure to cold air on Day 1. Oxygen consumption (VO2) was measured concurrently. After completion...
of Day 1, subjects were assigned to two groups. Group W performed the DMS task on Days 2 to 11 in warm air (22 C) during a 45 min period before being exposed to cold air on days 2 to 11. On Day 12, all subjects were exposed to cold air as on Day 1. VO2 was measured concurrently on Days 4 to 8. DMS performance was significantly impaired in all subjects during exposure to cold air on Day 1 when compared to baseline DMS performance. Performance on the DMS was significantly different between the groups on Day 12. Group W performance was not different on Day 12 when compared to Day 1. Group C performance was not different from baseline on Day 12 and was significantly improved when compared to Day 1. VO2 was elevated in the cold but was not different between groups. VO2 was not different on Day 12 when compared to Day 1. DMS is affected by acute exposure to cold air. Performance on the DMS task improves with repeated cold air exposure only when the DMS task is repeatedly performed in cold air.

GRA

N91-17535# Institute for Defense Analyses, Alexandria, VA.
COLIN P. HAMMON and STANLEY A. HOROWITZ Mar. 1990
39 p
Contract MDA903-84-C-0031
(AD-A228582; AD-E501304; IDA-P-2379; IDA/HQ-90-35201)
Avail: NTIS HC/MF A03 CSCL 05/9
This work addresses the development of quantitative relationships between how much aircrews have flown and how well they perform important aspects of their missions. It is determined that additional flying enhances proficiency in two ways: through the short-run honing of skills and through the long-run development of mastery. Estimates of the strength of the links between flying experience and three measures of performance are developed. The measures are: bombing accuracy, the quality of landings aboard aircraft carriers, and kills in air combat maneuvering exercises. In general, it is found that while both short-run experience and important, career experience has a stronger relationship than recent experience to performance.

GRA

N91-17536# National Inst. of Standards and Technology, Gaithersburg, MD.
FED-X: THE NIST EXPRESS TRANSLATOR
STEPHEN NOWLAND CLARK Aug. 1990
16 p
(PB90-269507; NISTIR-4371) Avail: NTIS HC/MF A03 CSCL 06/3
The product data exchange specification (PDES) is an emerging standard for the exchange of product information among various manufacturing applications. PDES includes an information model written in the EXPRESS language; other PDES-related information models are also written in EXPRESS. The National PDES Testbed and NIST has developed software to manipulate and translate EXPRESS models. The software consists of an in-memory working form and an associated EXPRESS language parser, FED-X. The design and capabilities of FED-X and the EXPRESS Working Form are discussed.

GRA

N91-17537# Pacific Northwest Lab., Richland, WA.
ELF (EXTREMELY-LOW-FREQUENCY) FIELD INTERACTIONS AT THE ANIMAL, TISSUE AND CELLULAR LEVELS
T. S. TENFORDE Oct. 1989
Contract DE-AC06-76RL-01830
(DE91-004807; PNL-SA-18664; CONF-9010265-1) Avail: NTIS HC/MF A03
A description is given of the fundamental physical properties of extremely-low-frequency (ELF) electromagnetic fields, and the mechanisms through which these fields interact with the human body at a macroscopic level. Biological responses to ELF fields at the tissue, cellular and molecular levels are summarized, including new evidence that ELF field exposure produces alterations in gene expression and the cytoplasmic concentrations of specific proteins.

DOE

N91-17538# Texas Univ., Galveston. Dept. of Otolaryngology, Physiology and Biophysics.
MANNING J. CORREIA and TABARACCI 30 Jun. 1989
8 p
Contract NAG2-186)
(NASA-CR-187877; NAS 1.26:187877) Avail: NTIS HC/MF A02 CSCL 06/16
The general goal was to examine tilt sensitivity of horizontal semicircular canal afferents. Computer programs were tested which controlled the short axis centrifuge at the Vestibular Research Facility, acquired action potentials and produced data reduction analyses including histograms and gain and phase calculations. A pre-amplifier was also developed for the acquisition of action potentials. The data were gathered that can be used to contribute toward the understanding of the tilt sensitivity of semicircular canal afferents in the unanesthetized gerbil preparation. Author

GRA

N91-17539# Naval Dynamics Lab., New Orleans, LA.
4 Sep. 1990
27 p Sponsored by Naval Medical Research and Development Command, Bethesda, MD
Contract DA-229030; NBDR-90R005
Avail: NTIS HC/MF A03 CSCL 06/5
This report lists all research reports, special reports, monographs, technical memoranda, joint reports, research information bulletins, journal articles, and conference proceedings published by the Naval Dynamics Laboratory between January 1980 and August 1990.

GRA

N91-17540# Dartmouth Coll., Hanover, NH. Dept. of Psychology.
91 p
Contract AF-AFOSR-0437-89; AF PROJ. 2313)
(AD-A229111; AFSOR-90-1132TR) Avail: NTIS HC/MF A05 CSCL 06/5
The saccadic control system represents a good model system to study the selection of stimulus events according to their spatial location. The present work focuses on two factors known to influence saccade latency: the presence of a fixation stimulus and the nature of the saccade target. We report evidence which suggests that fixation point offsets facilitate pre-motor stages of saccade generation (Reuter-Lorenz et al., in press; Appendix I). This idea, in conjunction with electrophysiological data, suggested that fixation offset might also facilitate saccades to acoustic targets. Experiment 1 confirmed this suggestion (Fendrich, et al. (in preparation)). The facilitatory effects of redundant stimulation via fixation offset might also facilitate saccades to acoustic targets. Experiment 1 confirmed this suggestion (Fendrich, et al. (in preparation)).

GRA

N91-17541# Texas Univ. Health Science Center, San Antonio. Dept. of Ophthalmology.
JOSEPH M. HARRISON, CHEN PENG, CHARLES S. BALLENTINE, and J. TERRY YATES Oct. 1990
44 p Sponsored by Southeastern Center for Electrical Engineering Education, Inc., Saint Cloud, FL
The trend towards a significant age-related decline in contrast sensitivity that was demonstrated in subjects aged 21 to 50 in previous studies prompted a replication with a large sample size and an investigation of scattered light, measured indirectly by disability glare, as a function of age. The age-related decline of contrast sensitivity was confirmed in the age range 21 to 50 with a large sample size, 30, in each decade. Contrast sensitivity to neither externally generated nor interference gratings changed significantly with age. The high spatial frequency cutoff derived from the contrast sensitivity to 12, 16, and 20 cycle per degree gratings did not vary as a function of age. This is consistent with the fact that we selected only those subjects with 20/20 or better visual acuity. Consistent with the lack of declining contrast sensitivity over this age range was the lack of a significant age-related increase in susceptibility to disability glare as measured by sensitivity to 4 and 12 cycles per degree gratings without and with glare. The interaction between age and glare condition was not statistically significant. Increment threshold for a low mesopic background did not change significantly as a function of age. There was a significant increase in the increment threshold limited of the glare condition for the oldest decade in the paradigm simulating night time glare.

GRA

N91-18572# California Univ., Berkeley. Lawrence Berkeley Lab.

DIGITAL RADIOGRAPHY: PRESENT DETECTORS AND FUTURE DEVELOPMENTS
V. PEREZ-MENDEZ Aug. 1990 20 p Presented at the 3rd International Conference on Applications of Physics in Medicine and Biology: Medical Diagnostic Imaging, Trieste, Italy, 4-7 Sep. 1990
(Contract DE-AC03-76SF-00998) (DE91-005386; LBL-29441; CONF-900993-1) Avail: NTIS HC/MF A03

Present detectors for digital radiography are of two classes: real time detectors and storage (non real time) types. Present real time detectors consist of image intensifier tubes with an internal cesium iodide layer x ray converter. Non real time detectors involve linear sweep arrays or storage detectors such as film. Future detectors discussed here can be of both types utilizing new technologies such as hydrogenated amorphous silicon photodiode arrays coupled to thin film transistor arrays.

DOE

N91-18573# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX. MICROBIOLOGY ON SPACE STATION FREEDOM
(NASA-CP-3108; S-619; NAS 1.55:3108) Avail: NTIS HC/MF A03

This panel discussion convened in Houston, Texas, at the Lunar and Planetary Institute, on November 6 to 8, 1989, to review NASA’s plans for microbiology on Space Station Freedom. A panel of distinguished scientists reviewed, validated, and recommended revisions to NASA’s proposed acceptability standards for air, water, and internal surfaces on board Freedom. Also reviewed were the proposed microbiology capabilities and monitoring plan, disinfection procedures, waste management, and clinical issues. In the opinion of this advisory panel, ensuring the health of the Freedom’s crews requires a strong goal-oriented research effort to determine the potential effects of microorganisms on the crewmembers and on the physical environment of the station. Because there are very few data addressing the fundamental question of how microgravity influences microbial function, the panel recommended establishing a ground-based microbial model of Freedom, with subsequent evaluation using in-flight shuttle data. Sampling techniques and standards will be affected by both technological advances in microgravity-compatible instrumentation, and by changes in the microbial population over the life of the station.

2 Oct. 1990 54 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-90-016) Avail: NTIS HC/MF A04

Abstracts of Soviet literature in various areas of the life sciences are compiled. The following subject areas are covered: aerospace medicine, epidemiology, immunology, microbiology, nonionizing radiation effects, physics, radiobiology, and virology.

N91-18575# Joint Publications Research Service, Arlington, VA. ORTHOSTATIC STABILITY OF ATHLETES OF DIFFERENT SPECIALIZATIONS AND ITS CHANGE AS PRODUCED BY LOWER GRAVITY Abstract Only
Avail: NTIS HC/MF A04

The orthostatic stability of athletes of different specializations was examined, and the changes in that stability after a stint under conditions of lower gravity are discussed. The conditions of reduced gravity were simulated by submersion into a dry immersion for three days. During the orthostatic test and during the recovery period, the following indicators of central and peripheral hemodynamics were determined: stroke volume, pulse blood flow of the femur and crus (by the rheographic method), heart contraction rate (from ECG), and systolic and diastolic blood pressure.

Y.S.

N91-18576# Joint Publications Research Service, Arlington, VA. POSSIBILITY OF USING EVOKED BRAIN POTENTIALS TO DIAGNOSE FLIGHT CREW FATIGUE
Avail: NTIS HC/MF A04

The possibilities for using evoked potentials to diagnose fatigue among flight crews when they are performing their jobs are studied. The basic theoretical premise was the accepted fact that as fatigue develops, the physiological price of activity increases, reserve possibilities for processing additional information decline, and performance of a flying assignment worsens in the dynamics of pilot performance. A 10-hour flight on a route with alternating cycles of manual and automatic control was modeled on a flight simulator. An electroencephalogram was recorded during the landing approaches. Auditory stimuli irrelevant to the operator were used to obtain auditory evoked potentials (AEPs). Traditional indicators were used in the analysis of average AEPS - the latent periods of isolated components and their amplitudes. Before and after the experiment the operator used a special scale to evaluate the level of their feeling of fatigue. The quality of activity associated with the landing approach was evaluated.

Y.S.

Avail: NTIS HC/MF A04

The risk of falling ill to infectious diseases grows significantly among people in biological isolation. This shows up in the activation of the latent conditionally pathogenic component of human automicroflora, the weakening of the colonization resistance barrier, and the weakening of the immune system. Intensive microbial exchange occurs between people occupying hermetically sealed
CEREBRAL-VASCULAR EFFECTS OF MOTION SICKNESS

YU. D. KORNILOVA, A. F. ZHERNAKOV, A. D. VOSKRESENSKY, YU. D. POMETOV, and V. N. ALEKSEYEV

The body's physiological systems that are most sensitive to the effects of weightlessness and subject to pharmacological adjustment at various stages of space flight are examined. Special attention is given to the design and practical application of cardiovascular preparations, and agents for the prevention of motion sickness, as well as substances that affect metabolic processes and mineral saturation of bone tissue. Emphasis is given to the possible use of medical agents in space flights and in practical public health. Author

PHARMACOLOGICAL REGULATION OF PHYSIOLOGICAL FUNCTIONS IN SPACE MEDICINE

V. S. SHASKHOV

In its JPRS Report: Science and Technology. USSR: Life Sciences p 1-5 26 Sep. 1990 Transl. into ENGLISH from Farmakologiya i Toksikologiya, Moscow (USSR), v. 53, no. 1, Jan.-Feb. 1990 p 5-10
Avail: NTIS HC/MF A04

An analysis was conducted in the effects of graded physical stress on cerebral hemodynamics in order to refine fitness parameters for pilots. It is shown that, in general, individuals with cardiovascular problems generally presented with hypo- or hyperperfusion of the brain and much greater recovery periods. The body's physiological systems that are most sensitive to the effects of weightlessness and subject to pharmacological adjustment at various stages of space flight are examined. Special attention is given to the design and practical application of cardiovascular preparations, and agents for the prevention of motion sickness, as well as substances that affect metabolic processes and mineral saturation of bone tissue. Emphasis is given to the possible use of medical agents in space flights and in practical public health. Author

EFFECT OF GRADED PHYSICAL STRESS ON CEREBRAL HEMODYNAMICS IN PILOTS

L. I. STARIKOV

Avail: NTIS HC/MF A04

An analysis was conducted in the effects of graded physical stress on cerebral hemodynamics in order to refine fitness parameters for pilots. It is shown that, in general, individuals with cardiovascular problems generally presented with hypo- or hyperperfusion of the brain and much greater recovery periods. These factors have to be considered in assessing job fitness and in planning flight assignments to avoid undue physical stress. A program of exercise therapy recommended for pilots with hypo- and hyperdynamic extrasystoles is discussed. Y.S.

RELATIONSHIP BETWEEN ORTHOSTATIC STABILITY AND POST-SPACE FLIGHT VESTIBULAR FUNCTION IN MAN

V. M. MIKHAYLOV, L. N. KORNILOVA, A. F. ZHERNAKOV, A. D. VOSKRESENSKY, YU. D. POMETOV, and V. N. ALEKSEYEV

Analysis of the relationship between orthostatic stability and vestibular function was performed on cosmonauts after space flight aboard the Salyut-6 space station. Orthostatic and vestibular function tests conducted upon landing and later showed functional deterioration in both tests. In addition, a positive correlation coefficient was obtained for centered results of both tests. Author

RELATIONSHIP BETWEEN VERTICAL OPTIKINETIC NYSTAGMUS AND SUSCEPTIBILITY TO MOTION SICKNESS

O. A. VOROBYEV, V. V. ZARITSKAYA, and YU V. KRYLOV

A study was conducted on the relationship between vertical optokinetic nystagmus and motion sickness on healthy males under conditions of simulated weightlessness. The factors affecting the vestibular apparatus (primarily optolithic receptors) and redistribution of body fluids in the cranial direction modify vertical optokinetic nystagmus to a much greater degree.
in subjects who are susceptible to motion sickness. These findings confirmed the importance of hemodynamics in the pathogenesis of motion sickness, as well as the fact that studies on vertical oscillations of long duration, particularly of downward predominance, may be of prognostic value regarding susceptibility to motion sickness during space flight.

Author

N91-18599# Joint Publications Research Service, Arlington, VA.

CIRCADIAN PATTERNS IN PLASMA LIPIDS, CARBOHYDRATES, AND SOME HORMONES OF HEALTHY PILOTS Abstract Only
YE. YE. NIKOLAYEVSKY

Avail: NTIS HC/CF A04

A comparative analysis was conducted on the circadian patterns of plasma lipids, hormones, and blood sugar in healthy pilots and an age- and health-equivalent group of non-flight specialists. The results demonstrated that the mean daily lipid and hormone levels in the pilots exceeded the corresponding control levels, usually by a factor of one-fold or better. In the case of blood sugar the relationship was reversed, with the level in the control subjects exceeding the value in pilots. Differences between the two groups were also noted in acrophase values and amplitude parameters. The most pronounced differences in acrophase were noted for blood sugar, beta-lipoproteins, and cholesterol. In general, the shifts were interpreted to reflect pilot adaptability in the face of stress, with the conclusion that these biochemical values may be used in assessment of occupational fitness.

Author

N91-18590# Joint Publications Research Service, Arlington, VA.

EXPERIMENTAL ASSESSMENT OF EFFECT OF HEAD POSITION ON CENTER OF GRAVITY OF HUMAN BODY IN EJECTION SEATS Abstract Only
G. G. DEMIRCHOGLYAN, YU. G. KONAKHEVIC, V. KH. PETLYUK, R. V. PESHKOV, P. N. KHLOMENOK, L. N. SHOLPO, and V. I. BRAZHNIK

Avail: NTIS HC/CF A04

Kinematic experiments were performed on 55 pilots to assess the effects of head inclination on the body’s center of gravity in ejection seats. The purpose was to obtain quantitative data relating trajectory of the ejection seats in relation to anthropometric characteristics, employing a dynamographic stand designed to measure such effects. A two-factor regression equation relating head inclination to change in the center of gravity was derived and used for graph construction.

Author

N91-18591# Joint Publications Research Service, Arlington, VA.

ULTRASONIC ASSESSMENT OF HUMAN TIBIA DURING 370-DAY ANTIOORTHOSTATIC HYPOKINESIA Abstract Only
A. M. TATARINOV, S. L. DUBONOS, KH. A. YANSON, V. S. OGANOV, V. V. DZENIS, and A. S. RAKHMANOV

Avail: NTIS HC/CF A04

Studies were conducted on ultrasonic assessment of the effects of simulated weightlessness and exercise therapy on human long bones. The subject were maintained in an antilorthostatic position. Exercise therapy was constant throughout the experiment for some subjects, and for other ones it was started at the beginning of the fifth month. Acoustic profiles for 120 kHz waves revealed considerable individual variations in average velocity, average velocity in the diaphyses, and decrement values in velocity along the distal half of tibia. One year after the experiment all values returned to baseline levels, and the resultant data confirmed the beneficial effects of exercise on human long bones in simulated weightlessness.

Author

N91-18592# Joint Publications Research Service, Arlington, VA.

STRESS AND HUMAN CIRCULATION Abstract Only
B. M. FEDOROV, T. V. SEBENKINA, T. M. SINITSYN, YE. N. STREETSOVA, V. M. VAKHRSTIK, and T. G. NIKOLAYEVA

Avail: NTIS HC/CF A04

A variety of research and diagnostic techniques, including EKG, Doppler echocardiography, Xe-133 labels, etc., were employed in an assessment of human cerebral and systemic circulation during stress. The results demonstrated that intense mental activity potentiated cerebral blood flow, particularly in the supramarginal convolution of the brain, as well as in the angular convolution and in the parietotemporal and occipital region of the left cerebral hemisphere. In most cases an increased flow was also detected in the upper frontal convolution, Broca’s convolution, and the superior temporal convolution. Prolonged bed rest was also observed to be a stressful situation predisposing to hypertension. The data were consistent with the view that maximum mental concentration was accompanied by a decrease in heart rate, but that in the majority of cases changes in regional and systemic hemodynamics are predicated on the emotional component of any activity. Cerebral hemodynamics in situations of intense mental activity appear to be closely connected to processes directed at maintaining optimum mental function and seem to be adaptive in nature. In general, mental activity within the framework of time constraints evoked hemodynamic changes that were as pronounced as those induced by submaximal physical demands.

Author

N91-18594# Pacific Northwest Lab., Richland, WA. Life Sciences Center.

REVISION OF THE ICRP DOSIMETRIC MODEL FOR THE HUMAN RESPIRATORY TRACT
W. J. BAIR


DOE

Although the dosimetric model of the respiratory tract used in ICRP (International Comission on Radiological Protection) Publication 30 had not been shown to be seriously deficient for the purpose of calculating Annual Limits on Intake (ALIs) for workers, the availability of new information led the ICRP in 1984 to create a special Task Group to review the dosimetric model of the respiratory tract and, if justified, propose revisions or a new model. The Task Group directed its efforts toward improving the model used in Publication 30 rather than developing a completely new model. The objective was a model that would facilitate calculation of biologically meaningful doses; be consistent with morphological, physiological, and radiobiological characteristics of the respiratory tract; incorporate current knowledge; meet all radiation protection needs; be user friendly by not being unnecessarily sophisticated; be adaptable to development of computer software for calculation of relevant radiation doses from knowledge of a few readily measured exposure parameters; be equally useful for assessment purposes as for calculating ALIs; be applicable to all members of the world population; and consider the influence of smoking, air pollutants, and diseases of the inhalation, deposition, and clearance of radioactive particles from the respiratory tract. The model provides for calculation of a committed dose equivalent for each region, adjusted for the relative cancer sensitivity of that region, and for the summing of these to yield a committed dose equivalent for the entire respiratory tract.

DOE

N91-18595# New York Univ. Medical Center.

ONCOGENIC ACTION OF IONIZING RADIATION

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begun within the second or third year of the current contract period. They include: (1) development of small-scale dosimetry; (2) development of a differential volume phantom; (3) development of a dosimetric bone model; (4) assessment of the new ICRP lung model; and (5) studies into the mechanisms of DNA damage. A progress report is given for each of these tasks within the Comprehensive Report. In each use, preliminary results are very encouraging and plans for further research are detailed within this document.

NEW IMAGING SYSTEMS IN NUCLEAR MEDICINE

1990 10 p

Contract DE-FG02-87ER-60519

(DE91-004782; DOE/ER-60519/T2) Avail: NTIS HC/MF A02

Further progress has been made on improving the uniformity and stability of PCR-I, the single ring analog coded tomograph. This camera has been employed in a wide range of animal studies described below. Data from PCR-I have been used in various imaging processing procedures. These include motion pictures of dog heart, comparison of PET and MRI image in dog heart and rat brain and quantitation of tumor metabolism in the nude mouse using blood data from heart images. A SUN workstation with TACAC board has been used to produce gated three-dimensional images of the dog heart. The ANALYZE program from the Mayo Clinic has also been mounted on a SUN workstation for comparison of images and image processing.

DOE

NEW BIOMEDICAL APPLICATIONS OF RADIOCARBON


Contract W-7405-ENG-48

(DE91-006249; UCRL-JC-105825; CONF-9006309-1) Avail: NTIS HC/MF A03

The potential of accelerator mass spectrometry (AMS) and radiocarbon in biomedical applications is being investigated by Lawrence Livermore National Laboratory (LLNL). A measurement of the dose-response curve for DNA damage caused by a carcinogen in mouse liver cells was an initial experiment. This demonstrated the sensitivity and utility of AMS for detecting radiocarbon tags and led to numerous follow-on experiments. The initial experiment and follow-on experiments are discussed in this report.

DOE

THE INCIDENCE OF SLEEP DISTURBANCES IN DUTCH COCKPIT CREW OPERATING ON TRANSMERIDIAN ROUTES


(ETN-91-99697) Avail: NTIS HC/MF A03

An inquiry into the occurrence of sleep disturbances among cockpit crew of two Dutch commercial airlines is described. Questionnaires were sent to 1191 cockpit crewmembers. Each anonymized questionnaire comprised 24 items concerning sleep and the use of sleeping aids at home and en route over the last 6 months. The Groningen sleep quality scale was used to evaluate the quality of sleep. The response percentage was 60. A positive correlation between operating on transmeridian flights and complaints about the quality of sleep was demonstrated. The sleep quality en route was significantly worse than at home. Forty seven percent of the transmeridian flying crewmembers with sleep disturbances judged their disturbed sleep to affect their performance in the cockpit. Among the sleeping aids used during lay overs were alcohol (42 percent) and hypnotics (10 percent). It is concluded that transmeridian operations cause significant complaints about the quality of sleep in a large group of Dutch cockpit crew. A disturbed sleep and the use of sleeping aids, such as alcohol and hypnotics might affect flight safety.

ESA

COCKPIT CREW OPERATING ON TRANSMERIDIAN ROUTES

THE INCIDENCE OF SLEEP DISTURBANCES IN DUTCH COCKPIT CREW OPERATING ON TRANSMERIDIAN ROUTES


(ETN-91-99697) Avail: NTIS HC/MF A03

An inquiry into the occurrence of sleep disturbances among cockpit crew of two Dutch commercial airlines is described. Questionnaires were sent to 1191 cockpit crewmembers. Each anonymized questionnaire comprised 24 items concerning sleep and the use of sleeping aids at home and en route over the last 6 months. The Groningen sleep quality scale was used to evaluate the quality of sleep. The response percentage was 60. A positive correlation between operating on transmeridian flights and complaints about the quality of sleep was demonstrated. The sleep quality en route was significantly worse than at home. Forty seven percent of the transmeridian flying crewmembers with sleep disturbances judged their disturbed sleep to affect their performance in the cockpit. Among the sleeping aids used during lay overs were alcohol (42 percent) and hypnotics (10 percent). It is concluded that transmeridian operations cause significant complaints about the quality of sleep in a large group of Dutch cockpit crew. A disturbed sleep and the use of sleeping aids, such as alcohol and hypnotics might affect flight safety.

ESA

A COMPUTATIONAL MODEL OF THE CEREBELLUM


(DE91-004824; LA-UR-90-3733; CONF-9007190-1) Avail: NTIS HC/MF A02

The need for realistic computational models of neural microarchitecture is growing increasingly apparent. While traditional neural networks have made inroads on understanding cognitive functions, more realism (in the form of structural and connectivity constraints) is required to explain processes such as vision or motor control. A highly detailed computational model of mammalian cerebellum was developed. It is being compared to physiological recordings for validation purposes. The model is also being used to study the relative contributions of each component to cerebellar processing.

DOE

CONSIDERATIONS OF BETA AND ELECTRON TRANSPORT IN INTERNAL DOSE CALCULATIONS Progress Report

WESLEY E. BOLCH and JOHN W. POSTON, SR. Dec. 1990 46 p

Contract DE-FG05-88ER-60707

(DE91-006251; DOE/ER-60707/T1) Avail: NTIS HC/MF A03

Irradiation radiation has broad uses in modern science and medicine. These uses often require the calculation of energy deposition in the irradiated media and, usually, the medium of interest is the human body. Energy deposition from radioactive sources within the human body and the effects of such deposition are considered in the field of internal dosimetry. In July of 1988, a three-year research project was initiated by the Nuclear Engineering Department at Texas A and M University under the sponsorship of the U.S. Department of Energy. The main thrust of the research was to consider, for the first time, the detailed spatial transport of electron and beta particles in the estimation of average organ doses under the Medical Internal Radiation Dose (MIRD) schema. At the present time (December of 1990), research activities are continuing within five areas. Several are new initiatives begun within the second or third year of the current contract period. They include: (1) development of small-scale dosimetry; (2) development of a differential volume phantom; (3) development of a dosimetric bone model; (4) assessment of the new ICRP lung model; and (5) studies into the mechanisms of DNA damage. A progress report is given for each of these tasks within the Comprehensive Report. In each use, preliminary results are very encouraging and plans for further research are detailed within this document.

DOE

BEHAVIORAL SCIENCES

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

THE NOE FLIGHTS AND THEIR EFFECT UPON A PILOT


COG 401

The effects of NOE helicopter flight on pilot emotional state
and eyesight use are discussed in view of flight tests, encompassing six 'horizontal' and four 'vertical' maneuvers, which were conducted by a Mi-2 helicopter. These tests have revealed a differentiation in the effect of maneuvers on the emotional state of the pilot; the most distressing maneuvers were those involving a coupling of vertical maneuvers with rapid descent. Heartbeat rates exceeding normal by 60 percent were recorded in such cases. Oculographic tests confirmed that the pilot's sight is not stabilized in one direction during NOE, but rather alternates between the outside and the instrument panel. This underscores the need for incorporating HUDs on NOE-mission helicopters. O.C.

A91-25100

VERTICAL DISPARITIES AND PERCEPTION OF THREE-DIMENSIONAL SHAPE

Random dot stereograms are used here in a shape judgment task to show that changes in vertical disparities have no effect on perceived three-dimensional shape. Changes in ocular convergence do alter perceived shape, suggesting substantial changes in the subjects' scaling of horizontal disparities. It is concluded that vertical disparities are not used to scale disparities for viewing distance, and that extraretinal signals must be considered when analyzing human three-dimensional shape perception. C.D.

A91-26782

AVIATION PSYCHOLOGY
RICHARD S. JENSEN, ED. (Ohio State University, Columbus) Aldershot, England and Brookfield, VT, Gower Technical, 1989, p. 154-175. refs Copyright

Topics presented include a study of the human factors in the super cockpit, the cognitive demands of automation in aviation, some implications of automation on air traffic control, and special considerations for helicopter safety. Also presented are personality assessment in aviator selection, the selection and screening programs for air traffic control specialists, aircrew performance assessment, and human performance aspects of aircraft accidents. R.E.P.

A91-26789

PILOT DECISION MAKING AND JUDGEMENT
ROSS TELFER IN: Aviation psychology. Aldershot, England and Brookfield, VT, Gower Technical, 1989, p. 154-175. refs Copyright

Evaluation and results are discussed that cover the pilot judgment studies instituted by the FAA to develop, evaluate and implement appropriate training materials and methods. To evaluate pilot judgments in a realistic setting, flight students submit to a flight check conducted by an experienced flight instructor. After each flight the instructor rates the pilot performance on each judgment situation on the basis of a five point scale ranging from four (sound judgment) to zero (dangerous judgment) with the judgment situation. O.C.

A91-26792

MEASURES OF IN-FLIGHT WORKLOAD
VALERIE J. Gawron, SAMUEL G. SCHFLETT, and JAY C. MILLER IN: Aviation psychology. Aldershot, England and Brookfield, VT, Gower Technical, 1989, p. 240-287. refs Copyright

As both system performance and safety are dependent on operator workload, NASA, the FAA and all three services are evaluating and developing empirical measures of workload to be utilized in flight. A review is presented of this evaluation including a general description, a discussion of weaknesses and strengths, and guidelines for utilization. Two common elements defining pilot workload are what the pilot is required to accomplish with the aircraft and the conditions under which the required operation is to be conducted. There are three uses for workload measurement: (1) to predict the workload demands of a particular system configuration before it reaches production or simulation, (2) to assess workload demands of already existing systems, and (3) the online monitoring of workload. Finally, a summary of workload validation studies is presented. R.E.P.

A91-26793

PERSONALITY ASSESSMENT IN AVIATOR SELECTION

This paper examines the personality factors employed to predict performance in aviation. Historical information on the methods developed during and after World War I to develop applied psychology in the aviator selection process is presented. In general, results obtained were not favorable when personality inventories were validated against performance criteria. The principal reason for this was that the preselection of candidates eliminated abnormal individuals, and that performance measures were unreliable and invalid. Various tests conducted by the U.S. military air services and British and Scandinavian forces are described. New automated behavior-based inventories are discussed and it is shown that aviation selection appears to be most promising in the area of computer administration and in concealing the personality trait of interest. R.E.P.

A91-26794

SELECTION AND SCREENING PROGRAMS FOR AIR TRAFFIC CONTROL

A review is presented of the training, responsibilities, and screening programs for the air traffic control specialist in the FAA. The selection and screening process that applies to those ATCS personnel assigned to the terminal and enroute options is described. Each candidate for the position is continually evaluated, from an initial aptitude selection test battery through performance-based screening at the FAA Academy, and eventually in on-the-job training, performed at the facility assigned. Due to the critical safety-related aspects of the work, screening and identifying characteristics in individuals that can predict successful operation in air traffic are particularly important. General selection guidelines are described along with selection procedures, the FAA Academy, effectiveness of the placement process, and the utility of ATCS academy screening. R.E.P.

A91-26795

AIRCREW PERFORMANCE ASSESSMENT

Aircrew performance measurement is the act of determining the quantity, quality, and dimensions of aircrew performance by comparison against a standard. The three principal applications for aircrew performance measurement are aircrew selection, aircrew training, and research. An evaluation of the C-130 weapon system trainer is presented as an example to identify and discuss various
measurement and methodology issues that are relevant to the evaluation of students, media, and aircrew training methods in a real-world environment. Expert systems focusing on air combat are also discussed, and it is shown that this technique may be applied to other measurement areas, particularly those necessitating the evaluation of performance in complex situations and higher order aircrew proficiency.

R.E.P.

A91-26796
HUMAN PERFORMANCE ASPECTS OF AIRCRAFT ACCIDENTS
Copyright
An overview is presented of the theory and practice of investigating the human performance aspects of aircraft accidents. The complex issues involved in the investigation procedures are discussed along with case studies which show the potential benefits of conducting detailed human performance analyses. Psychologists are becoming an integral part of the modern interdisciplinary teams that investigate civil and military aviation accidents. The basic role of these psychologists is to assist in systematically recording and explaining the effects of factors connected with human performance degradation. Details are provided on the accident causation, investigation, and prevention processes including the role played by the flight surgeon, research psychologist, and human factor advocates.

R.E.P.

A91-27826* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

COCKPIT NAPPING
Copyright
The results of a NASA-sponsored study examining the effectiveness of a brief, preplanned cockpit rest period to improve pilot alertness and performance in nonaugmented long-haul flight operations are discussed. Four regularly scheduled trans-Pacific flight legs were studied. The shortest flight legs were about 7 h and the longest about 9.5 h, with duty periods averaging about 11 h and layovers about 25 h. Three-person B747 crews were divided randomly into two volunteer pilot groups. These crews were nonaugmented, and therefore no relief pilots were available. The rest group, consisting of four crews, was allowed a 40 min opportunity to rest during the overwater cruise portion of the flight. On a preplanned, rotating basis, individual crew members were allowed to nap. It is concluded that a preplanned cockpit nap is accomplished without disrupting normal flight operations or compromising safety.

L.K.S.

A91-28169* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

OPTIMAL DISPLACEMENT IN APPARENT MOTION AND QUADRATURE MODELS OF MOTION SENSING
ANDREW B. WATSON (NASA, Ames Research Center, Moffett Field, CA) Vision Research (ISSN 0042-6993), vol. 30, no. 9, 1990, p. 1389-1393. refs
Copyright
A grating appears to move if it is displaced by some amount between two brief presentations, or between multiple successive presentations. A number of recent experiments have examined the influence of displacement size upon either the sensitivity to motion, or upon the induced motion aftereffect. Several recent motion models are based upon quadrature filters that respond in opposite quadrants in the spatiotemporal frequency plane. Predictions of the quadrature model are derived for both two-frame and multiframe displays. Quadrature models generally predict an optimal displacement of 1/4 cycle for two-frame displays, but in the multiframe case the prediction depends entirely on the frame rate.

Author

N91-17044* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

IN-FLIGHT CREW TRAINING
Avail: NTIS HC/MF A99 CSCL 051
The Helmet Mounted Display system and Part Task Trainer are two projects currently underway that are closely related to the in-flight crew training concept. The first project is a training simulator and an engineering analysis tool. The simulator's unique helmet mounted display actually projects the wearer into the simulated environment of 3-D space. Miniature monitors are mounted in front of the wearer's eyes. Partial Task Trainer is a kinematic simulator for the Shuttle Remote Manipulator System. The simulator consists of a high end graphics workstation with a high resolution color screen and a number of input peripherals that create a functional equivalent of the RMS control panel in the back of the Orbiter. It is being used in the training cycle for Shuttle crew members. Activities are underway to expand the capability of the Helmet Display System and the Partial Task Trainer.

Author

N91-18577* Joint Publications Research Service, Arlington, VA.

PSYCHOLOGICAL PREPARATION OF OPERATORS FOR ACTIVITY DURING SUSTAINED G-LOADS
Avail: NTIS HC/MF A04
The timely performance by an operator of protective measures (primarily the tensing at will of leg and abdominal muscles) prevents the development of visual disturbances accompanying G-loading and thus increases the reliability of his activity. The development of a special mental quality in the operator - the ability to divide one's attention between carrying out an operator task and performing protective measures - is the most important element in the psychological preparation of the individual for successful performance of operator tasks in conditions involving sustained G-loads. The possibility of developing a two-tiered system of mental regulation in ordinary conditions is studied.

Y.S.

N91-18588* Joint Publications Research Service, Arlington, VA.

Avail: NTIS HC/MF A04
Color selection in the Luscher test was used in the assessment of emotional status of flight instructors in various field-related situations. In comparison with the population at large, flight personnel showed preference for cooler colors, such as blue, green, or violet. This preference is taken to reflect emotional stress encountered by the pilots in day-to-day situations. In particular, preference for violet and green, a mixture of blue and red or blue and yellow, is understood to reflect adaptability and flexibility in the face of stress.

Author

N91-18593* Joint Publications Research Service, Arlington, VA.

NEUROTIC AND PSYCHOSOMATIC RISK FACTORS IN FLIGHT PERSONNEL Abstract Only
V. I. YEVDOKIMOV In its JPRS Report: Science and Technology. USSR: Life Sciences p 5 14 Sep. 1990 Transl. into ENGLISH

Author
from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 24, no. 2, May-Jun. 1990 p 50-53

A fighter proficiency testing was combined with personality assessment test in order to ascertain health risk factor in the case of pilots 121 and trainees with neurotic and psychosomatic disorders. In that group, 16 pilots and 8 trainees were diagnosed with anesthetic problems, while 34 pilots, 21 pilot trainees, and 42 allied flight personnel were determined to suffer from a variety of psychosomatic disorders. The fundamental findings led to the conclusion that individuals at risk exhibited inadequate mental adaptive potential, in contrast to 165 control subjects without such problems.

N91-18601 Institute for Perception RVO-TNO, Soesterberg (Netherlands).

THE SELECTIVE LISTENING TASK AS A TEST FOR PILOTS AND AIR TRAFFIC CONTROLLERS Final Report

The use of the Selective Listening Task (Gopher and Kahneman, 1971) as a test for pilots and air traffic controllers was evaluated. Task performance of samples from these populations (86 and 87, respectively) correlated significantly with later success in training. Apparently the task is a suitable selection device. Registration of training motivation revealed that this conclusion was independent of motivation differences. It is recommended to use the first half of the task only and to simplify the scoring procedure. The norms for the conversion of a number of errors to decile scores, based on a sample of 390 pilot applicants, are included.

N91-18622* Houston Univ., Clear Lake, TX. Dept. of Reading and Language Arts.

AN OVERVIEW OF THE EDUCATION AND TRAINING COMPONENT OF RICIS Abstract Only
GLENN B. FREEDMAN In its RICIS 1987 Symposium. Executive Summary 1 p 1987
Avail: NTIS HC/MF A15 CSCL 09/2

Research in education and training according to RICIS (Research Institute for Computing and Information Systems) program focuses on means to disseminate knowledge, skills, and technological advances rapidly, accurately, and effectively. A range of areas for study include: artificial intelligence, hypermedia, and full-text retrieval strategies, use of mass storage and retrieval options such as CD-ROM and laser disks, and interactive video and interactive media presentations.

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT
Includes human engineering; biotechnology; and space suits and protective clothing.

A91-24322/

MILITARY AIRCRAFT HEAD SUPPORT SYSTEM

A91-24339#


A91-25845


A91-26608* Jet Propulsion Lab., California Inst. of Tech., Pasadena.


A91-26620 SIMULATION SYSTEM FOR A SPACE ROBOT USING 6 AXIS SERVOS H. SHIMOJO, M. INOUE, K. TSUCHIYA (Mitsubishi Electric Corp., Amagasaki, Japan), K. NINOMIYA, I. NAKATANI (Institute of Space and Astronautical Science, Sagamihara, Japan) et al. IN: Automatic

Copyright

The development of a space robot with a manipulator which is operated to catch and handle a target, in zero gravity environment, is described. In this case, the behavior of the robot main body caused by the reaction force exerted by the manipulator motion has to be taken into consideration in order to control the manipulator correctly. To solve this problem, a ground simulation system combining numerical simulation and servo mechanisms was constructed. On this system, dynamics of the space robot and the target is solved based on the momentum conservation law, and the relative motion between them is realized. Using this simulation system, space robots can be developed efficiently.

Author

A91-26621

THEORETICAL AND EXPERIMENTAL STUDY ON IN-ORBIT CAPTURE OPERATION WITH SATELLITE MOUNTED MANIPULATOR


Copyright

This paper treats both theoretical and experimental studies on a control problem of a space free-flying space manipulator, with an aim of developing a new control method for trajectory tracking or target capturing, considering the dynamical interaction between the manipulator arm and the base vehicle in space microgravity environment. In the theoretical study, the generalized Jacobian matrix (GJM) concept is introduced. By means of this new matrix, the conventional control methods for ground-fixed manipulators are directly applicable for space manipulators. In the experimental study, a laboratory model of a robot satellite supported on air bearings is developed in order to simulate the free-flying behavior of mechanical links in microgravity environment. An on-line resolved motion rate control scheme with vision feedback is developed for experimenting capture operations, utilizing the GJM. The experimental results confirm the validity of the GJM concept and the proposed control method.

Author

A91-26622

SIMULATION AND CONTROL OF SPACE MANIPULATORS BEARING COMPLEX PAYLOADS


Copyright

Payloads to be handled by space manipulators cannot always be considered as inert bodies represented by mass and inertias. Modeling is considered in this paper from the point of view of the connection of a dynamic model of a payload to a general purpose multibody simulation package. Control issues are discussed in the framework of dynamic control, where the overall control loop is split up between an inner force control loop dependent only on the manipulator parameters, and an outer payload control loop whose adaptation to large inert and complex payloads is investigated.

Author

A91-26784

CREW SYSTEMS DESIGN - SOME DEFENCE, PSYCHOLOGY FUTURES


Copyright

Airborne early warning (AEW) Nimrod system design and development is examined with particular regard to the aircrew facilities aspects. The system is compared to those systems employed aboard both the U.S. AWACS and F/A 18 aircraft. Only the AEW Nimrod utilizes duplicated scanners with limited transverse, which necessitates further duplication of scanner control and stabilization, a good part of the radar, electronic surveillance, and the IFF radar. A human-centered approach is recommended for future crew systems design, with a return to a more active role in the control loop for the human operator, aided by AI information management and decision support systems, basically directed at preserving adaptive control. It is noted that automation technology will be more acceptable and effective if it works in a fashion qualitatively similar to the way humans work and if it is adaptive and flexible.

R.E.P.

A91-26785

SPEECH TECHNOLOGY IN THE COCKPIT


Copyright

Speech technology concerning human/machine interaction refers to voice input/output technology, where voice input is realized by use of a machine correctly identifying one of 'n' possible words, utterances or phrases and the voice output provides feedback, cautions, warnings or advisories to the talker/operator, while conducting in-flight, cockpit related applications and functions. Considerations that are addressed include speech synthesis, speech recognition, recognition algorithms, and the problems with cockpit application of speech recognition. It is concluded that template matching, isolated word, speaker dependent ASR systems are the only systems that appear to be viable for cockpit applications for the foreseeable future.

R.E.P.

A91-26786

COGNITIVE DEMANDS OF AUTOMATION IN AVIATION

PAMELA S. TSANG and MICHAEL A. VIDULICH IN: Aviation psychology. Aldershot, England and Brookfield, VT, Gower Technical, 1989, p. 66-86. refs

Copyright

This paper focuses on the main cognitive tasks required of pilots in the face of automation. Both subjective and objective assessment techniques are evaluated and discussed. In order to understand the cognitive demands that the pilot experiences, it is necessary to understand the basic cognitive processing characteristics of the pilot, and devise methods for evaluating levels of cognitive demands. An empirical approach to understanding these cognitive demands on the pilot is described, which in turn identifies where automation is needed most. Cognitive demands, and therefore the necessity for automation, were evaluated by performance and subjective workload ratings. The performance data indicated that there was resource competition between the two tasks that were determined a priori to rely heavily on the response resources, i.e., the target acquisition and flight control tasks.

R.E.P.
A91-26787
IMPLICATIONS OF AUTOMATION ON AIR TRAFFIC CONTROL
Copyright
Air traffic control faces the continuous requirement to maintain and enhance its current high standards of efficiency and safety, while handling constantly increasing demands for ATC services from a great variety of operators. A review is presented on the implications of automation that include system constraints, ergonomics, staffing levels, error reduction, workload, stress, allocation of functions, and professional knowledge and attitudes. As for ergonomics, compromises have to be reached, taking into account the frequency and sequence in which controls and displays must be utilized to perform the complete range of tasks. R.E.P.

A91-26788
SIMULATION
Copyright
An evolutionary overview of the simulator in aviation is presented. It is increasingly applied for flight crew training, systems training, and research into advanced flight technology. Simulators are utilized for three principal purposes: to facilitate the design of systems by allowing experimentation with different system configurations and modes of utilization without the requirement of constructing an actual system, to support applied and basic research in the definition of the fundamental principles of system operation, and to train personnel in the utilization and operation of systems. Further descriptions and details are provided on the uses of training simulators, the transfer of training, the simulator as a training device, the control of aircraft motion, simulator design and fidelity, and the simulator instructional system. R.E.P.

A91-26791
THE EYES PREFER REAL IMAGES
Copyright
For better or worse, virtual imaging displays are with us in the form of narrow-angle combing-glass presentations, head-up displays (HUD), and head-mounted projections of wide-angle sensor-generated or computer-animated imagery (HMD). All military and civil aviation services and a large number of aerospace companies are involved in one way or another in a frantic competition to develop the best virtual imaging display system. The success or failure of major weapon systems hangs in the balance, and billions of dollars in potential business are at stake. Because of the degree to which national defense is committed to the perfection of virtual imaging displays, a brief consideration of their status, an investigation and analysis of their problems, and a search for realistic alternatives are long overdue. Author

A91-26832
MIT-NASA/KSC SPACE LIFE SCIENCE EXPERIMENTS - A TELESCIENCE TESTBED
(Contract NAGW-1092) (AAS PAPER 90-002) Copyright
Experiments performed at MIT to better define Space Station information system telescience requirements for effective remote coaching of astronauts by principal investigators (PI) on the ground are described. The experiments were conducted via satellite video, data, and voice links to surrogate crewmembers working in a laboratory at NASA's Kennedy Space Center. Teams of two PIs and two crewmembers performed two different space life sciences experiments. During 19 three-hour interactive sessions, a variety of test conditions were explored. Since bit rate limits are necessarily imposed on Space Station video experiments surveillance video was varied down to 50 Kb/s and the effectiveness of PI controlled frame rate, resolution, grey scale, and color decimation was investigated. It is concluded that remote coaching by voice works and that dedicated crew PI voice loops would be of great value on the Space Station. L.K.S.

A91-26833*
TELESCIENCE - OPTIMIZING AEROSPACE SCIENCE RETURN THROUGH GEOGRAPHICALLY DISTRIBUTED OPERATIONS
(AAS PAPER 90-003) Copyright
The paper examines the objectives and requirements of teleoperations, defined as the means and process for scientists, NASA operations personnel, and astronauts to conduct payload operations as if these were colocated. This process is described in terms of Space Station era platforms. Some of the enabling technologies are discussed, including open architecture workstations, distributed computing, transaction management, expert systems, and high-speed networks. Recent testbedding experiments are surveyed to highlight some of the human factors requirements. L.M.

A91-26834*
APPLIED HUMAN FACTORS RESEARCH AT THE NASA JOHNSON SPACE CENTER HUMAN-COMPUTER INTERACTION LABORATORY
(AAS PAPER 90-004) Copyright
The applied human factors research program performed at the NASA Johnson Space Center's Human-Computer Interaction Laboratory is discussed. Research is conducted to advance knowledge in human interaction with computer systems during space crew tasks. In addition, the Laboratory is directly involved in the specification of the human-computer interface (HCI) for space systems in development (e.g., Space Station Freedom) and is providing guidelines and support for HCI design to current and future space missions. Author
Space Station assembly are described together with the results the Station will support human occupation independent of the electromagnetic pulses of simulation and analyses. Special attention is given to the Space presence of the Space Shuttle; and 16 more flights for achieving during the initial assembly stage when the Space Station will not augment the capabilities of conventional manipulator devices.

**TELEROBOTIC OPERATIONS**

During the initial assembly stage when the Space Station will not augment the capabilities of conventional manipulator devices.

**MULTIPLE MANIPULATOR CONTROL FROM ORBITER FOR SPACE PLATFORM DESIGN, OPERATIONS, AND PLANNING**


It is proposed that considerable gains in efficiency can be achieved in the areas of space platform design and construction as well as in the planning and execution of space operations by the application of recent advances in manufacturing technology. The advances which are considered applicable include the concurrent design or engineering strategy and new sensor capabilities which will perform wrist force sensing and target location determination. It is pointed out that these devices can augment the capabilities of conventional manipulator devices.

**NEW DESIGN STRATEGIES AND TECHNOLOGIES FOR OPERATOR-MACHINE INTERFACE FOR SPACE PLATFORM DESIGN, OPERATIONS, AND PLANNING**


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Space Policy goal of maintaining a world leadership position in space. In the past, spacecraft life support systems have used open-loop technologies that were simple and sufficiently reliable to demonstrate the feasibility of spaceflight. A critical technology area needing development in support of both long duration missions and the establishment of lunar or planetary bases is regenerative life support. The information presented in this paper describes a conceptual design of a Lunar Base Controlled Ecological Life Support System (LCELSS) which supports a crew size ranging from 4 to 100. The system includes, or incorporates interfaces with, eight primary subsystems. An initial description of the Lunar-Base CELSS subsystems is provided within the framework of the conceptual design. The system design includes both plant (algae and higher plant) and animal species as potential food sources. 

A91-27708

A PROTOTYPE MODEL FOR HUMAN/AUTOMATION TRADE-OFFS

RICHARD JOHNSON (Colorado, University, Boulder) IN: Engineering, construction, and operations in space II; Proceedings of Space 90, the Second International Conference, Albuquerque, NM, Apr. 22-26, 1990, Vol. 2, New York, American Society of Civil Engineers, 1990, p. 1334-1343. refs

Copyright

Future space construction missions will involve both human and machine constructors. Selection of the optimum constructor mix requires a model of constructor capabilities and requirements. The database for that model is developed via extrapolation from current literature. Optimization is done via minimization of total mission cost using a linear programming approach. This prototype is the first cut at producing a general tool for choosing a near-optimum constructor mix for any space construction mission. The linear programming optimization model illuminates several significant representational and data-gathering problems.

A91-27712

ARTIFICIAL GRAVITY - HUMAN FACTORS DESIGN REQUIREMENTS

STEPHEN D. CAPPS (Boeing Aerospace and Electronics, Huntsville, AL) IN: Engineering, construction, and operations in space II; Proceedings of Space 90, the Second International Conference, Albuquerque, NM, Apr. 22-26, 1990, Vol. 2, New York, American Society of Civil Engineers, 1990, p. 1374-1382. refs

Copyright

The effects of prolonged exposure to weightlessness on humans are considered. The challenge of creating environments conducive to the average human as well as creating the means of human survival for extended space flight and settlement is examined. Since the environment created by spinning a vehicle differs substantially from earth gravity, design limitations such as artificial gravity level, gravity gradient, Coriolis forces, tangential motion, and locomotion are analyzed. The results of adaptation schedule experiments are presented. A set of human factors design requirements pertaining to the upper level of angular velocity, upper and lower gravity levels, gravity gradients, radial traffic, transport across spin axis, and human activity at the hub is recommended. Rotating habitats are considered to be the only comprehensive solution for determining the exact human factors envelope.

A91-27713

PARTIAL GRAVITY - HUMAN IMPACTS ON FACILITY DESIGN

STEPHEN CAPPS (Boeing Aerospace and Electronics, Huntsville, AL) and NATHAN MOORE (NASA, Johnson Space Center, Houston, TX) IN: Engineering, construction, and operations in space II; Proceedings of Space 90, the Second International Conference, Albuquerque, NM, Apr. 22-26, 1990, Vol. 2, New York, American Society of Civil Engineers, 1990, p. 1383-1392. refs

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Partial gravity affects the body differently than earth gravity and microgravity environments. The main difference from earth gravity is human locomotion; while the main difference from microgravity is the specific updown orientation and reach envelopes which increase volume requirements. Much data are available on earth gravity and microgravity design; however, very little information is available on human reactions to reduced gravity levels in IVA situations (without pressure suits). Therefore, if humans commit to permanent lunar habitation, much research should be conducted in the area of partial gravity effects on habitat design.

A91-27717

WORKING ON THE MOON - THE APOLLO EXPERIENCE

ERIC M. JONES (Los Alamos National Laboratory, NM) IN:
54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT


During the six completed landing missions, Apollo lunar surface crews conducted 160 astronaut-hours of EVAs and also conducted a similar sum of procedures. The ability to land equipment and consumables was very modest but, despite stay times of no more than 32 hours, the crews of Apollos 11, 12, and 14 were able to test their mobility and their capability of doing useful work outside the spacecraft. For the last three missions, thanks to landing module modifications which enabled landings with significant amounts of cargo, stay times more than doubled to three days. The crews were able to use lunar rovers to conduct extensive local exploration and to travel up to 10 km away from their immediate landing sites. Author

A91-27727
LEVEL OF RECYCLING EFFECTIVENESS

The Level of Recycling Effectiveness (LORE) scale is presented. It is a conceptual framework for evaluating recycling and other alternative strategies of meeting needs in space activities. The LORE scale is developed, defined, and examples of its use are given. The LORE scale should help reduce planning time by serving as a framework within which initial thinking can take place when selecting between alternatives. Author

N91-17048# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX. PAYLOAD DEPLOYMENT SYSTEMS AND ADVANCED MANIPULATORS
Avail: NTIS HC/MF A99 CSCL 05H

The results of discussions on future development of avionics to support payload deployment systems and advanced manipulators are discussed. The discussions summarized here were held during the Space Transportation Avionics Technology Symposium in Williamsburg, Virginia on November 7 to 9, 1989. Symposium participants agreed that this subpanel would have benefited from more participation by users. It was suggested that inputs from Shuttle payload users should be incorporated, either by direct discussions with users or by incorporating comments from users as kept by Payload Accommodations. The Jet Propulsion Laboratory (JPL), Goddard, and Langley, as builders of payloads, and the Space Station Utilization Office could also provide useful inputs. Other potential users for future systems should also be identified as early as possible to determine what they anticipate their needs to be. Symposium participants also recognized that payload deployment is normally not a safety critical area, and as such, is vulnerable to budget cuts that defer costs from development to operations. This does give opportunities for upgrades of operational systems, but these must be very cost effective to compete with vehicle requirements that enhance safety or increase lifetime. Author


The role is studied of structured models in autonomous motor learning. Any autonomous system, such as the human motor system, has only the internal consistency of its various sensors to rely upon for model building (learning). To study the possibility of learning structured models from internal consistency constraints, the specific problem of learning the kinematic parameters (relative link orientations and length) of general revolute joint manipulators is explored. First it is noted that a manipulator may form a mobile closed kinematic chain when interacting with the environment, if it is redundant with respect to the task degrees of freedom (DOFs) at the endpoint. Then it is demonstrated that if the mobile closed chain assumes a number of configurations, then loop consistency equations permit joint angle readings; endpoint sensing is not required. Author

(Contract DE-AC02-76CH00016) (DES1-9005439; BNL-NUREG-4545; CONF-9010165-16) Avail: NTIS HC/MF A03

Advanced, computer-based, human-system interface designs are emerging in nuclear power plant (NPP) control rooms. These developments may have significant implications for plant safety in that they will greatly affect the ways in which operators interact with systems. At present, however, the only guidance available to the U.S. Nuclear Regulatory Commission (NRC) for the review of control room-operator interfaces, NUREG-0700, was written prior to these technological changes; therefore, it is not designed to address them. The objective of the project reported in this paper is to develop an Advanced Control Room Design Review Guideline for use in performing human factors reviews of advanced operator interfaces. This guideline will be implemented, in part, as a portable, computer-based, interactive document for field use. The paper describes the overall guideline development methodology, the present status of the document, and the plans for further guideline testing and development. Author

DOE

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today surfaces as: What causes crewmembers to commit errors in judgment, performance, or perception, and how might the influences of such causes be reduced. Progress in the field of human factors (HF) analysis has revealed some solutions while advancing the fundamental goal of flight safety - mishap prevention. The impact of HF studies on mishap prevention is clarified and summarized and how aircrew fatigue is a common denominator among HF elements is shown. Accepted techniques for combating and coping with fatigue are listed. Finally, recommendations on how to maintain operational awareness of aircrew fatigue considerations are proposed.

Author

N91-18078# Military Airlift Command, Scott AFB, IL. Test and Evaluation Div.

AIRCrew EYE/RESPIRATORY PROTECTION: A MILITARY AIRLIFT COMMAND PERSPECTIVE

JAMES SOUSA In AGARD, Progress in Military Airlift 9 p Dec. 1990

Copyright Avail: NTIS HC/ MF A14; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The effort of the Military Airlift Command (MAC) and the Air Force System Command (AFSC) to improve aircrew eye/respiratory protection (AERP) systems for chemical warfare defense is outlined. This paper represents an attempt to present an overview of AERP systems and how they may be used to meet the MAC mission requirements. The MAC mission to conduct and support operations remains the same during war and peacetime and despite the presence of chemical agents. An effective AERP system is needed to support the worldwide operations. The ongoing, test effort has uncovered important problems and challenges to overcome. However, after hundreds of ground and over 50 flight test hours in the MAC mission environment, solutions are on the way. More challenges exist now, but the numerous hurdles already cleared have prepared a way to proceed.

Author

N91-18127# Colorado Univ., Boulder.

METHODS FOR THE DEVELOPMENT OF A BIOREGENERATIVE LIFE SUPPORT SYSTEM


Copyright Avail: NTIS HC/MF A14 ; CSCL 08/11

In this paper, a two-step methodological approach to designing a life support system based on the utilization of plants and animals. The biggest stumbling block in the initial phases of developing a bioregenerative life support system is encountered in collecting and consolidating the data. If a database existed for the systems engineer so that he or she may have accurate data and a better understanding of biological systems in engineering terms, then the design process would be simplified. Also addressed is a means of evaluating the subsystems chosen. These subsystems are unified into a common metric, kilograms of mass, and normalized in relation to the throughput of a few basic elements. The initial integration of these subsystems is based on input/output masses and eventually balanced to a point of operation within the inherent performance ranges of the organisms chosen. At this point, it becomes necessary to go beyond the simplifying assumptions of simple mass relationships and further define for each organism the processes used to manipulate the throughput matter. Mainly considered here is the fact that these organisms perform input/output functions on differing timescales, thus establishing the need for buffer volumes or appropriate subsystem phasing. At each point in a systematic design it is necessary to disturb the system and discern its sensitivity to the disturbance. This can be done either through the introduction of a catastrophic failure or by applying a small perturbation to the system. One example is increasing the crew size. Here the wide range of performance characteristics once again shows that biological systems have an inherent advantage in responding to systemic perturbations. Since the design of any space-based system depends on mass, power,
and volume requirements, each subsystem must be evaluated in these terms. Author

N91-18128*# Florida Univ., Gainesville.
IMPLEMENTATION OF SENSOR AND CONTROL DESIGNS FOR BIOREGENERATIVE SYSTEMS
Avail: NTIS HC/MF A14 CSCL 06/11
The EGM 4000/4001 Engineering Design class is an interdisciplinary design course that allows students to experience the design process. The projects involved the design of sensors and subsystems of a closed-loop life support system (CLLSS) with special emphasis on the Controlled Ecological Life Support System (CELSS) currently being developed at Kennedy Space Center (KSC) by NASA. To understand the work performed by the students, one must understand the purpose and concept of a CLLSS system. In the years to come, NASA will be constructing Moon bases and sending astronauts to other worlds on extended space missions. In order to support the crews, unreasonable large quantities of supplies would have to be sent from Earth. These supplies would be difficult to transport and require large holds. To remedy this problem, NASA plans to incorporate crops into the spacecraft. These crops would supply food for the crews, as well as provide beneficial psychological side effects. In addition, the plants would recycle the air and use their byproducts as a water and food resource for the crew. The students in the design class were to work on supporting this project. In order to do this successfully, the course was separated into two phases. The first semester involved studying the various aspects of a CLLSS to determine sensing needs and develop ideas. The second semester involved first determining which of the ideas were most promising. Specific sensors were then designed and tested under laboratory conditions with promising results. Finally, recommendations for further development were proposed. Atmosphere and temperature control, nutrient delivery, plant health and propagation, and resource recycling are discussed. Author

N91-18137*# Kansas State Univ., Manhattan.
AUTOMATION OF CLOSED ENVIRONMENTS IN SPACE FOR HUMAN COMFORT AND SAFETY
Avail: NTIS HC/MF A14 CSCL 06/11
The Environmental Control and Life Support System (ECLSS) for the Space Station Freedom and future colonization of the Moon and Mars presents new challenges for present technologies. Current plans call for a crew of 8 to live in a such, shirt-sleeve environment for 90 days without ground support. Because of these requirements, all life support systems must be self-sufficient and reliable. The ECLSS is composed of six subsystems. The temperature and humidity control (THC) subsystem maintains the cabin temperature and humidity at a comfortable level. The atmosphere control and supply (ACS) subsystem ensures proper cabin pressure and partial pressures of oxygen and nitrogen. To protect the space station from fire damage, the fire detection and suppression (FDS) subsystem provides fire sensing alarms and extinguishers. The waste management (WM) subsystem compactly stores and processes solid wastes for return to Earth, and collects urine for water recovery. Because it is impractical, if not impossible, to supply the station with enough fresh air and water for the duration of the space station's extended mission, these elements are recycled. The atmosphere revitalization (AR) subsystem removes CO2 and other dangerous contaminants from the air. The water recovery and management (WRM) subsystem collects and filters condensate from the cabin to replenish potable water supplies, and processes urine and other waste waters to replenish hygiene water supplies. These subsystems are not fully automated at this time. Furthermore, the control of these subsystems is not presently integrated; they are largely independent of one another. A fully integrated and automated ECLSS would increase astronauts' productivity and contribute to their safety and comfort. The Kansas State University Advanced Design Team is in the process of researching and designing controls for the automation of the ECLSS for Space Station Freedom and beyond. The approach chosen to solve this problem is to divide the design into three phases. The first phase is to research the ECLSS as a whole system and then concentrate efforts on the automation of a single subsystem. The AR subsystem was chosen for our focus. During the second phase, the system control process will then be applied to the AR subsystem. Author

HABITABILITY: CAMELOT 4
Avail: NTIS HC/MF A14 CSCL 06/11
During 1988 to 1989 the NASA/USRA Advanced Design Program sponsored research and design efforts aimed at developing habitability criteria and at defining a habitability concept as a useful tool in understanding and evaluating dwellings for prolonged stays in extraterrestrial space. The Circulating Auto sufficient Mars-Earth Luxurious Orbital Transport (CAMELOT) was studied as a case in which the students would try to enhance the quality of life of the inhabitants by applying architectural design methodology. The study proposed 14 habitability criteria considered necessary to fulfill the defined habitability concept, which is that state of equilibrium that results from the interaction between components of the Individual Architecture Mission Complex, which allows a person to sustain physiological homeostasis, adequate performance, and acceptable social relationships. Architecture, design development, refinements and revisions to improve the quality of life, new insights on artificial gravity, form and constitution problems, and the final design concept are covered. Author

GENESIS LUNAR OUTPOST: AN EVOLUTIONARY LUNAR HABITAT
Avail: NTIS HC/MF A14 CSCL 06/11
Students at the University of Wisconsin-Milwaukee Department of Architecture undertook a series of studies of lunar habitats during the 1989 to 1990 academic year. Undergraduate students from architecture and mechanical and structural engineering with backgrounds in interior design, biology and construction technology were involved in a seminar in the fall semester followed by a design studio in the spring. The studies resulted in three design alternatives for lunar habitation and an integrated design for an early stage lunar outpost. Author

N91-18582*# Joint Publications Research Service, Arlington, VA.
PSYCHOLOGICAL ASSESSMENT OF HORIZON INDICATORS IN PLANES Abstract Only
V. A. PONOMARENKO, V. V. LAPA, and N. A. LEMESHCHENKO In its JPRS Report: Science and Technology. USSR: Life Sciences p 17 26 Sep. 1990 Transl. into ENGLISH from Psychologicheskij Zhurnal, Moscow (USSR), v. 11, no. 2, Mar.-Apr. 1990 p 37-46
Avail: NTIS HC/MF A04
Psychological studies were conducted on optimum horizon indicators in view of recent findings demonstrating that more than 20 percent of airplane accidents are attributed to spatial disorientation, and that this number is increasing. Trials conducted with flight simulators demonstrated that a display depicting an aircraft in flight against a stationary horizon, i.e., depiction of spatial relationship in a geocentric system of coordinates, facilitates spatial perception in comparison with a moving-horizon display. The key
disadvantage of the latter method lies in the requirement for additional information processing necessary for reorientation of the information into geocentric coordinates. 

Author


BASIC RESEARCH IN HUMAN FACTORS Interim Report, 1984 - 1988

HAROLD VANCOTT and ELIZABETH NEILSEN Jul. 1989 42 p

(Contract MDA903-38-C-0031)

(AD-A226318; ARI-RN-90-78) Avail: NTIS HC/MF A03 CSCL 23/2

This report outlines the purpose, membership, and recent activities of the Committee of Human Factors. It summarizes current studies in the areas of human performance models, multicolored displays, distributed decision making, expert systems, and aging. The report also discusses reports from 1984 through 1988 that represent the areas listed above.

N91-18603# National Aeronautics and Space Administration, Washington, DC.

SPACESUIT GUIDEBOOK

1991 24 p

(NASA-PED-117; NAS 1.84:117) Avail: NTIS HC/MF A03 CSCL 06/11

This guidebook is designed to supplement the Spacesuit wall chart (WAL-114) published by the Education Affairs Division, January 1990. The wall chart depicts Astronaut Bruce McCandless on his historic first untethered spacewalk using the manned maneuvering unit. He flew on Shuttle mission 41-B, and ventured 100 meters for the Shuttle's cargo bay and returned safely. This guidebook explains in depth the elements depicted on the wall chart in see-through and cut-away perspectives. Together the wall chart and guidebook show as well as explain the inside workings of the spacesuit and its various components. Forty separate elements are identified with an accompanying numerical legend. Those elements are further explained in this guidebook along with their functions and how they work in relation to other elements. Additional chapters discuss essential components of the spacesuit such as the primary life support system and the manned maneuvering unit, and the method for donning the spacesuit.

N91-18604# Lawrence Livermore National Lab., CA. Systems and Human Performance.

HUMAN ENGINEERING DESIGN CONSIDERATIONS FOR THE USE OF SIGNAL COLOR ENHANCEMENT IN ASW DISPLAYS

WILLIAM W. BANKS Nov. 1990 89 p

(Contract W-7405-ENG-48)

(DE91-00494; UCRL-ID-105261) Avail: NTIS HC/MF A05 CSCL 06/11

The Lawrence Livermore National Laboratory (LLNL) was requested to examine and define man-machine limits as part of the Office of Naval Technology's High Gain Initiative program (HGI). As an initial investigative area, LLNL's Systems and Human Performance effort focused upon color display interfaces and the use of color enhancement techniques to define human and system interface limits in signal detection and discrimination tasks. The knowledgeable and prudent use of color in different types of display is those elements to facilitate human visual detection, discrimination, and recognition in complex visual tasks. The consideration and understanding of the complex set of interacting variables associated with the prudent use of color is essential to optimize human performance, especially in the ASW community. The designers of advanced display technology and signal processing algorithms may be eventually called upon to present pre-processed information to ASW operators and researchers using the latest color enhancement techniques. These techniques, however, may be limited if one does not understand the complexity and limits of human information processing which reflects the assessed state of knowledge relevant to the use of color in displays. The initial sections of this report discuss various aspects of color presentation and the problems typically encountered, while the last section deals with a specific research proposal required to further our understanding and proper use of color enhancement methods.

N91-18605# National Aerospace Medical Centre, Soesterberg (Netherlands).

ENVIRONMENTAL FACTORS INFLUENCING FLIGHT CREW PERFORMANCE

M. SIMONS 1990 14 p Presented at ICAO Human Factors Seminar, Leningrad, USSR, 3-7 Apr. 1990

(ETN-91-98698) Avail: NTIS HC/MF A03

Developments in commercial aviation have changed the pilot's task to that of a flight systems manager. In this task optimum vigilance is required. It is anticipated that the performance of the modern pilot might be impaired by the cumulative effects of frequent disturbance of sleep and prolonged exposure to mild hypoxia, low relative humidity, ozone, and noise. The effects of loss of sleep, lower cabin pressure, low relative humidity, ozone, and noise on a pilot's performance is discussed. Research on the effects of the combination of environmental factors on performance is recommended. Such research should include controlled studies under cockpit environmental conditions, employing over time assessment of psychological performance, and using tasks that are representative for the task of a modern pilot. Conditions to be included in such a study are given.

N91-18606# National Aerospace Medical Centre, Soesterberg (Netherlands). Dept. of Research and Development.

COCKPIT-ENVIRONMENTAL FACTORS DURING LONG-RANGE FLIGHTS

M. SIMONS Apr. 1989 52 p Sponsored by Civil Aviation Authority, Netherlands.

(Rept-89-02-RDL; ETN-91-98699) Avail: NTIS HC/MF A04

As a result of the increase of the average sector length flown by most international airlines, flight crew is exposed to the aircraft cabin environment for a longer period of time. Scientific literature is reviewed with respect to the effects of prolonged (greater than 8 hours) exposure to cockpit environmental conditions on well being and performance of flight crew. The effects of cabin pressure, relative humidity, ozone, cosmic radiation, noise and vibration are discussed in detail. Recommendations for future studies are formulated.

N91-19014# New Mexico Highlands Univ., Las Vegas. Dept. of Engineering Technology.

BIOREGENERATIVE LIFE SUPPORT

BILL TAYLOR In Alabama Univ., Research Reports: 1990 NASA/ASEE Summer Faculty Fellowship Program 5 p Oct. 1990

(Contract NGT-01-002-099)

Avail: NTIS HC/MF A16 CSCL 06/11

Bioregenerative life support systems utilize plant growth for food, water, and atmospheric revitalization. Simulation studies of a simplified model are presented that suggest survivability in the face of partial plant growth chamber failure. Simulation studies demonstrate the potential for a bioregenerative life support system on an extended mission. In addition to robustness and survivability in terms of the food supply, the plant growth chamber produces exactly the right amount of oxygen for the crew's metabolic needs. The amount of water taken up by the plants during food production is balanced by the crew's metabolic water production.

Y.S.
AEROSPACE MEDICINE AND BIOLOGY / A Continuing Bibliography (Supplement 350)
June 1991
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