

NASA SP-7011 (356)  
December 1991

# AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(NASA-SP-7011(356)) AEROSPACE MEDICINE AND  
BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH  
INDEXES (SUPPLEMENT 356) (NASA) 71 p

N92-15538

CSCL 06E

Unclas

00/52 0061967



NASA SP-7011 (356)

December 1991

# **AEROSPACE MEDICINE AND BIOLOGY**

A CONTINUING BIBLIOGRAPHY WITH INDEXES



National Aeronautics and Space Administration  
Office of Management  
Scientific and Technical Information Program  
Washington, DC

1991

# INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 192 reports, articles and other documents originally announced in November 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:

<i>STAR</i> (N-10000 Series)	N91-29139 — N91-31077
<i>IAA</i> (A-10000 Series)	A91-48445 — A91-52998

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.

A cumulative index for 1991 will be published in early 1992.

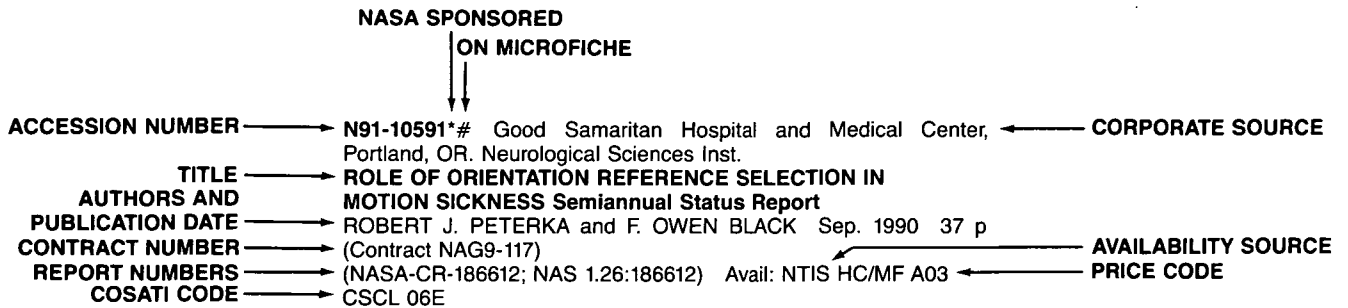
Information on availability of documents listed, addresses of organizations, and NTIS price schedules are located at the back of this issue.

# TABLE OF CONTENTS

	Page
<b>Category 51 Life Sciences (General)</b>	<b>301</b>
<b>Category 52 Aerospace Medicine</b> Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.	<b>305</b>
<b>Category 53 Behavioral Sciences</b> Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.	<b>314</b>
<b>Category 54 Man/System Technology and Life Support</b> Includes human engineering; biotechnology; and space suits and protective clothing.	<b>318</b>
<b>Category 55 Space Biology</b> Includes exobiology; planetary biology; and extraterrestrial life.	<b>N.A.</b>
<b>Subject Index .....</b>	<b>A-1</b>
<b>Personal Author Index .....</b>	<b>B-1</b>
<b>Corporate Source Index .....</b>	<b>C-1</b>
<b>Foreign Technology Index .....</b>	<b>D-1</b>
<b>Contract Number Index .....</b>	<b>E-1</b>
<b>Report Number Index .....</b>	<b>F-1</b>
<b>Accession Number Index .....</b>	<b>G-1</b>
<b>Appendix .....</b>	<b>APP-1</b>



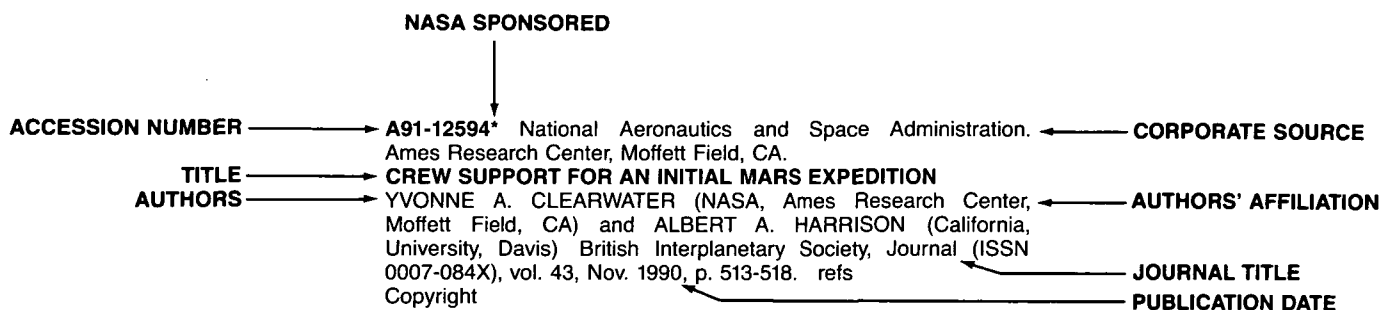
# TYPICAL REPORT CITATION AND ABSTRACT



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.

Author

# TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



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.

Author

# AEROSPACE MEDICINE AND BIOLOGY

*A Continuing Bibliography (Suppl. 356)*

December 1991

51

## LIFE SCIENCES (GENERAL)

**A91-48450**

### **VISUAL MOTION COMMANDS FOR PURSUIT EYE MOVEMENTS IN THE CEREBELLUM**

RICHARD J. KRAUZLIS and STEPHEN G. LISBERGER (California, University, San Francisco) *Science* (ISSN 0036-8075), vol. 253, Aug. 2, 1991, p. 568-571. Research supported by DARPA. refs (Contract NSF BNS-86-16509)

Copyright

Eye movements that follow a target (pursuit eye movements) facilitate high acuity visual perception of moving targets by transforming visual motion inputs into motor commands that match eye motion to target motion. The performance of pursuit eye movements requires the cerebellar flocculus, which processes both visual motion and oculomotor signals. Electrophysiological recordings from floccular Purkinje cells have allowed the identification of their firing patterns during generation of the image velocity and image acceleration signals used for pursuit. Analysis with a method based on a behavioral model converted the time-varying spike trains of floccular Purkinje cells into a description of the firing rate contributed by three visual motion signals and one oculomotor input. The flocculus encodes all the signals needed to guide pursuit. Author

**A91-49201**

### **HYPOBARIC HYPOXIA (380 TORR) DECREASES INTRACELLULAR AND TOTAL BODY WATER IN GOATS**

R. W. HOYT, M. J. DURKOT, V. A. FORTE, JR., L. J. HUBBARD, L. A. TRAD, and A. CYMERMAN (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) *Journal of Applied Physiology* (ISSN 8750-7587), vol. 71, Aug. 1991, p. 509-513.

refs

Copyright

**A91-49202**

### **EFFECTS OF INVARIANT SYMPATHETIC ACTIVITY ON CUTANEOUS CIRCULATORY RESPONSES TO HEAT STRESS**

DANIEL RICHARDSON, HU QING-FU, and STEVEN SHEPHERD (Kentucky, University, Lexington) *Journal of Applied Physiology* (ISSN 8750-7587), vol. 71, Aug. 1991, p. 521-529. Research supported by Kentucky Heart Association. refs (Contract NIH-P01-HL-36552)

Copyright

The effect of sympathetic withdrawal on cutaneous circulatory responses to direct and indirect heat stress was investigated in anesthetized rats subjected to a sympathetic clamp (SC) procedure (SC), so that constrictor tone remained invariant during exposures of either the animal's tail (direct heating) or body (indirect heating) to a 35 C environment. Flow through the arteriovenous anastomoses (AVAs) in the tail was measured by laser-Doppler flowmetry (LDF), while the capillary flow was evaluated by videodensitometry measurements of blood cell velocity (CBV) in single capillaries within the subepidermal vascular plexus. It was

found that both direct and indirect heating significantly increase the LDF and CBV values. In rats subjected to the SC procedure, the LDF responses to both types of heating were lower than in sham-operated rats, while CBV was not affected. I.S.

**A91-49203**

### **HIGH PRESSURE MODIFIES RESPIRATORY ACTIVITY IN ISOLATED RAT BRAIN STEM-SPINAL CORD**

ARIEL TARASIUK and YORAM GROSSMAN (Negev, University, Beersheba, Israel) *Journal of Applied Physiology* (ISSN 8750-7587), vol. 71, Aug. 1991, p. 537-545. Research supported by Ministry of Science and Technology of Israel. refs

Copyright

Effects of hyperbaric pressure on the rhythmic activity of the respiratory center in the absence of peripheral sensory afferents were examined by using an isolated brain stem-spinal cord preparation from newborn rats. In addition, the effect of pressure on the response of the respiratory center to sensory input from the trigeminal and vagus cranial nerves was examined. Hyperbaric pressure significantly depressed the mean inspiratory drive (frequency x time integral of single electrical bursts) in C5 but not in C1 ventral roots. Pressure also reduced the amount of inhibition on the respiratory activity normally exerted by trigeminal and vagal nerve stimulation and, in some cases, reversed it to excitation. It is concluded that, in the absence of sensory input, exposure to hyperbaric pressure depresses central respiratory activity. However, in an intact system, it may alter the balance between excitation and inhibition and render the system hyperexcitable to the same sensory input. Author

**A91-49205**

### **PRESSURE-INDUCED STRIATAL DOPAMINE RELEASE CORRELATES HYPERLOCOMOTOR ACTIVITY IN RATS EXPOSED TO HIGH PRESSURE**

JACQUES H. ABRAINI and JEAN-CLAUDE ROSTAIN (CNRS, Laboratoire de Biologie des Hautes Pressions, Marseille, France) *Journal of Applied Physiology* (ISSN 8750-7587), vol. 71, Aug. 1991, p. 638-643.

refs

(Contract DRET-87-168)

Copyright

Free-moving rats chronically implanted in the striatum with multifiber carbon electrodes selective to dopamine were compressed in a helium-oxygen mixture to 80 bars. Extracellular dopamine level and behavioral symptoms of high-pressure neurological syndrome were simultaneously recorded. Under these conditions, the extracellular level of dopamine monitored by differential pulse voltammetry was found to be pressure dependent, and hyperlocomotor activity, a behavioral symptom of high-pressure neurological syndrome, was found to be linked to these pressure-induced changes in dopamine release. Author

**A91-49569**

### **DIFFERENCES IN THERMOREGULATION MECHANISMS OF RATS DURING SEPARATE AND COMBINED ADAPTATION TO COLD AND HEAT [RAZLICHIIA MEKHAZIMOV TERMOREGULIATSII KRYV PRI RAZDEL'NOI I KOMBINIROVANNOI ADAPTATSII K KHOLODU I TEPLU]**

IU. I. ROSSOMAKHIN and S. A. PEVNYI (Donetskii Gosudarstvennyi Universitet, Donetsk, Ukrainian SSR)

## 51 LIFE SCIENCES (GENERAL)

Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 37, May-June 1991, p. 86-92. In Russian. refs  
Copyright

**A91-49570**

### ACTIVITY OF ACID PHOSPHATASE IN THE BLOOD SERUM OF RATS WITH DIFFERENT TYPES OF HYPOXIA [AKTIVNOST' KISLOI FOSFATAZY V SYVOROTKE KROVI U KRYYS PRI GIPOKSII RAZLICHNOGO PROISKHOZHDENIYA]

M. M. SEREDENKO, I. I. ANTONOVA, S. B. KOVAL', and P. V. GACHKOVSKII (AN USSR, Institut Fiziologii, Kiev, Ukrainian SSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 37, May-June 1991, p. 115-118. In Russian. refs  
Copyright

The effect of hypoxia on the activity of serum acid phosphatase in the blood of rats subjected to hypoxic, acute circulatory-hemic, or hemic types of hypoxia of different intensities was investigated. Results showed that all types of hypoxia caused increases of acid phosphatase in the blood serum, which correlated positively with the severity of hypoxia. It is suggested that the blood level of lysosomal hydrolases reflects the functional state of cellular lysosomes. I.S.

**A91-50633**

### THE EFFECTS OF HYPOBARIC HYPOXIA ON SPECIFIC B CELL RESPONSES FOLLOWING IMMUNIZATION IN MICE AND HUMANS

R. BISELLI, S. LE MOLI, P. M. MATRICARDI, S. FARRACE, A. FATTOROSSO, R. NISINI, and R. D'AMELIO (Aeronautica Militare Italiana, Divisione Aerea Studi Ricerche e Sperimentazioni, Pomezia, Italy) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 870-874. refs  
Copyright

The effects of hypobaric hypoxia on the qualitative and quantitative aspects of the immune response to a T-independent immune antigen were investigated in human subjects and in mice. Human subjects were 18 men who participated in a scientific project to Mount Poumori (Nepal) for 20 d at 4930 m; they were immunized with a single subcutaneous dose of an antimeningococcal vaccine containing polysaccharides A and C (PsA and PsC). Mice were kept in a hypobaric chamber at 5500 m for 30 d and were immunized after 10 d with the same vaccine. Results showed no significant differences between the control (sea-level) and high-altitude groups of both types of subjects in the antibody response to PsA and PsC, indicating that prolonged exposure to hypobaric hypoxia does not affect humoral immune response to T-independent antigens. I.S.

**A91-50634** Arizona Univ., Tucson.

### THE EFFECT OF A SPACE FOOD BAR DIET ON BODY AND MUSCLE MASS IN NORMAL AND HIND-LIMB SUSPENDED RATS

KATHRYN A. MUNOZ and MARC E. TISCHLER (Arizona, University, Tucson) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 875-878. refs (Contract NAG2-384; NGT-70308)  
Copyright

The effect of a food bar diet used for rats in space flights on the body mass, muscle mass, and muscle protein content of rats was investigated by comparing these characteristics in normal controls and with those in hind-limb suspended rats fed standard pellets or food bars. Results indicate that, although consumption of a food bar diet resulted in normal gains in body mass and muscle protein when compared to a standard pellet diet, it does not alter the atrophic responses of skeletal muscle to muscle unloading. Thus, it was found that hind-limb unloading reduced the values of the soleus muscle mass and protein content/100 g body mass in both diet groups. In the plantaris, extensor digitorum longus, and tibialis, on the other hand, values of the protein content/100 g body mass were not changed by suspension in either diet group. I.S.

**A91-50999**

### HUMAN FACTORS FOR PILOTS

ROGER G. GREEN, MELANIE JAMES, DAVID GRADWELL (RAF, Institute of Aviation Medicine, Farnborough, England), HELEN MUIR (Cranfield Institute of Technology, England), and ROGER L. GREEN Research supported by Cranfield Institute of Technology and RAF. Aldershot, England and Brookfield, VT, Avebury Technical, 1991, 146 p. refs  
Copyright

This handbook attempts to provide a reasonably comprehensive but concise outline of the available human factors knowledge about flying in the hope that it will prove useful and interesting to the practicing pilot. Particular attention is given to the following topics: basic aviation physiology and health maintenance; basic aviation psychology; stress, fatigue, and their management; and the social psychology and ergonomics of the flight deck. B.J.

**A91-51401**

### IMMUNOMODULATIONS OF THYMOCYTES AND SPLENOCYTES IN TRAINED RATS

ARNAUD FERRY, PHILIPPE RIEU, FATIHA LAZIRI, CHARLES Y. GUEZENNEC, ABDELLAH EL-HABAZI, CHRISTINE LE PAGE, and MICHEL RIEU (Paris V, Universite; Centre d'Etude et de Recherche de Medecine Aerospatiale, Bretigny-sur-Orge, France) Journal of Applied Physiology (ISSN 8750-7587), vol. 71, Sept. 1991, p. 815-820. Research supported by Secretariat d'Etat Charge de la Jeunesse et des Sports and Centre d'Etude et de Recherche de Medecine Aerospatiale of France. refs  
Copyright

Effects of training (running) on thymus and spleen cells in a rat are described. The subjects of the experiment were young Wistar control rats ( $n = 6$ ), rats trained for 4 wk ( $n = 5$ ), and rats trained for 4 wk followed by 1 wk of intensive training. Various lymphocyte surface and nuclear markers were determined by immunocytochemistry. It is concluded that the total effect of 5 wk of training did not significantly affect thymus cells. It decreased the absolute number of splenocytes ( $P$  less than 0.01) and the absolute number and the percentage of CD4 = splenocytes ( $P$  less than 0.05). The effect of training increased the percentage of CD8 = splenocytes ( $P$  less than 0.05), the percentage of BrdU+ cells in culture stimulated with Con A, and the viability of CD4+ splenocytes. It is suggested that the effect of training modulates both the number and the function of the immunocompetent cells of the primary and secondary lymphoid compartments. O.G.

**A91-51404**

### ELEVATED INTERSTITIAL FLUID VOLUME IN RAT SOLEUS MUSCLES BY HINDLIMB UNWEIGHTING

SUSAN C. KANDARIAN, ROBERT C. BOUSHEL, and LEAH M. SCHULTE (Boston University, MA) Journal of Applied Physiology (ISSN 8750-7587), vol. 71, Sept. 1991, p. 910-914. Research supported by American College of Sports Medicine Foundation. refs  
Copyright

Consideration is given to a study intended to measure the interstitial fluid volume of atrophied soleus muscles after 28 days of hindlimb unweighting and to calculate the magnitude of the effect of any enlargement on the specific tetanic tension ( $P$  sub 0) of whole soleus muscle. Nine female Wistar rats were hindlimb unweighted (HU) by tail suspension. Interstitial fluid volume and maximum  $P$  sub 0 were measured in vitro at 25 C. Relative muscle interstitial fluid volume increased 107 percent in HU rats ( $35.5 \pm$  or  $- 2.8$  microliter/100 mg wet mass) compared with the control value ( $17.2 \pm$  or  $- 0.5$  microliter/100 mg) ( $P$  less than 0.001), however, absolute interstitial fluid volume was unchanged. Specific  $P$  sub 0 from HU rats was 23 percent lower than control. It is concluded that relative interstitial fluid volume is elevated twofold in soleus muscles after unweighting. O.G.

**A91-51406\*** -Arizona Univ., Tucson.

### INFLUENCES OF CHEMICAL SYMPATHECTOMY AND SIMULATED WEIGHTLESSNESS ON MALE AND FEMALE RATS

CHRISTOPHER R. WOODMAN, CRAIG S. STUMP, JANE A. STUMP, LISA A. SEBASTIAN, Z. RAHMAN, and CHARLES M. TIPTON (Arizona, University, Tucson) *Journal of Applied Physiology* (ISSN 8750-7587), vol. 71, Sept. 1991, p. 1005-1014. refs

(Contract NAG2-392)

Copyright

Consideration is given to a study aimed at determining whether the sympathetic nervous system is associated with the changes in maximum oxygen consumption ( $VO_{2max}$ ), run time, and mechanical efficiency observed during simulated weightlessness in male and female rats. Female and male rats were compared for food consumption, body mass, and body composition in conditions of simulated weightlessness to provide an insight into how these parameters may influence aerobic capacity and exercise performance. It is concluded that chemical sympathectomy and/or a weight-bearing stimulus will attenuate the loss in  $VO_{2max}$  associated with simulated weightlessness in rats despite similar changes in body mass and composition. It is noted that the mechanisms remain unclear at this time. O.G.

**A91-51408**

**MAXIMUM OXYGEN UPTAKE AND ARTERIAL BLOOD OXYGENATION DURING HYPOXIC EXERCISE IN RATS**

NORBERTO C. GONZALEZ, ABIOTONA SOKARI, and RICHARD L. CLANCY (Kansas, University, Medical Center, Kansas City) *Journal of Applied Physiology* (ISSN 8750-7587), vol. 71, Sept. 1991, p. 1041-1049. refs

(Contract NIH-HL-39443)

Copyright

Experiments are described which have two major objectives, namely, to describe the effect of maximum treadmill exercise on gas exchange, arterial blood gases, and arterial blood oxygenation in rats acclimated for 3 wk to simulated altitude (SA, barometric pressure 370-380 torr) and to determine the contribution of acid-base changes to the changes in arterial blood oxygenation of hypoxic exercise. Maximum  $O_2$  uptake measured in four groups of rats resulted in acidosis, hypocapnia, and elevated blood lactate. The data obtained indicate that several features of hypoxic exercise are similar to those seen in humans, with the exception of the mechanism of decrease in  $O_2$  saturation of hemoglobin in arterial blood, which in humans appears to be due to incomplete alveolar-capillary equilibration. O.G.

**A91-51409**

**EFFECT OF ALKALOSIS ON MAXIMUM OXYGEN UPTAKE IN RATS ACCLIMATED TO SIMULATED ALTITUDE**

NORBERTO C. GONZALEZ, MARCELO ZAMAGNI, and RICHARD L. CLANCY (Kansas, University, Medical Center, Kansas City) *Journal of Applied Physiology* (ISSN 8750-7587), vol. 71, Sept. 1991, p. 1050-1056. refs

(Contract NIH-HL-39443)

Copyright

Experiments are described aimed at determining whether prevention or moderation of exercise acidosis would influence arterial blood oxygenation and exercise capacity in hypoxia. Exercise in  $HxNaCl$  resulted in a decrease in arterial  $O_2$  concentration  $Ca(O_2)$ , which was largely due to a pH-induced decrease in  $O_2$  saturation of arterial blood, and occurred despite an increase in arterial  $PO_2$ .  $NaHCO_3$  moderated the acidosis of exercise and largely attenuated the decrease in  $Ca(O_2)$ .  $NaHCO_3$  moderated acidosis of exercise and largely attenuated the decrease in  $Ca(O_2)$ . An almost linear relationship is found between maximum  $O_2$  uptake ( $VO_{2max}$ ) and the corresponding  $Ca(O_2)$ , which suggests that the effect of  $NaHCO_3$  on  $VO_{2max}$  may be related to moderation of the decrease in  $Ca(O_2)$ . O.G.

**A91-52601**

**CARNOSINE AND ITS BIOLOGICAL SIGNIFICANCE [KARNOZIN I EGO BIOLOGICHESKOE ZNACHENIE]**

ALEKSANDR A. BOLDYREV (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) *Priroda* (ISSN 0032-874X), July 1991,

p. 11-16. In Russian. refs

Copyright

The biological role of carnosine in an organism is discussed together with its medical uses. Among the established biomedical effects of carnosine are its effects against infectious and rheumatic polyarthritis and against essential hypertonia in humans; the stimulation of granular-tissue growth and acceleration of wound healing in humans and rats; antihistamine and antiprostaglandin effects in rabbits and dogs; antistressory, antihypertensory, and adaptogenic effects in rats; the antishock effects in humans, rats, and rabbits. Other biomedical effects of carnosine cited include its anticarcinogenicity in humans and a radioprotective effect in mice. It is noted that synthetic preparations of carnosine, even if almost 99 percent pure, were found to be not as effective as carnosine prepared from muscle tissue, or were harmful, due to (unidentified) trace impurities contained in these preparations. I.S.

**A91-52602**

**NEUROMEDIATORY INTERACTIONS IN SPECIFIC AND NONSPECIFIC STRUCTURES OF THE CENTRAL NERVOUS SYSTEM UNDER THE UNLOADING OF THE LOCOMOTOR APPARATUS AND DOSED VISCERAL IRRITATION [NEIROMEDIATORNYE VZAIMOOTNOSHENIIA V SPETSIFICHESKIKH I NESPETSIFICHESKIKH STRUKTURAKH TSNS PRI RAZGRUZKE OPORTNO-DVIGATEL'NOGO APPARATA I DOZIROVANNOM VISTSERAL'NOM RAZDRAZHENII]**

M. I. U. TAITIS, T. V. DUDINA, T. S. KANDYBO, A. I. ELKINA (AN BSSR, Institut Fiziologii, Minsk, Belorussian SSR), and A. S. DMITRIEV (Akademiia Nauk BSSR, Doklady (ISSN 0002-354X), vol. 35, Aug. 1991, p. 758-761. In Russian. refs

Copyright

The individual contributions of locomotor-apparatus unloading and drug-induced visceral irritation to the manifestations of the space sickness syndrome were investigated in guinea pigs subjected either locomotor-apparatus unloading (by placing the animals, supported on a soft membrane, in a lukewarm water bath) and/or to visceral irritation due to an injection of a peristaltic-inducing drug. Results are presented showing that the contribution of visceral irritation to manifestations of space sickness is mediated by the fastigial cerebellar nuclei. It is suggested that this fact should be taken into account when developing pharmacological means to correct the motion-sickness syndrome. I.S.

**A91-52713**

**PHYSICAL WORK CAPACITY OF THE ORGANISM IN EXPERIMENTS WITH COMBINED EXPOSURE TO HYPOKINESIA AND RADIATION [FIZICHESKAIA RABOTOSPOSOBNOST' ORGANIZMA V EKSPERIMENTAKH S KOMBINIROVANNYM DEISTVIEM GIPOKINEZII I RADIATSII]**

N. I. ARLASHCHENKO (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) *Akademiia Nauk SSSR, Izvestiia, Seria Biologicheskaiia* (ISSN 0002-3329), July-Aug. 1991, p. 576-582. In Russian. refs

Copyright

The effect of space-flight conditions (i.e., low-level total-body irradiation combined with antiorthostatic hypokinesia) on the work capacity of mice was investigated in 90 mice kept for periods from 45 min to 28 days in narrow plastic holders with a head-down tilt and subjected to radiation at a level of 8-Gy. Work capacity was estimated at 2 h and at the 3rd, 7th, 10th, 14th, 21st, and 28th day after irradiation, by measuring the speed at which the animals could swim across a standard length of a water tank. It was found that prolonged exposures to hypokinesia could affect the work capacity of the animals as much as a 50-percent lethal dose or irradiation. The effects of radiation and hypokinesia with respect to work capacity were not cumulative. I.S.

## 51 LIFE SCIENCES (GENERAL)

A91-52726

**FUNDAMENTALS OF BODY ENERGETICS: THEORETICAL AND PRACTICAL ASPECTS. I - THE BASIC ENERGETICS, HEAT EXCHANGE, AND THERMOREGULATION [OSNOVY ENERGETIKI ORGANIZMA: TEORETICHESKIE I PRAKTICHESKIE ASPEKTY. I - OBSHCHAYA ENERGETIKA, TEPLOBMEN I THERMOREGULIATSIIA]**

KIRILL P. IVANOV (AN SSSR, Institut Fiziologii, Leningrad, USSR) Leningrad, Izdatel'stvo Nauka, 1990, 312 p. In Russian. refs

Copyright

The theory of energy metabolism in a living organism is discussed together with recent observations on energy-exchange and heat-exchange regulations. Special attention is given to the mechanisms of heat exchange between the living body and the environment, between internal organs and blood, and between individual cells and blood. Particular consideration is given to modern theories of homiothermia and thermoregulation, the most recent findings on the central and peripheral thermal sensors, and the structure and functions of the thermoregulatory center. The energy requirements of humans and animals living under different conditions are examined together with the question of the quantitative efficiency of the thermoregulatory reactions and the body defenses against external heat. I.S.

N91-29709# Pacific Northwest Lab., Richland, WA.

**BIOLOGICAL INTERACTIONS OF EXTREMELY-LOW-FREQUENCY ELECTRIC AND MAGNETIC FIELDS**

T. S. TENFORDE Mar. 1990 30 p Presented at the 10th International Conference on Bioelectrochemistry and Bioenergetics, Pont-a-Mousson (France), 24-30 Sep. 1989 (Contract DE-AC06-76RL-01830) (DE90-011927; PNL-SA-17147; CONF-8909334-1) 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. The mechanisms through which ELF electric and magnetic fields induce currents in humans and other living objects are described. Evidence is presented that cell membranes play an important role in transducing ELF signals. Both experimental evidence and theoretical models are described that relate pericellular currents and electrochemical events at the outer membrane surface to transmembrane signaling pathways and cytoplasmic responses. Biological responses to ELF fields at the tissue, cellular and molecular levels are summarized, including new evidence that ELF field exposure produces alterations in messenger RNA synthesis, gene expression and the cytoplasmic concentrations of specific proteins. DOE

N91-29710# Army Research Inst. of Environmental Medicine, Natick, MA.

**DATA ACQUISITION SYSTEM FOR COLLECTING BIOPHYSICAL AND PHYSIOLOGICAL DATA**

K. W. STEPHEN and M. S. CHANG Apr. 1991 249 p (Contract DA PROJ. 3M1-62787-A-878) (AD-A237654; USARIEM-T9-91) Avail: NTIS HC/MF A11 CSCL 12/5

The Biophysics and Biomedical Modeling Division general purpose data acquisition system (AC128) is designed to sample up to 128 channels of input data, using an IBM-AT compatible personal computer (PC). The most recent set of sampled data are displayed in real time on the PC monitor. All data are also temporarily stored in the PC memory. Options to save the collected data onto other more permanent storage devices are provided. In this report the term AC128 represents the entire data acquisition system, comprising both the hardware and the software. The software portion alone will be referred to as the SoS. The AC128 SoS does not replace the PC Disk Operating System (DOS). The SoS runs within the PC DOS and calls many DOS provided functions. The primary types of input supported include thermocouples, thermistors, and voltages. All standard

thermocouple types (T, E, J, K, B, R, S) are allowed. Thermistors which subscribe to the Steinhart-Hart conversion equation are supported. GRA

N91-29711# Arizona State Univ., Tempe. Dept. of Botany. **SPECIFIC MUTAGENESIS OF A CHLOROPHYLL-BINDING PROTEIN**

W. F.J. VERMAAS Jan. 1991 6 p (Contract DE-FG02-89ER-14031)

(DE91-014813; DOE/ER-14031/3) Avail: NTIS HC/MF A02

Chlorophyll, absorbing light energy for use in photosynthesis, is bound by specific proteins in thylakoid membranes such as CP47. His residues have been suggested to serve as chlorophyll ligands. To test the necessity of His residues in CP47, specific His residues have been altered to Tyr or Asn, and the effects of these mutations are now studied in vivo in the cyanobacterium *Synechocystis* sp. PCC 6803. Most mutations lead to a decreased photoautotrophic growth rate of the cyanobacterium, due in part to a decreased stability of the photosystem 2 complex. The effective relative antenna size of photosystem 2 in the various CP47 mutants is now being measured. The CP47 protein may also be involved in events at the donor side of photosystem 2. We have identified a region which can be deleted without obvious ill effects, and a domain which appears crucial for photosystem 2 structure and function. Residues of particular importance will be defined by further mutagenesis experiments. DOE

N91-29712# Georgia Univ., Athens. **MICROBIOLOGY AND PHYSIOLOGY OF ANAEROBIC FERMENTATIONS OF CELLULOSE**

J. WIEGEL May 1991 23 p

(Contract DE-FG09-86ER-13614)

(DE91-015239; DOE/ER-13614/4) Avail: NTIS HC/MF A03

The biochemistry and physiology of four major groups of anaerobic bacteria involved in the conversion of cellulose to methane or chemical feedstocks are examined. Aspects of metabolism which are relevant to the interactions and bioenergetics of consortia are being studied. Properties of the cellulolytic enzyme cluster of *Clostridium thermocellum* are investigated. Five different hydrogenases have been characterized in detail from anaerobic bacteria. Genes for different hydrogenases are being cloned and sequenced to determine their structural relationships. The role of metal clusters in activation of H<sub>2</sub> is being investigated, as is the structure and role of metal clusters in formate metabolism. The function of formate in the total synthesis of acetate from CO<sub>2</sub> and the role of this primary in anaerobes will be examined as well. Finally, these enzyme studies will be performed on thermophilic bacteria, and pertinent species will be isolated. DOE

N91-29713# Duke Univ., Durham, NC.

**STABLE ISOTOPE FRACTIONATION IN PHOTOSYNTHESIS: ANALYSIS OF AUTOTROPHIC COMPETENCE FOLLOWING TRANSFORMATION OF THE CHLOROPLAST GENOME OF CHLAMYDOMONAS**

J. E. BOYNTON, N. W. GILLHAM, and C. B. OSMOND 15 Jun. 1991 12 p

(Contract DE-FG05-89ER-14005)

(DE91-015792; DOE/ER-14005/T1) Avail: NTIS HC/MF A03

Isotopic techniques needed to assess the interactions between photosynthesis and respiration in *Chlamydomonas* have been devised for C-13, using plate and liquid cultures. The effectiveness of various transformation strategies for the chloroplast *psbA* gene has been evaluated with respect to their utility in constructing and characterizing strains homoplasmic for site-directed mutations in an otherwise isogenic background. Our analysis of the first site-directed change in the D-1 protein of *Chlamydomonas* indicates that a second site mutation (arg(sub 238) greater than lys) in the loop between transmembrane helices IV -- V can partially compensate for the reduced photosynthetic performance that accompanies the atrazine resistant mutation (ser(sub 264) greater than ala/gly) in this alga and in higher plants grown under high light intensities. DOE

**N91-30667\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**HORIZONTALLY ROTATED CELL CULTURE SYSTEM WITH A COAXIAL TUBULAR OXYGENATOR Patent**

DAVID A. WOLF, inventor (to NASA), RAY P. SCHWARZ, inventor (to NASA), and TINH T. TRINH, inventor (to NASA) (Krug International, Houston, TX.) 25 Jun. 1991 17 p Filed 30 Jun. 1988

(NASA-CASE-MSC-21294-1; US-PATENT-5,026,650; US-PATENT-APPL-SN-213558; US-PATENT-CLASS-435-286; US-PATENT-CLASS-435-285; US-PATENT-CLASS-435-312; US-PATENT-CLASS-435-313; US-PATENT-CLASS-435-818; US-PATENT-CLASS-261-83; INT-PATENT-CLASS-C12M-3/02) Avail: US Patent and Trademark Office CACL 06/3

The present invention relates to a horizontally rotating bioreactor useful for carrying out cell and tissue culture. For processing of mammalian cells, the system is sterilized and fresh fluid medium, microcarrier beads, and cells are admitted to completely fill the cell culture vessel. An oxygen containing gas is admitted to the interior of the permeable membrane which prevents air bubbles from being introduced into the medium. The cylinder is rotated at a low speed within an incubator so that the circular motion of the fluid medium uniformly suspends the microbeads throughout the cylinder during the cell growth period. The unique design of this cell and tissue culture device was initially driven by two requirements imposed by its intended use for feasibility studies for three dimensional culture of living cells and tissues in space by JSC. They were compatible with microgravity and simulation of microgravity in one G. The vessels are designed to approximate the extremely quiescent low shear environment obtainable in space. Official Gazette of the U.S. Patent and Trademark Office

**N91-30668\*#** California Univ., San Diego, La Jolla. Div. of Physiology.

**COSMOS 2044: LUNG MORPHOLOGY STUDY, EXPERIMENT K-7-28 Final Report, 1 Oct. 1988 - 30 Sep. 1991**

ANN R. ELLIOTT, ODILE MATHIEU-COSTELLO, and JOHN B. WEST. 1991 13 p (Contract NAG2-616) (NASA-CR-187711; NAS 1.26:187711) Avail: NTIS HC/MF A03 CACL 06/3

Researchers examined the effect of microgravity during spaceflight on lung tissue. The ultrastructure of the left lungs of 5 Czechoslovakian Wistar rats flown on the 13 day, 19+ hour Cosmos 2044 mission was examined and compared to 5 vivarium and 5 synchronous controls at 1-g conditions, and 5 rats exposed to 14 days of tail suspension. Pulmonary hemorrhage and alveolar edema of unknown origin occurred to a greater extent in the flight, tail-suspended, and synchronous control animals, and in the dorsal regions of the lung when compared with the vivarium controls. The cause of these changes, which are possibly due to an increase in pulmonary vascular pressure, requires further investigation. Author

**N91-30669\*** Lockheed Engineering and Sciences Co., Washington, DC.

**USSR SPACE LIFE SCIENCES DIGEST, ISSUE 31**

LYDIA RAZRAN HOOKE, ed., RONALD TEETER, ed., VICTORIA GARSHNEK, ed., and JOSEPH ROWE, ed. Washington NASA Jan. 1990 116 p (Contract NASW-4292)

(NASA-CR-3922(37); NAS 1.26:3922(37)) Avail: NTIS HC A06/MF A01 CACL 06/3

This is the thirty first issue of NASA's Space Life Sciences Digest. It contains abstracts of 55 journal papers or book chapters published in Russian and of 5 Soviet monographs. Selected abstracts are illustrated with figures and tables from the original. The abstracts in this issue have been identified as relevant to 18 areas of space biology and medicine. These areas include: adaptation, biological rhythms, cardiovascular and respiratory systems, endocrinology, enzymology, genetics, group dynamics, habitability and environmental effects, hematology, life support

systems, metabolism, microbiology, musculoskeletal system, neurophysiology, nutrition, operational medicine, psychology, radiobiology, and space biology and medicine. Author

**N91-30673#** Joint Publications Research Service, Arlington, VA. **STATUS OF LIPID PEROXIDATION SYSTEM IN RAT TISSUES AFTER 7-DAY FLIGHT ON KOSMOS-1667 Abstract Only**

N. V. DELENYAN and A. A. MARKIN *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 1 25 Oct. 1990 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 23, no. 4, Jul.-Aug. 1989 p 34-37 Avail: NTIS HC/MF A04

A study is made of the levels of lipid peroxidation products (diene conjugates, Schiff bases and malonic dialdehyde), the activity of basic antioxidant enzymes (superoxidismutase, catalysis, glutathione peroxidase, glutathione reductase), and the bioantioxidants tocopherol (vitamin E) in the tissues of rats after a seven day flight on board the Kosmos-1667 satellite. The data obtained indicated a generalized increase in lipid peroxidation in the livers of rats, increasing the permeability of cell membranes. Reliable increases were observed in the activity of the cytoplasmic enzyme of the hepatocytes with a simultaneous increase in general antioxidant activity. These changes, plus a milder increase in lipid peroxidation products in the myocardium, indicate that the intensification of lipid peroxidation probably results from the altered gravitation. Author

**N91-30674#** Joint Publications Research Service, Arlington, VA. **BLOOD ELECTROLYTE BALANCE IN DOGS REPEATEDLY EXPOSED TO +G(SUBZ) ACCELERATION Abstract Only**

R. A. VARTBARONOV, G. D. GLOD, I. G. POPOV, N. N. UGLOVA, N. N. SARYCHEVA, and I. S. ROLIK *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 2 25 Oct. 1990 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 23, no. 4, Jul.-Aug. 1989 p 43-46 Avail: NTIS HC/MF A04

A study was made of the dynamics of the concentration of K(+), Na(+), Mg(++), and Ca(+++) in the blood plasma of animals during exposure to the maximum tolerated acceleration +G sub z of increasing intensity, as well as the possible antiarrhythmic effect of hypermagnesemia under these conditions. Centrifuge experiments were performed on seven mongrel dogs, with exposure once or twice per week over a period of five months, with increasing acceleration to the point of appearance of cardiac rhythm disorders. Blood samples were taken two to three days after each acceleration exposure. Hypermagnesemia was achieved by i/m injection of a 25 pct. magnesium sulfate solution, dose 0.5 ml/kg. The experiments produced persistent hypermagnesemia and hyperkalemia of a compensatory nature, decreasing the loss of K(+) ions and increasing acceleration tolerance by 1.5 g. Author

52

## AEROSPACE MEDICINE

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

**A91-48574**  
**PERFORMANCE TESTING AS A DETERMINANT OF FITNESS-FOR-DUTY**

R. W. ALLEN, ANTHONY C. STEIN (Systems Technology, Inc., Hawthorne, CA), and JAMES C. MILLER (Performance Factors, Inc., Alameda, CA) SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Oct. 1-4, 1990. 16 p. refs (SAE PAPER 901870) Copyright

Performance testing provides an important complement to urine testing as a determinant of fitness for duty. Performance testing can be conducted immediately to screen out impaired workers

before they undertake safety related job functions. Urine testing involves the expense and delay of laboratory testing, and results relate more to life style than current on-the-job performances capability. This paper reviews performances based testing and discusses the development and application of two performance based screening devices. One device has the capability of rapidly screening for impaired psychomotor performance given previous baseline data. The second device provides the potential for screening psychomotor and divided attention performance without prior experience or baseline data. Author

**A91-48786****HEART PERIOD AS A USEFUL INDEX OF PILOT WORKLOAD IN COMMERCIAL TRANSPORT AIRCRAFT**

S. A. METALIS (Douglas Aircraft Co., Long Beach, CA) International Journal of Aviation Psychology (ISSN 1050-8414), vol. 1, no. 2, 1991, p. 107-116. refs

Copyright

As part of a larger study of the validity and reliability of various workload measures for use in aircraft certification, heart period (a function of heart rate) was investigated. In two separate experiments, pilots flew either normal-workload or high-workload missions in a B-727 simulator to determine whether the measures could serve to discriminate between the two workload levels. To test reliability of the measures, the pilots flew the missions again on another day. The results indicate that heart period can serve as an effective supplemental index of aircrew workload in the case of transport aircraft flight deck certification. Furthermore, although sampling artifacts make a strong interpretation tenuous, samples of 30 heartbeats proved sensitive to workload manipulations and appeared to capture the phasic changes in workload better than did the heart data collected from the entire phase of flight duration. Author

**A91-49204****HEAT LOSS FROM THE HUMAN HEAD DURING EXERCISE**

W. RASCH, P. SAMSON, J. COTE, and M. CABANAC (Universite Laval, Quebec, Canada) Journal of Applied Physiology (ISSN 8750-7587), vol. 71, Aug. 1991, p. 590-595. Research supported by Defence and Civil Institute of Environmental Medicine of Canada. refs

Copyright

The mechanism responsible for the loss of heat introduced by arterial blood into the human brain during passive and exercise-induced hyperthermia was investigated by measuring evaporative and convective heat losses from the head skin and expired air in four male subjects at rest and during incremental exercise at 5, 15, and 25 C ambient temperature. It was found that the heat losses, separately and together (total), were highly correlated with the increasing esophageal temperature at 15 and 25 C, but not at 5 C. The heat loss from the head was larger than the heat brought to the brain by arterial blood during hyperthermia plus the heat produced by the brain, estimated to about 40 W and 20 W, respectively. I.S.

**A91-49206****EFFECT OF AXILLARY BLOCKADE ON REGIONAL CEREBRAL BLOOD FLOW DURING STATIC HANDGRIP**

D. B. FRIEDMAN, L. FRIBERG, J. H. MITCHELL, and N. H. SECHER (Bispebjerg Hospital; Copenhagen, University, Denmark) Journal of Applied Physiology (ISSN 8750-7587), vol. 71, Aug. 1991, p. 651-656. Research supported by Danish Medical Council, Lawson and Rogers' Lacy Research Fund in Cardiovascular Diseases, Ryburn Chair in Heart Research, and La Cour's Fund. refs

Copyright

The effect a static handgrip on the blockade of the regional cerebral blood flow (rCBF) induced in human subjects with lidocaine is investigated together with the question of whether such changes are attenuated when small afferent fibers from the working muscles are blocked with regional anesthesia. Values of rCBF were determined at rest and during static handgrip before and after regional blockade with lidocaine. Results showed that handgrip

did not affect hemispheric mean CBF, but that the premotor rCBF increased from 55 to 60 ml/100 g per min and motor sensory rCBF increased from 57 to 63 ml/100 g per min to both the ipsilateral and contralateral sides during handgrip before, but not after axillary blockade. There was no change in the rCBF to other regions of the brain, and regional anesthesia did not alter resting rCBF. I.S.

**A91-49207****PASSIVE HEAT EXPOSURE LEADS TO DELAYED INCREASE IN PLASMA LEVELS OF ATRIAL NATRIURETIC PEPTIDE IN HUMANS**

J. LEPPALUOTO, O. ARJAMAA, O. VUOLTEENAHO, and H. RUSKOAHO (Oulu, University, Finland) Journal of Applied Physiology (ISSN 8750-7587), vol. 71, Aug. 1991, p. 716-720. Research supported by Academy of Finland. refs

Copyright

**A91-50629****THE MEASUREMENT OF PSYCHOPHYSIOLOGICAL REACTIONS OF PILOTS TO A STRESSOR IN A FLIGHT SIMULATOR**

WARRICK J. SIVE and JOHANN HATTINGH (Witwatersrand, University, Johannesburg, Republic of South Africa) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 831-836. refs

Copyright

Seventeen Boeing 737 pilots were exposed to an acute stressor in a flight simulator: a birdstrike between V1 (velocity of aircraft on take-off run at which crew is committed to take-off regardless of any incidents occurring) and Vr (velocity of aircraft at take-off). Certain physiological variables together with state anxiety scores were measured at different stages of the simulated flight. Levels of plasma cortisol, norepinephrine, total protein, total lipid, lactate, and the hematocrit changed significantly across the test conditions. Plasma epinephrine, osmolality, and glucose levels did not change significantly across the test conditions. Captains and copilots differed significantly in the profiles obtained for the state anxiety scores. The variables measured in this study demonstrated different profiles in response to the stressor. Author

**A91-50630****DIETARY INTAKE AND BLOOD LIPID PROFILE SURVEY OF FIGHTER PILOTS AT TYNDALL AIR FORCE BASE**

ELIZABETH K. COPP and NANCY R. GREEN (Florida State University, Tallahassee) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 837-841. refs

Copyright

A 24-hour dietary recall, a food frequency checklist, and a blood lipid profile were collected from 30 USAF fighter pilots. Sample mean intakes of nutrients studied met U.S. military recommended dietary allowances, except for folic acid, which was 78 percent. Mean percentages of energy derived from carbohydrates, protein and fat were 48.3, 16.1 and 34.2 percent respectively. Of the pilot sample, 63 percent reported they did not eat breakfast daily. Sample mean blood lipid profile values were: total cholesterol = 218 mg/dl, HDL-cholesterol = 45 mg/dl, triglycerides = 109 mg/dl. Based on total cholesterol level, 40 percent of the pilot sample should have follow-up according to the National Cholesterol Education Program. A significant negative relationship was found between reported exercise frequency and total cholesterol/HDL-cholesterol ratio. Some fighter pilots could benefit from counseling with a dietitian regarding dietary intake patterns, decreasing dietary fats, and the advantages of regular exercise. Author

**A91-50631\*** Wright State Univ., Dayton, OH.**GENDER-BASED DIFFERENCES IN THE CARDIOVASCULAR RESPONSE TO STANDING**

ROBERT W. GOTSHALL, PAI-FENG TSAI (Wright State University, Dayton, OH), and MARY A. B. FREY (NASA, Johnson Space Center; Universities Space Research Association, Houston, TX;



Wright State University, Dayton, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 855-859. refs

Copyright

The cardiovascular responses of men and women to the stand test were compared by measuring respective values for heart rate, blood pressure, stroke volume, cardiac output, and total peripheral resistance during a 5-min supine and a 5-min standing test in ten subjects of each gender. It was found that, while the male and female subjects had similar heart rate values, all other responses exhibited greater changes in men than in women. While differences in the height of the subjects did not account for differences in cardiovascular responses, no mechanism responsible for these differences could be identified. I.S.

**A91-50635**

**WHITE FINGER SYMPTOMS - A CROSS-SECTIONAL STUDY**

LENNART DIMBERG (Goteborg, University, Sweden) and ANDERS ODEN Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 879-883. refs

Copyright

In a cross-sectional questionnaire study of 2933 employees of a Swedish aircraft company, the prevalence of white finger (wf) was asked for and then correlated with information on personal and anthropometrical data and on job-related and leisure-related activities. The questionnaire return rate was 96 percent. There were 210 (7 percent) who reported white finger symptoms. A positive association with age and with work with vibrating hand-tools (polishing and deburring instruments and marking pens) and a negative association with body weight was found. The higher proportion of wf among female workers did not retain statistical significance after consideration of their lesser weight in the multivariate testing. The highest proportion of wf was found among polishers/grinders (23 percent), sheet-metal workers (19 percent) and cleaners (15 percent). It is concluded that work with vibrating hand-tools of the type used in this industry probably increases the prevalence of wf and that ways to better insulate tools need to be evaluated. Author

**A91-50636**

**MEDICAL CAUSES OF IN-FLIGHT INCAPACITATION - USAF EXPERIENCE 1978-1987**

TIMOTHY J. MCCORMICK (USAF, Hospital, Robins AFB, GA) and TERENCE J. LYONS (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 884-887. refs

Copyright

In-flight incapacitation of a fully trained crewmember due to a serious underlying medical condition is a rather infrequent event. In order to delineate the extent and nature of the incapacitation problem the data base at the Air Force Safety and Inspection Center was reviewed for all incidents coded for incapacitation, preexisting disease, or other acute illnesses occurring during the ten years between 1978 and 1987. During this period, there were 23 in-flight incidents of incapacitation due to significant underlying medical conditions. In 11 of the incidents, the incapacitation resulted in a loss of consciousness. Neurologic conditions were the most frequent cause followed by cardiovascular conditions. A rate of incapacitation was calculated as 0.19 per million aircrew flying hours. Author

**A91-50637**

**FACTORS ASSOCIATED WITH LEUKOCYTURIA IN ASYMPTOMATIC PILOTS**

PAUL FROOM, IGAL SHOCHAT (Israel Air Force, Aeromedical Centre, Jerusalem), and JOCHANAN BENBASSAT (Hadassah University Hospital, Jerusalem, Israel) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 890-892. refs

Copyright

The prevalence of leukocyturia during annual examinations is related to recent activities and history data in 923 pilots. Urinary analysis was done and the results were cross-tabulated with

answers from a questionnaire and with a past history of leukocyturia obtained from the pilot's chart. The prevalence of four to six or more white blood cells (WBCs) in the urinary sediment was 5.3 percent. Leukocyturia was 35.7 times more common (odds ratio) in those with a previous history of leukocyturia and a concomitant history of urethritis (p less than 0.0001). Yet, a history of leukocyturia accounted for only 18.1 percent of the cases of leukocyturia. There was a trend for an association between jogging and leukocyturia. The prevalence of leukocyturia was not affected by smoking, other physical exercise, a history of nephrolithiasis, air duty in the preceding 24 h, or a history of transient illness during the last 2 weeks. It is concluded that there is an association between a history of both leukocyturia and urethritis. Author

**A91-50638\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**A COMPARISON BETWEEN COMPUTER-CONTROLLED AND SET WORK RATE EXERCISE BASED ON TARGET HEART RATE**

WANDA M. PRATT, STEVEN F. SICONOLFI, LAURIE WEBSTER, JUDITH C. HAYES, AUGUSTUS D. MAZZOCCA, and BERNARD A. HARRIS, JR. (NASA, Johnson Space Center, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 899-902. refs

Copyright

Two methods are compared for observing the heart rate (HR), metabolic equivalents, and time in target HR zone (defined as the target HR + or - 5 bpm) during 20 min of exercise at a prescribed intensity of the maximum working capacity. In one method, called set-work rate exercise, the information from a graded exercise test is used to select a target HR and to calculate a corresponding constant work rate that should induce the desired HR. In the other method, the work rate is controlled by a computer algorithm to achieve and maintain a prescribed target HR. It is shown that computer-controlled exercise is an effective alternative to the traditional set work rate exercise, particularly when tight control of cardiovascular responses is necessary. I.S.

**A91-50851**

**EFFECT OF HYPERTHERMIA ON SOME HORMONAL AND IMMUNOGENIC CHARACTERISTICS OF HUMANS [VLIIANIE GIPERTERMII NA NEKOTORYE GORMONAL'NYE I IMMUNNYE POKAZATELI CHELOVEKA]**

T. V. PETROVA, M. V. VASIN, S. M. RAZINKIN, and O. G. SHAN'GIN Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, May-June 1991, p. 94-97. In Russian. refs

Copyright

The effect of hyperthermia on the hormonal and immunogenic systems in humans was investigated in healthy objects kept at +60 C until the time when further exposure could no longer be tolerated. Measurements of blood-serum concentrations of insulin, cortisone, somatotrophic hormone, beta-2 microglobulin, and immunoglobulins A, M, G, and E and of cardiovascular characteristics showed that subjects most sensitive to hyperthermia had the highest rate of rectal temperature increase, dysimmunoglobulinemia, and increased concentrations of circulating immune complexes and beta-2 microglobulin. It is suggested that measurements of immunoglobulins may be used as parameters indicating poor tolerance of humans to hot climate. I.S.

**A91-50852**

**THE ROLE OF PHOTOPERIODISM IN THE FORMATION OF ADAPTATIONAL CHANGES IN THE HUMAN ENDOCRINE SYSTEM IN THE NORTH [ROL' FOTOPERIODIZMA V FORMIROVANII ADAPTATSIONNYKH IZMENENII ENDOKRINNOI SISTEMY U CHELOVEKA NA SEVERE]**

S. G. SUKHANOV (Institut Fiziologii, Syktyvkar, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, May-June 1991, p. 110-114. In Russian. refs

Copyright

The hormonal and biochemical shifts induced in newly arriving



residents of the Archangelsk region by differences in the daytime length were compared to those in the local population of Russias origin and in aborigines of Nenets and Komi origin. The total number of subjects was 1000 males. It was found that, among the newcomers, the levels of cortisone and thyroxin sharply increased, above those in local populations, during both the polar night and polar day, while the levels of testosterone decreased. I.S.

A91-50853

**TAXONOMIC ANALYSIS OF INDIVIDUAL REACTIONS OF AN ORGANISM TO HYPOXIA-RELATED TESTS**  
[TAKSONOMICHESKII ANALIZ INDIVIDUAL'NYKH REAKTSII ORGANIZMA NA TESTIRIUSHCHEE GIPOKSIKESKOE VOZDEISTVIE]

IU. V. BUSHOV and K. T. PROTASOV (Nauchno-Issledovatel'skii Institut Biologii i Biofiziki, Tomsk, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, May-June 1991, p. 123-128. In Russian. refs

Copyright

The individual differences in the reaction of human subjects during a hypoxia test were investigated using subjects divided into three stenic types (I, II, and III) on the basis of taxonomic analyses. The tests included a 60-min-long exposure in an altitude chamber to 3.5 km altitude combined with physical and psychological exercises. The stenic type I subjects were characterized by low increases in the heart rate (HR), low values of minute blood volume (MBV), the parasympathic trend of the vegetative regulation, low levels of basic metabolism, and the lowest decrease in physical work capacity during moderate hypoxia. The type II objects were characterized by relatively high values of HR and MBV increases, well-balanced vegetative regulation, near normal basic metabolism, and significant lowering of physical work capacity due to hypoxia. Type III subjects displayed the lowest HR and MBV increases, the lowest blood-oxygen saturation, and the greatest decrease in work capacity. I.S.

A91-50854

**TYPOLGICAL CHARACTERISTICS OF DEFENSE REACTIONS DURING CHRONOPHYSIOLOGICAL STRESS**  
[TIPOLOGICHESKIE ZAKONOMERNOSTI ZASHCHITNYKH REAKTSII V USLOVIAKH KHRONOFIZIOLOGICHESKOGO NAPRIAZHENIIA]

V. S. NOVIKOV (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, May-June 1991, p. 133-136. In Russian. refs

Copyright

Individual differences of defense reactions to chronophysiological stress among human subjects of different constitutions were investigated by correlating various somatotropic indices (including body weight and height, lung capacity, and chest circumference) of the subjects with adaptational reactions to hypokinesia, hypoxia, high temperature and humidity, and high-CO<sub>2</sub> atmosphere. The defense reactions were evaluated on the basis of measurements of the levels of leukocytes, the intensity of leukocytolysis, phagocytic activity, the efficiency of intracellular digestion, and the efficiency of leukocyte adhesion. It was found that the levels of defense reactions were higher in subjects with high and medium somatotropic characteristics than in subjects with low somatotropic indices. I.S.

A91-50855

**THE CHARACTERISTICS OF ADAPTIVE SHIFTS IN PARTICIPANTS OF THE SOVIET-AMERICAN BERING-BRIDGE EXPEDITION. I - THE ENERGY ASPECTS OF ADAPTATION**  
[OSOBENOSTI ADAPTIVNYKH PERESTROEK U UCHASTNIKOV SOVETSKO-AMERIKANSKOI EKSPEDITSII 'BERINGOV MOST.' I - ENERGETICHESKIE ASPEKTY ADAPTATSII]

A. A. AIDARALIEV, A. L. MAKSIMOV, and A. IA. SOKOLOV (AN SSSR, Institut Biologicheskikh Problem, Magadan, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, May-June 1991, p. 137-144. In Russian. refs

Copyright

Adaptive changes of the cardiovascular system and thermoregulation were measured in participants of the Soviet-American expedition during their ski trip through Chukotka and Alaska, with special attention given to differences in adaptive changes due to the ethnic background (European or Arctic aboriginal) of the expedition members. The measurements of the arterial pressure, external respiration, skin temperature, cardiographic indices, oxygen consumption, and energy expenditures during exercise tests showed that the adaptive changes in the thermoregulatory system in subjects of European origin differed from those of aborigines even at the end of the 2-month trip. It was found, however, that physically well-trained subjects of European background exhibited adequate levels of adaptation, making it possible for them to undergo extensive physical work under extreme climatic conditions. I.S.

A91-51402

**MECHANICS OF RUNNING UNDER SIMULATED LOW GRAVITY**

JIPING HE, RODGER KRAM, and THOMAS A. MCMAHON (Harvard University; MIT, Cambridge, MA) Journal of Applied Physiology (ISSN 8750-7587), vol. 71, Sept. 1991, p. 863-870. Research supported by Sloan Foundation. refs

(Contract NIH-AR-18140-13)

Copyright

Experimental observations of human running under simulated low gravity have been analyzed with particular attention given to adjustment of the spring properties of the leg to different levels of gravity. A hypothesis is suggested that leg spring stiffness would not change under simulated low-gravity conditions. Four subjects ran at one speed (3.0 m/s) under conditions of normal gravity and six simulated fractions of normal gravity from 0.2 to 0.7 G. For comparison, subjects also ran under normal gravity at five speeds from 2.0 to 6.0 m/s. It is concluded that both the stiffness of the leg, considered as a linear spring, and the vertical excursion of the center of mass during the flight phase did not change with forward speed or gravity. O.G.

A91-51403\* Pennsylvania Univ., Philadelphia.

**PULMONARY FUNCTION IN MEN AFTER OXYGEN BREATHING AT 3.0 ATA FOR 3.5 H**

J. M. CLARK, R. M. JACKSON, C. J. LAMBERTSEN, R. GELFAND, W. D. B. HILLER, and M. UNGER (Pennsylvania, University, Medical Center, Philadelphia) Journal of Applied Physiology (ISSN 8750-7587), vol. 71, Sept. 1991, p. 878-885. Research supported by Benjamin Franklin Partnership. refs

(Contract N00014-81-C-0826; NAS9-17238)

Copyright

A complete description of pulmonary measurements obtained after continuous O<sub>2</sub> exposure of 13 healthy men at 3.0 ATA for 3.5 h is presented. Measurements included flow-volume loops, spirometry, and airway resistance (n = 12); CO diffusing capacity (n = 11); closing volumes (n = 6); and air vs. HeO<sub>2</sub> forced vital capacity maneuvers (n = 5). The average difference in maximum mid expiratory flows at 50 percent vital capacity on air and HeO<sub>2</sub> was found to be significantly reduced postexposure by 18 percent. Raw and CO diffusing capacity were not changed postexposure. It is concluded that the relatively large change in forced expiratory flow at 25-75 percent of vital capacity compared with the mean forced expiratory volume in 1 s, the reduction in density dependence of flow, and the normal Raw postexposure are all consistent with flow limitation in peripheral airways as a major cause of the observed reduction in expiratory flow. O.G.

A91-51405

**BLOOD RHEOLOGY IN ACUTE MOUNTAIN SICKNESS AND HIGH-ALTITUDE PULMONARY EDEMA**

W. H. REINHART, B. KAYSER, A. SINGH, U. WABER, O. OELZ, and P. BAERTSCH (Bern, Universitaet; Geneva, University, Geneva; Zuerich, Universitaet, Zurich, Switzerland) Journal of Applied Physiology (ISSN 8750-7587), vol. 71, Sept. 1991, p. 934-938. refs

(Contract SNSF-3200-0092,85)

Copyright

In vitro flow properties of human blood at high altitude have been studied. Blood flow is determined by the hematocrit, plasma viscosity, RBC deformability, and RBC aggregation. These factors are studied in a prospective way at low altitude and during the first 24 h after rapid ascent by foot to 4,559 m in subjects with and without susceptibility to HAPE. No significant differences are found in any rheological parameters between healthy individuals and subjects with acute mountain sickness or high-altitude pulmonary edema, either before or during the illness. It is concluded that rheological abnormalities can be excluded as initiating event in the development of acute mountain sickness and high-altitude pulmonary edema. O.G.

**A91-51407**

**HYPOXIA POTENTIATES EXERCISE-INDUCED SYMPATHETIC NEURAL ACTIVATION IN HUMANS**

DOUGLAS R. SEALS, DAVID G. JOHNSON, and RALPH F. FREGOSI (Arizona, University, Tucson) *Journal of Applied Physiology* (ISSN 8750-7587), vol. 71, Sept. 1991, p. 1032-1040. Research supported by Arizona Heart Association. refs (Contract NIH-HL-39966; NIH-AG-06537; NIH-AG-00423)

Copyright

A hypothesis that hypoxia potentiates exercise-evoked sympathetic neural activation in humans has been tested. In 15 young healthy subjects, lower leg muscle sympathetic nerve activity (MSNA), venous plasma norepinephrine (PNE) concentrations, heart rate, and arterial blood pressure were measured at rest and in response to rhythmic handgrip exercise performed during normoxia or isocapnic hypoxia. It is concluded that hypoxia potentiates exercise-evoked sympathoexcitation in humans. The augmented sympathetic activation may be due to a synergistic interaction between these two stimuli. The mechanism underlying the greater sympathetic response to hypoxic exercise is considered to have its origin in the contracting skeletal muscles. O.G.

**A91-52331\*#** Idaho National Engineering Lab., Idaho Falls.

**RADIATION DOSE ESTIMATES FOR TYPICAL PILOTED NTR LUNAR AND MARS MISSION ENGINE OPERATIONS**

BRUCE G. SCHNITZLER (Idaho National Engineering Laboratory, Idaho Falls) and STANLEY K. BOROWSKI (NASA, Lewis Research Center, Cleveland, OH) AIAA, NASA, and OAI, Conference on Advanced SEI Technologies, Cleveland, OH, Sept. 4-6, 1991. 14 p. Research supported by NASA. refs (Contract DE-AC07-7ID-01570)

(AIAA PAPER 91-3407) Copyright

The natural and manmade radiation environments to be encountered during lunar and Mars missions are qualitatively summarized. The computational methods available to characterize the radiation environment produced by an operating nuclear propulsion system are discussed. Mission profiles and vehicle configurations are presented for a typical all-propulsive, fully reusable lunar mission and for a typical all-propulsive Mars mission. Estimates of crew location biological doses are developed for all propulsive maneuvers. Post-shutdown dose rates near the nuclear engine are estimated at selected mission times. Author

**N91-29714\*#** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, MD.

**COMPLIANT WALKER Patent Application**

JAMES J. KERLEY, inventor (to NASA), WAYNE EKLUND, inventor (to NASA), and J. ALLEN CRANE, inventor (to NASA) (NSI, Inc., Greenbelt, MD.) 3 Jul. 1991 21 p (NASA-CASE-GSC-13348-2; NAS-1.71:GSC-13348-2; US-PATENT-APPL-SN-725111) Avail: NTIS HC/MF A03 CSDL 06/12

A compliant walker is provided for humans having limited use of their legs and lower back. It includes an upright wheel frame which at least partially surrounds an upright user wearing a partial body harness. It is attached to the frame by means of cable compliant apparatus consisting of sets of cable segments and angle bracket members connected between opposite side members

of the frame and adjacent side portions of the harness. Novelty is believed to exist in the combination of a wheeled frame including a side support structure, a body harness, and compliance means connecting the body harness to the side support structure for flexibility holding and supporting a person in a substantially upright position when the user sags in the frame when taking weight off the lower extremities. NASA

**N91-29715#** Washington Univ., Seattle. Dept. of Applied Mathematics.

**PERTURBATION TECHNIQUES FOR MODELS OF BURSTING ELECTRICAL ACTIVITY IN PANCREATIC (BETA)-CELLS**

M. PERNAROWSKI, R. M. MUIRA (British Columbia Univ., Vancouver.), and J. KEVORKIAN 1991 46 p (Contract DE-FG06-86ER-25019)

(DE91-013901; DOE/ER-25019/21) Avail: NTIS HC/MF A03

Pancreatic beta-cells exhibit periodic bursting electrical activity consisting of active and silent phases. Experimentally, the ratio, ( $\rho$  sub f), of the active phase duration to the overall period is correlated to the insulin response of these cells to glucose concentration. Several different mathematical models of the beta-cell were developed to describe changes in the intracellular ionic concentrations and the ionic flow through the cellular membrane. The membrane potential in each of these models exhibits the same active and silent phase bursting patterns observed experimentally and, therefore, these models can be used to predict the value of the plateau fraction, ( $\rho$  sub f). The Sherman-Rinzel-Keizer (SRK) model of this phenomenon consists of three coupled first-order nonlinear differential equations which describe the dynamics of the membrane potential, the activation parameter for the voltage gated potassium channel, and the intracellular calcium concentration. These equations are transformed into a Lienard differential equation coupled to a single first-order differential equation for the slowly changing nondimensional calcium concentration. Leading order perturbation problems for the silent phase and the transition regions are reduced to quadrature. The solution of the leading order active phase problem is a limit cycle which depends on the value of the intracellular calcium concentration. Since the active phase equations exhibit weak damping, Melnikov's method can be applied to determine the bifurcation point of these equations. Thus, an explicit expression for the active phase duration is obtained. Together with the silent phase analysis, an approximation of the plateau fraction, ( $\rho$  sub f), is derived and its value compared to the plateau fraction numerically obtained from the SRK model. DOE

**N91-29716#** Army Research Inst. of Environmental Medicine, Natick, MA.

**PHYSIOLOGICAL RESPONSES TO INTERMITTENT EXERCISE AS MODIFIED BY HEAT STRESS AND PROTECTIVE CLOTHING**

KENNETH K. KRANING, II and RICHARD R. GONZALEZ May 1991 34 p (AD-A237447; USARIEM-12-91) Avail: NTIS HC/MF A03 CSDL 06/10

Time-weighted averaging is a method employed in heat stress analyses to consolidate the rate of heat production (M) from complex intermittent exercise patterns into a single continuous level of heat production. Physiological responses during intermittent and continuous exercise were studied in 4 subjects exposed to heat stress in which evaporation was either free or severely restricted. Intermittent work consisted of repeated 10 min exercise/rest patterns. Continuous work was at the time weighted average of intermittent exercise. When heat stress was uncompensable, intermittent work induced more physiological strain than continuous work: endurance time was 14 min less ( $p$  less than 0.05), core temperature at 60 min was 0.40 C higher ( $p$  less than 0.05), and the rate of core temperature rise was 33 percent greater. The difference in the rate of heat storage was not satisfactorily explained by a discrepancy in average M or in the calculated rate of surface heat loss. Alternatively, results may be explained by interruptions in the rate of heat transport via the

cutaneous circulation. These interruptions may be associated with postural and workload transitions. While the mechanisms are not totally understood, it is clear that application of the time-weighted averaging method should be applied with discretion. GRA

**N91-29717#** California Inst. of Tech., Pasadena.  
**STUDIES IN NEURAL NETWORKS Final Report**

1991 5 p  
(Contract N00014-87-K-0377)  
(AD-A237452) Avail: NTIS HC/MF A01 CSCL 06/4

Research performed under this grant centered on the computations done by biological networks of nerve cells, and on the theoretical and engineering of neurobiological computation. The biological studies were in greatest part theoretical analysis of the olfactory (smell) system. This is a very old and simple sensory system, and is highly conserved. Animals as different as snails and humans have strong anatomical similarities in their olfactory systems. In addition, the basic architecture of much of old cortex is claimed to be related to that of olfactory cortex, so understandings gained in the olfactory system are potentially applicable to other areas of brain. GRA

**N91-29718#** Pennsylvania Univ., Philadelphia. School of Medicine.

**HARDWARE IMPLEMENTATION OF NEURON NETS AND SYNAPSES WORKSHOP Final Report**

PAUL MUELLER 26 May 1991 3 p Workshop held in San Diego, CA, 13-15 Jan. 1988  
(Contract N00014-88-J-1050)  
(AD-A237704) Avail: NTIS HC/MF A01 CSCL 06/5

The workshop brought together 35 key investigators in this area and several representatives from funding agencies, with the aim to assess the current state of the field, to explore the potential for existing and new approaches and to identify those areas that provide currently the greatest opportunities and may need particular emphasis. It was evident from the high quality of the presentations that the field is making excellent and rapid progress. This is especially so for the special purpose systems that are modeled after biological sensory input systems such as retinas, cochleas, and networks for sound localization. The development of larger systems for more complex problems such as vision, speech recognition, tactile sensing, and robotics lies still in the more distant future. It was agreed that the field should make use of currently available technologies although research into new materials, devices, and interconnection methodology should be continued at an active level. GRA

**N91-29719#** Naval Aerospace Medical Research Lab., Pensacola, FL.

**MICRO SAINT MODELING OF PHYSIOLOGICAL AND HUMAN PERFORMANCE IN THE HEAT**

S. SHAMMA, R. STANNY, E. A. MOLINA, and W. A. MOREY  
Mar. 1991 28 p  
(Contract DA PROJ. 3M4-637648995)  
(AD-A238659; NAMRL-MONOGRAPH-42) Avail: NTIS HC/MF A03 CSCL 06/5

This report documents a Micro SAINT implementation of a heat-stress model developed by the U.S. Army Research Institute of Environmental Medicine. The model incorporates equations that relate deep-body temperature, heart rate, and sweat loss for clothed soldiers performing physical work in various environments. The Micro SAINT program might be used to help reduce casualties associated with extremes of environmental heat, to calculate appropriate work-rest cycles, and to estimate the drinking-water requirements associated with various levels of sweat loss. GRA

**N91-29720#** Smith-Kettlewell Inst. of Visual Sciences, San Francisco, CA.

**PSYCHOPHYSICAL STUDIES OF VISUAL CORTICAL**

**FUNCTION Final Technical Report, 1 Sep. 1988 - 31 Dec. 1990**  
KEN NAKAYAMA 28 Jun. 1991 4 p  
(Contract AF-AFOSR-0326-88; AF PROJ. 2313)

(AD-A238663; AFOSR-91-0639TR) Avail: NTIS HC/MF A01 CSCL 06/5

Our work explored a variety of research areas, all directed towards obtaining an understanding of visual cortical function using psychophysical techniques. In particular, we examined visual search, visual attention, the encoding of occluding surfaces, and color filling-in. With respect to visual search, we found a new unexpected relation between distractor number and reaction time, showing that for particular tasks, performance improved when distractor number increased. With respect to visual attention we obtained new information to support the specific hypothesis which proposed that express saccades were due to a rapid disengagement of attention from the fixation. With respect to occluded surfaces, we provided a new theoretical framework to understand the large number of new results collected, suggesting the generic view principle. Finally, with respect to color filling-in, we found evidence that such a hypothetical process can be interrupted after the presentation of a stimulus and we evaluated its spatio-temporal time course. GRA

**N91-29721#** Retina Foundation, Boston, MA. Eye Research Inst.

**EYE MOVEMENTS AND SPATIAL PATTERN VISION Annual Report, 1 May 1990 - 30 Apr. 1991**

LAWRENCE E. AREND 1 Jul. 1991 16 p  
(Contract AF-AFOSR-0377-89; AF PROJ. 2313)  
(AD-A238664; AFOSR-91-0651TR) Avail: NTIS HC/MF A03 CSCL 06/5

Models of human lightness and color perception must take account of color constancy, a tendency for apparent surface color to be relatively independent of the color and intensity of the illuminating light source. Our observers matched the lightnesses (apparent reflectances) and brightnesses (apparent luminances) of regions in simple and complex achromatic spatial patterns. The data showed that the observers' knowledge of the surface reflectances was unaffected by brightness changes due to varying illuminance. A third perceptual dimension, local brightness contrast, was different from both lightness and brightness. In further experiments, we found that moving a patch from a black background to a white background could produce an error of apparent surface color of about 1.5 Munsell Value steps. Similar experiments at mesopic mean luminances revealed that the brightness contrast produced by a fixed luminance contrast declines with mean luminance. GRA

**N91-29722#** Michigan Univ., Ann Arbor. Transportation Research Inst.

**METHODS FOR EVALUATING DISCOMFORT GLARE**

D. J. WEINTRAUB, A. W. GELLATLY, M. SIVAK, and M. FLANNAGAN Apr. 1991 24 p  
(PB91-185132; UMTRI-91-13) Avail: NTIS HC/MF A03 CSCL 05/8

The ratings obtained from the de Boer scale were compared to ratings from three alternative discomfort glare scales. Of additional interest was the relation between discomfort glare ratings and brightness ratings for the same stimuli. The scales evaluated were the de Boer scale, the DANDY scale (a newly developed categorical scale), an anchored magnitude estimation scale, a free magnitude estimation scale, and a brightness magnitude estimation scale. There are two main findings: (1) the discomfort ratings from the four tested discomfort glare scales were highly intercorrelated, and (2) brightness ratings from a magnitude estimation scale were highly correlated with ratings from an analogous discomfort glare scale. An implication of these findings is that brightness ratings provided essentially the same information as discomfort ratings using any of the four tested discomfort glare scales. Consequently, to the extent that brightness is a concept that is easier to communicate to subjects than is discomfort, researchers interested in discomfort glare might consider using brightness scales.

Author

**N91-30670#** Joint Publications Research Service, Arlington, VA.  
**JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES**

25 Oct. 1990 56 p Transl. into ENGLISH from various Russian articles

(JPRS-ULS-90-018) Avail: NTIS HC/MF A04

Translated articles are presented from Russian scientific publications in the general area of life sciences. Some more specific areas of discussion are as follow: aerospace medicine; agricultural science; biochemistry; biotechnology; genetics; immunology; industrial medicine; microbiology; nonionizing radiation effects; public health; and radiation biology. Some representative titles are as follow: Blood electrolyte balance in dogs repeatedly exposed to +G sub z acceleration; Variable productivity of winter wheat under dry conditions; Killer protein formed by *Hansenula anomala* (Hansen) H. Et P. Sydow; Construction of family of artificial human insulin genes; Cloning of chloroplast psbA and rbcL genes of *Gossypium Hirsutum* Cotton; Modeling of universal bone marrow by monoclonal antibodies; A method of classifying the toxicology parameters of toxic compounds; and Utilization of dimethylterephthalate by *Rhodococcus Erythropolis*.

**N91-30672#** Joint Publications Research Service, Arlington, VA.  
**REACTION OF SYMPATHOADRENAL SYSTEM OF COSMONAUTS AFTER LONG MISSIONS ON SALYUT-7 ORBITAL SPACECRAFT Abstract Only**

N. A. DAVYDOVA, R. KVETNYANSKI, and A. S. USHAKOV *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 1 25 Oct. 1990 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR)*, v. 23, no. 4, Jul.-Aug. 1989 p 14-20

Avail: NTIS HC/MF A04

Because the sympathoadrenal system is an important component of neurohumoral regulation, study of its hormonal and mediator component is especially important for long duration spaceflights, when the body is exposed to extreme conditions and the ability to adapt to such conditions determines, to a large extent, the success and completion of the mission. A broad spectrum of sympathoadrenal activity indicators are used to study catecholamine metabolism in cosmonauts after missions of 211 and 237 days, as well as during the missions. Analysis of the sympathoadrenal activity showed the hormonal component to have been stimulated, with the adrenaline/noradrenaline ratio twice as high as the preflight ratio. The transmitter component activity was inhibited, such that noradrenaline synthesis was low on the day of the landing, after which it gradually rose. Dopamine synthesis behaved in an opposite manner. Author

**N91-30675#** Joint Publications Research Service, Arlington, VA.  
**INFLUENCE OF LONG-TERM ANTIORTHOSTATIC HYPOKINESIA ON ACTIVITY OF ENZYMES INVOLVED IN ENERGY AND PLASTIC METABOLISM Abstract Only**

I. P. POPOVA, YE. G. VETROVA, and T. YE. DROZDOVA *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 2 25 Oct. 1990 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR)*, v. 23, no. 4, Jul.-Aug. 1989 p 51-55

Avail: NTIS HC/MF A04

Studies of human blood serum enzyme activity are of interest not only for diagnostic purposes, but also as a method of studying the specifics of human metabolism under extreme conditions. A dynamic study is presented of the serum activity of enzymes involved in energy and plastic metabolic processes in order to determine changes in the metabolism and to evaluate the corrective effects of a combination of preventive steps used in a 370 day antiorthostatic hypokinesia study. The preventive measures included drugs intended to normalize water-salt, mineral and lipid metabolism, calcium metabolism and the functioning of the pancreas, plus physical exercise in the horizontal position. A reduction in creatine phosphokinase level was observed during the course of the test, as well as decreases in isocitrate and glutamate dehydrogenase and increases in alanine and aspartate amino transferase, gamma glutamyl transferase and lactate

dehydrogenase, all of which returned to the normal levels during the recovery period following the hypokinesia. The preventive measures decreased the drop in creatine phosphokinase, gamma glutamyl transferase and aspartate aminotransferase. Author

**N91-30676#** Joint Publications Research Service, Arlington, VA.  
**OCULAR-VESTIBULAR-MOTOR INTERACTIONS IN EXPERIMENTAL LABYRINTH ASYMMETRY Abstract Only**

A. A. REPIN *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 2 25 Oct. 1990 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR)*, v. 23, no. 4, Jul.-Aug. 1989 p 59-64

Avail: NTIS HC/MF A04

The vestibular apparatus has a particular role in the coordination of movements of the eyes and head for gaze fixation. Stimulation of the labyrinth by electric current can imitate changes in the vestibular function observed immediately after labyrinthectomy and, in combination with immersion hypokinesia, can stimulate changes characteristic for the acute period of adaptation to weightlessness. The changes are compared in coordination of eye and head movements during trigger and predictive gaze fixation under conditions of experimental labyrinth asymmetry achieved by electrical stimulation. Alteration in the control of head and eye movement were followed by short term oscillopsia as a result of changes in the gain coefficient of the 'ocular vestibular motor' system. Unilateral stimulus of the labyrinths thus caused disorders in the coordination of head and eye movements with both trigger and predictive gaze fixation, reflecting processes of alteration of the excitability of the labyrinths. The altered status of the afferent element of the vestibular apparatus is manifested as disorders in coordination of the motor systems, deterioration, and instability of gaze fixation. Author

**N91-30677#** Joint Publications Research Service, Arlington, VA.  
**DIFFERENTIAL CRITERION FOR TOLERANCE OF A BLOW TO THE HEAD IN CERTIFICATION OF PROTECTIVE GEAR Abstract Only**

A. S. BARER, YU. G. KONAKHEVICH, L. N. SHOLPO, D. A. KURME, and L. YA. LEYTENE *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 2-3 25 Oct. 1990 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR)*, v. 23, no. 4, Jul.-Aug. 1989 p 76-79

Avail: NTIS HC/MF A04

A probability criterion was previously suggested for certification of pilots' headgear in which the severity of a blow to the head was evaluated in the context of flying conditions, with particular attention devoted to ensuring the pilot's ability to save himself in an emergency situation and survive for an extended period of time in an uninhabited area. A more flexible criterion was sought that takes into consideration the specific conditions of an emergency, such as the possibility of timely arrival of assistance. A differential criterion was developed in three stages: selection of clinical parameters for differential evaluation of the effects of a blow to the head; determination of the relationship of clinical signs of head trauma to impact parameters and location; and selection of critical parameters of impact trauma for differential evaluation of protective headgear and their certification. The results of the analysis were used to construct regression equations for the probability of various levels of trauma protection as functions of the maximum contact force. Author

**N91-30678#** Joint Publications Research Service, Arlington, VA.  
**PREDICTING THE EFFECT OF LINEAR AND ANGULAR IMPACT ACCELERATION ON HUMANS Abstract Only**

YU. V. MAZURIN and G. P. STUPAKOV *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 3 25 Oct. 1990 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR)*, v. 23, no. 4, Jul.-Aug. 1989 p 79-83

Avail: NTIS HC/MF A04

Modern methods of optimizing man-machine system interactions require planning of the actions of the operator not only under ordinary conditions of operation of aircraft, but also under extreme

conditions and emergency situations in which the operator may be exposed to high levels of linear and angular acceleration. A method is described for computer prediction of the probability of injury to individual subsystems of the body, as well as changes in activity, physiological responses, and subjective estimates of tolerance. The method is a combination of traditional methods of estimating the danger of injury in impact acceleration, and it is based on determination of statistical relationships between biomechanical and other effects described in a mathematical model of the human body. A flow chart of the algorithm used is presented. The method enables expansion of the list of predicted effects and evaluation of the tolerance of complex actions. It decreases the demands for the degree of identification of parameters of the mathematical model and increases the flexibility of simulations, allowing modern methods to be used for the accumulation and statistical processing of biomedical information. Author

**N91-30679#** Virginia Mason Research Center, Seattle, WA.  
**INFLUENCE OF ANTICHOLINESTERASE ON DISTRIBUTION OF VENTILATION AND GAS EXCHANGE** Final Report, Jan. - Nov. 1985

HAROLD I. MODELL Oct. 1990 15 p  
(Contract F33615-85-C-4512)  
(AD-A229341; USAFSAM-TR-90-30) Avail: NTIS HC/MF A03 CSCL 06/11

This project was designed to titrate the influence of pyridostigmine on pulmonary resistance and gas exchange. Experiments in pigs and dogs indicate that significant alterations in pulmonary function do not occur until acute dosages in the range of 3 to 6 mg/kg are reached. Furthermore, acute administration of large doses of pyridostigmine results in salivation and gastrointestinal stimulation well in advance of any impairment to respiratory function. GRA

**N91-30680#** Colorado Univ., Denver. Health Sciences Center.  
**SLEEP DISTURBANCES AT HIGH ALTITUDE. ROLE OF A PCO2 APNEIC THRESHOLD** Final Report, 14 Jun. 1985 - 15 Jun. 1987

JOHN T. REEVES and JOHN V. WEIL 9 Jun. 1990 13 p  
(Contract DAMD17-85-C-5205; DA PROJ. 3E6-2777-A-879)  
(AD-A229426) Avail: NTIS HC/MF A03 CSCL 06/5

This study addressed the issue as to how exposure and subsequent acclimatization to high altitude influences ventilatory control during wakefulness and sleep and considers the potential implications of such changes for adjustment to high altitude. Specifically, it has been known for some time that during several days exposure to high altitude there occurs a steady, progressive rise in ventilation, the origins of which have been the subject of extensive controversy. Under these same conditions, it is also known that sleep disturbance associated with periodic breathing is common. To further investigate these issues, we studied six healthy males at sea level on nights 1, 4, and 7, after arrival at high altitude (14,110 feet). During wakefulness, ventilation and the ventilatory responses to hypoxia and hypercapnia were measured, and during both non-rapid-eye-movement and rapid-eye-movement sleep, ventilation, ventilatory pattern and hypercapnic ventilatory response were measured. GRA

**N91-30681#** Florida Univ., Saint Augustine. Lab. for Experimental Marine Biology and Medicine.

**INHIBITION OF OLFACTORY RECEPTOR CELLS: AN AQUATIC MODEL** Annual Report, Mar. 1990 - Mar. 1991

BARRY W. ACHE Apr. 1991 44 p  
(Contract N00014-90-J-1566; NR PROJ. RR0-4108)  
(AD-A234437) Avail: NTIS HC/MF A03 CSCL 06/3

The receptor cell is the first level of olfactory integration in some, and possibly all, organisms. Experimental and modeling analyses of lobster olfaction assign the integrative properties of the receptor cell to the expression of multiple, opposing transduction pathways, as well as to the passive electrical properties of the cell. GRA

**N91-30682#** Scotgen Ltd., Aberdeen (Scotland).  
**RESHAPED HUMAN MONOCLONAL ANTIBODIES FOR THERAPY AND PASSIVE IMMUNIZATION** Midterm Report, 31 Jul. 1989 - 30 Jul. 1990

WILLIAM J. HARRIS 20 Aug. 1990 37 p  
(Contract DAMD17-89-C-9060; DA PROJ. 3M1-61102-BS-12)  
(AD-A234770) Avail: NTIS HC/MF A03 CSCL 06/5

The purpose of the project is to apply reshaping technology for the humanisation of monoclonal antibodies specific for junin and vaccinia viruses. The cloning of immunoglobulin variable region heavy (VH) and light (VK) chain genes was achieved through synthesis and amplification of complementary DNA (cDNA) copied from RNA extracted from mouse hybridoma cells. For anti-junin, comprehensive VH and VK sequences were obtained, the CDR (complementarity determining regions) sequences elucidated, and the CDR's transplanted onto human VH and VK genes. Human IgG1 and Kappa constant regions were then added to produce humanised anti-junin immunoglobulin genes which are currently being introduced into mammalian cells for humanized antibody production. For anti-vaccinia, comprehensive sequencing of VH and VK genes is in progress and partial VH sequence is reported. GRA

**N91-30683#** Joint Publications Research Service, Arlington, VA.  
**JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES**

19 Feb. 1991 65 p Transl. into ENGLISH from various Russian articles  
(JPRS-ULS-91-005) Avail: NTIS HC/MF A04

Several topics related to U.S.S.R. science and technology are covered. Topics include aerospace medicine, agricultural science, biochemistry, biophysics, biotechnology, epidemiology, genetics, human factors engineering, immunology, laser bioeffects, clinical medicine, public health, psychology, radiation biology, veterinary medicine, and virology.

**N91-30686#** Joint Publications Research Service, Arlington, VA.  
**REACTION OF SYMPATHOADRENAL SYSTEM OF COSMONAUTS AFTER LONG MISSIONS ON SALYUT-7 ORBITAL SPACECRAFT** Abstract Only

N. A. DAVYDOVA, R. KVETNYANSKI, and A. S. USHAKOV *In its JPRS Report: Science and Technology. USSR: Life Sciences* p 1 19 Feb. 1991 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR)*, v. 23, no. 4, Jul.-Aug. 1989 p 14-20  
Avail: NTIS HC/MF A04

Because the sympathoadrenal system is an important component of neurohumoral regulation, study of its hormonal and mediator components is particularly important for long-duration space flights, when the body is exposed to extreme conditions and the ability to adapt to such conditions determines, to a large extent, the success and completion of the mission. Here, a broad spectrum of sympathoadrenal activity indicators is utilized to study catecholamine metabolism in cosmonauts after missions of 211 and 237 days, as well as during the missions. Immediately after the shorter flight, adrenaline, 4-hydroxy 3-methoxymandelic acid, and homovanillic acid levels were higher than preflight levels; noradrenaline, dopamine, DOPA, methanephine, and nor-methanephine levels were lower than pre-flight levels. Excretion of catecholamines, DOPA, and metabolites gradually rose and, by post-flight days 3-6, were considerably higher than preflight levels. None of the indicators normalized until 45 days after the flight. Analysis of the sympathoadrenal activity showed the hormonal component to have been stimulated, with the adrenaline/noradrenaline ratio twice as high as the pre-flight ratio. The transmitter component activity was inhibited such that the nonadrenaline synthesis was low on the day of the landing, after which it gradually rose. Dopamine synthesis behaved in an opposite manner. Blood catecholamines increased slightly on days 217-219 of the 237-day flight, while their content in the urine remained constant and the excretion of metabolites decreased, all parameters increasing significantly following the flight. Author

**N91-30688#** Joint Publications Research Service, Arlington, VA.  
**PREDICTING THE EFFECT OF LINEAR AND ANGULAR IMPACT ACCELERATION ON HUMANS Abstract Only**  
 YU. V. MAZURIN and G. P. STUPAKOV *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 3 19 Feb. 1991 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 23, no. 4, Jul.-Aug. 1989 p 79-83  
 Avail: NTIS HC/MF A04

Modern methods of optimizing man-machine system interactions require planning of the actions of the operator, not only under ordinary conditions of operation of an aircraft, but also under extreme conditions and emergency situations in which the operator may be exposed to high levels of linear and angular acceleration. Described here is a method for computer prediction of the probability of injury to individual subsystems of the body, as well as changes in activity, physiological responses, and subjective estimates of tolerance. The method is a combination of traditional methods of estimating the danger of injury in impact acceleration, and it is based on the determination of statistical relationships between biomechanical and other effects described in a mathematical model of the human body. A flow chart of the algorithm employed is presented. The method enables the expansion of the list of predicted effects and evaluation of the tolerance of complex actions. It decreases the demands for the degree of identification of parameters of the mathematical model and increases the flexibility of simulations, allowing modern methods to be used for the accumulation and statistical processing of biomedical information and mathematical modeling to assure safety and continued efficiency of aircraft crews. Author

**N91-30690#** Medical Coll. of Georgia, Augusta. Shock Society.  
**A REVIEW: THE 13TH ANNUAL CONFERENCE ON SHOCK Final Report, 3 Mar. - 14 Sep. 1990**  
 SHERWOOD M. REICHARD 1 Jun. 1991 7 p Conference held in Durango, CO, 8-11 Jun. 1990 (Contract DAMD17-90-Z-0028) (AD-A237300) Avail: NTIS HC/MF A02 CSCL 06/5

The Shock Society presented the Thirteenth Annual Conference on Shock during June 8 to 11, 1990, in Durango, Colorado. The meeting was attended by about 400 clinical and basic scientists representing numerous biomedical disciplines and clinical specialty areas: a common denominator was a shared major interest in some aspects of shock and trauma research. The scientific program comprised over 200 presentations constituting three major symposia, three minisymposia, 4 young investigators competition, three workshops, and eleven thematic poster sessions. Emphasis was placed on currently emerging concepts concerning the pathogenesis and management circulatory shock, sepsis, trauma, ischemia, inflammation, and their multifaceted interactions. The majestic southern Rocky Mountains were nearby for viewing and excursion. These observations indicate that the scientific presentations, attendance, audience discussions-debates, and venue for the Thirteenth Annual Conference on Shock were of exceptional quality and successfully continued the long-standing tradition of scientific excellence promulgated by the Shock Society. GRA

**N91-30691#** National Oceanic and Atmospheric Administration, Boulder, CO. Wave Propagation Lab.  
**IRRADIANCE DISTRIBUTIONS ON THE HUMAN RETINA FROM A LASER OBSERVED THROUGH THE TURBULENT ATMOSPHERE**  
 J. H. CHURNISIDE and R. J. HILL Apr. 1991 80 p (PB91-196907; NOAA-TM-ERL-WPL-196) Avail: NTIS HC/MF A05 CSCL 06/18

The statistics of position and size of the focal spot on a simulated human retina for laser illumination through refractive turbulence in the atmosphere were measured. Both 3 and 7 mm apertures were used under a variety of propagation conditions. No significant mitigating effects of spot broadening or motion were observed. Author

**N91-30692\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.  
**DOPPLER INDICES OF GAS PHASE FORMATION IN HYPOBARIC ENVIRONMENTS: TIME-INTENSITY ANALYSIS**  
 MICHAEL R. POWELL Sep. 1991 61 p (NASA-TM-102176; S-626; NAS 1.15:102176) Avail: NTIS HC/MF A04 CSCL 06/16

A semi-quantitative method to analyze decompression data is described. It possesses the advantage that it allows a graded response to decompression rather than the dichotomous response generally employed. A generalized critical volume (C-V), or stoichiometric time-dependent equilibrium model is examined that relates the constant of the equation  $P_{sub i} \text{ equals } m P_{sub b} + b$  to variable tissue supersaturation and gas washout terms. The effects of the tissue ratio on gas phase formation indicate that a decreased ratio yields fewer individuals with Doppler detectable gas bubbles, but those individuals still present with Spencer Grade 3 or 4. This might indicate a local collapse of tissue saturation. The individuals with Grade 3 or 4 could be at risk for type 2 decompression sickness by transpulmonic arterialization. The primary regulator of the problems of decompression sickness is the reduction of local supersaturation, presumably governed by the presence and number of gas micronuclei. It is postulated that a reduction in these nuclei will favor a low incidence of decompression sickness in microgravity secondary to hypokinesia and adynamia. Author

**N91-30693** Institute for Perception RVO-TNO, Soesterberg (Netherlands). Audiology Group.  
**DAMAGE RISK FOR LOW-FREQUENCY IMPULSE NOISE; THE SPECTRAL FACTOR IN NOISE-INDUCED HEARING LOSS Final Report**

G. F. SMOORENBURG 14 Nov. 1990 29 p (Contract A86/M/161) (IZF-1990-A-37; TD-90-3413; ETN-91-99820) Copyright Avail: Institute for Perception RVO-TNO, P.O. Box 23, 3769 SG Soesterberg, Netherlands

The prediction of risk of hearing damage for impulse noise is commonly based on either the peak level of the impulses, their duration and the total number of impulses or on the total energy contained in the impulse noise exposure. These physical measures do not include frequency dependent weighting of the impulse energy whereas such weighting (A weighting) is applied when dealing with steady state noise. The results of animal experiments suggest that, at equal peak level, risk of hearing damage is not higher for large caliber weapons than for light caliber weapons, although impulse duration for large caliber weapons assumes about tenfold the light caliber value. The results suggest that low frequency energy in the impulse is less damaging to the ear than mid and high frequency energy. All human data on temporary threshold shifts after exposure to large caliber weapons are examined against the existing criteria based primarily on light caliber weapons, excluding and including frequency dependent A weighting. The results suggest the inclusion of a weighting into damage risk criteria for impulse noise. ESA

**N91-30694#** Royal Signals and Radar Establishment, Malvern (England).

**INFORMATION PROCESSING IN THE OUTER RETINA**

S. COLLINS 18 Apr. 1991 21 p (RSRE-MEMO-4469; BR302008; ETN-91-99848) Copyright Avail: NTIS HC/MF A03

Analog electronics appears to offer the most direct way to mimic the information processing which occurs in the dendrites of neurons. Unfortunately, analog electronics suffers from a restricted dynamic range, a problem which also occurs in neurons. This study was initiated to understand how biological neural systems overcome the problems inherent in employing components with an adequate dynamic range. The inadequacy of the dynamic range available in neurons is most apparent in retinas which deal with an input signal covering five decades using components with a dynamic range of less than two decades. The predictive encoding hypothesis which is proposed to explain the function of the outer



retina is adopted as a framework for understanding the neurological data discussed. Then, three different, independently evolved, retinas are considered to demonstrate the different implementations of the same underlying principle. It is shown that the problems posed by the limited dynamic range available in both neurons and analog electronics can be overcome if the system is correctly designed. ESA

**N91-30695#** Amsterdam Univ. (Netherlands). Dept. of Mathematics and Computer Science.

**PHYSIOLOGICAL MODELLING USING RL**

FRED DEGEUS, ERNEST ROTTERDAM (Groningen Rijksuniv., Netherlands), SIEGER VANDENNEHEUVEL, and PETER VANEMDEBOAS Dec. 1990 17 p (ITLI-CT-90-08; ISSN-0924-8374; ETN-91-99569) Avail: NTIS HC/MF A03

The use of constraints to build quantitative physiological models and the application of these models to assist anaesthetists in decision making are discussed. A simple physiological model of human blood circulation and gas is given. It is represented in RL (Relational Language) and used for interpretation and prediction purposes. Interaction with the anaesthetist is required about intermediate results and further assumptions to be made. As time in the operating theater is limited, an optimal interface is essential. Effective interaction must be possible however, because making assumptions is the way in which physicians cope with incompleteness of information. A constraint solver provides a tool to support this. ESA

## 53

**BEHAVIORAL SCIENCES**

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

**A91-48789\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**COMMUNICATION VARIATIONS AND AIRCREW PERFORMANCE**

BARBARA G. KANKI (NASA, Ames Research Center, Moffett Field, CA), VALERIE G. FOLK (Educational Testing Service, Princeton, NJ), and CHERYL M. IRWIN (Texas, University, Austin) (International Symposium on Aviation Psychology, 5th, Columbus, OH, Apr. 17-20, 1989) International Journal of Aviation Psychology (ISSN 1050-8414), vol. 1, no. 2, 1991, p. 149-162. refs Copyright

The relationship between communication variations and aircrew performance (high-error vs low-error performances) was investigated by analyzing the coded verbal transcripts derived from the videotape records of 18 two-person air transport crews who participated in a high-fidelity, full-mission flight simulation. The flight scenario included a task which involved abnormal operations and required the coordinated efforts of all crew members. It was found that the best-performing crews were characterized by nearly identical patterns of communication, whereas the midrange and poorer performing crews showed a great deal of heterogeneity in their speech patterns. Although some specific speech sequences can be interpreted as being more or less facilitative to the crew-coordination process, predictability appears to be the key ingredient for enhancing crew performance. Crews communicating in highly standard (hence predictable) ways were better able to coordinate their task, whereas crews characterized by multiple, nonstandard communication profiles were less effective in their performance. Author

**A91-48790**

**PREDICTING SUCCESS IN PRIMARY FLYING SCHOOL FROM THE CANADIAN AUTOMATED PILOT SELECTION SYSTEM - DERIVATION AND CROSS-VALIDATION**

BARRY SPINNER (Canadian Forces Personnel Applied Research Unit, Toronto; New Brunswick, University, Fredericton, Canada) International Journal of Aviation Psychology (ISSN 1050-8414), vol. 1, no. 2, 1991, p. 163-180. refs Copyright

This research derived and cross-validated an equation predicting outcome in Primary Flying School (PFS) from the Canadian Automated Pilot Selection System (CAPSS), a computer-driven, moving-base flight simulator recording up to 250,000 instrument readings per candidate. For the derivation study, 225 pilot candidates operated CAPSS before entering PFS. A pool of 20,700 summary measures (SMs) from 880 data sets was generated from the raw data. Through several cycles of analyses, these measures were reduced to a single prediction equation. The equation was cross-validated on a new sample of 172 pilot candidates. The CAPSS equation significantly predicted PFS outcome for the cross-validation sample,  $r = 0.47$ ,  $p$  below 0.0005. Classification analysis indicated that 79.4 percent of the candidates selected by CAPSS actually passed PFS, compared to 69.8 percent for the current selection system. Only 13.3 percent of those who could have passed were rejected, whereas the current system is estimated to reject 57.0 percent of qualified applicants. It is estimated that using CAPSS instead of the current selection system will double the number of PFS graduates from a group of applicants. Author

**A91-49857**

**MANAGING THE MODERN COCKPIT; PROCEEDINGS OF THE 3RD HUMAN ERROR AVOIDANCE TECHNIQUES CONFERENCE, DALLAS, TX, DEC. 4, 5, 1990**

Conference sponsored by SAE. Warrendale, PA, Society of Automotive Engineers, Inc. (SAE P-239), 1990, 72 p. For individual items see A91-49858 to A91-49864. (SAE P-239) Copyright

The present conference on human error-avoidance techniques in advanced cockpit management discusses pilot training course updating, regulatory body perspectives on the implementation of new technology, airframe manufacturer perspectives on novel cockpit-technology implementation, and airline preferences in advanced cockpit technologies. Also discussed are the role of the captain in future cockpits, factors affecting pilot decisionmaking in aborted takeoffs, an analysis of pilot-ground controller communications, and pilot performance research for the Traffic Alert and Collision Avoidance System. O.C.

**A91-49859**

**IMPLEMENTATION OF NEW TECHNOLOGY - A UNITED AIRLINE'S PERSPECTIVE**

BOB SMITH (United Airlines, Chicago, IL) IN: Managing the modern cockpit; Proceedings of the 3rd Human Error Avoidance Techniques Conference, Dallas, TX, Dec. 4, 5, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 15-18. (SAE PAPER 902342) Copyright

The FAA's Special Federal Aviation Regulation 58, promulgated on September 26, 1990, allows air carriers to develop unique pilot-qualification programs independently of prior regulations and artificial constraints, following a rigorous instructional system-design process. It is hoped that this emphasis by the new Advanced Qualification Programs (AQP) on airline creativity will lead to superior crew member training. AQP will be mission-oriented, proficiency-based, analytically developed, and empirically validated. AQP must include cockpit resource management training and evaluation, line operational simulations, and specialized training for instructors. O.C.

**A91-49860**

**FACTORS AFFECTING PILOT DECISION-MAKING IN REJECTED TAKEOFFS**

BARRY STRAUCH (National Transportation Safety Board, Washington, DC) IN: Managing the modern cockpit; Proceedings of the 3rd Human Error Avoidance Techniques Conference, Dallas, TX, Dec. 4, 5, 1990. Warrendale, PA, Society of Automotive

Engineers, Inc., 1990, p. 25-33. refs  
(SAE PAPER 902344) Copyright

The National Transportation Safety Board has issued a Special Investigation Report examining the training and procedures used by commercial aviation in the choosing and implementation of high speed rejected takeoffs (RTOs), which involve runway overruns and have a high potential for incident or accident. Attention is presently given to aspects of pilot decision making during RTO initiation and execution, as well as to the deficiencies identified in pilot training (including flight-simulator training) and RTO procedures. Recommendations are made which address those deficiencies. O.C.

**A91-49861\*** Stanford Univ., CA.

**ANALYSIS OF ROUTINE PILOT-CONTROLLER COMMUNICATION**

DANIEL G. MORROW (Decision Systems; Stanford University, CA), ALFRED LEE, and MICHELLE RODVOLD (Decision Systems, Stanford, CA) IN: Managing the modern cockpit; Proceedings of the 3rd Human Error Avoidance Techniques Conference, Dallas, TX, Dec. 4, 5, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 35-40. Research supported by NASA. refs

(SAE PAPER 902352) Copyright

Although pilot-controller communication is central to aviation safety, this area of aviation human factors has not been extensively researched. Most research has focused on what kinds of communication problems requires understanding how communication usually works in routine operations. A sample of communication usually works in routine operations. A sample of routine pilot-controller communication in the TRACON environment is described. After describing several dimensions of routine communication, three kinds of communication problems are treated: inaccuracies such as incorrect readbacks, procedural deviations such as missing callsigns and readbacks, and nonroutine transactions where pilot and controller must deal with misunderstandings or other communication problems. Preliminary results suggest these problems are not frequent events in daily operations. However, analysis of the problems that do occur suggest some factors that may cause them. Author

**A91-49862**

**PILOT-CONTROLLER COMMUNICATIONS - A CONTROLLER'S PERSPECTIVE**

LARRY L. BARBOUR (National Air Traffic Controllers Association, Washington, DC) IN: Managing the modern cockpit; Proceedings of the 3rd Human Error Avoidance Techniques Conference, Dallas, TX, Dec. 4, 5, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 41-44.

(SAE PAPER 902353) Copyright

A critical evaluation is made of the state of pilot-ATC communications with a view to remediation of several widespread shortcomings. Transceiver-related problems associated with mountainous regions appear to be the ones most easily remedied, by means of satellite communications. A more fundamental problem is the controller's inability to discern whether a pilot has missed a given transmission due to distraction or inattention, or through intermittent malfunction of the transmission system. Attention must be given to situations requiring very rapid communications between pilot and controller. O.C.

**A91-49864\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**PILOT PERFORMANCE RESEARCH FOR TCAS**

SHERYL L. CHAPPELL (NASA, Ames Research Center, Moffett Field, CA) IN: Managing the modern cockpit; Proceedings of the 3rd Human Error Avoidance Techniques Conference, Dallas, TX, Dec. 4, 5, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 51-68. refs

(SAE PAPER 902357) Copyright

Three separate studies have been conducted to ascertain pilot responsiveness to advisories generated by the Traffic Alert and Collision Avoidance System (TCAS II). In the first of these, pilot

responses to normal TCAS II resolution advisories were evaluated, while the second gave attention to amended advisories and the third to alternative display formats. Within this study's simulated conditions, pilots were able to respond to advisories quickly and accurately. The addition of a target vertical speed range on the resolution advisory display resulted in further improvements of pilot response and accuracy. O.C.

**A91-50632**

**RELATIONSHIPS BETWEEN SYMPTOMS, MOODS, PERFORMANCE, AND ACUTE MOUNTAIN SICKNESS AT 4,700 METERS**

BARBARA SHUKITT-HALE, LOUIS E. BANDERET, and HARRIS R. LIEBERMAN (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 865-869. refs

Copyright

The relationships between acute mountain sickness (AMS, estimated by the MC-C cerebral factor of the Environmental Symptoms Questionnaire, ESQ) and the moods, performance, and various adverse symptoms brought about by ascents above 4000 m were investigated in 20 male soldiers who were evaluated on 11 symptom-, 13 mood-, and 14 cognitive/motor performance measures after exposures to altitudes of 550 and 4700 m for 5-7 hrs. It was found that the AMS-C factor score correlations with the composite measures of symptoms, moods, and performance were 0.90, 0.77, and 0.59, respectively. I.S.

**A91-50639**

**CURRENT RESEARCH AND TRENDS IN AVIATION PSYCHOLOGY IN POLAND**

JAN F. TERELAK (Military Institute of Aviation Medicine, Warsaw, Poland) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 903-906. refs

Copyright

Basic trends of research carried out in Poland during the past decade within the Military Institute of Aviation Medicine were reviewed. Aviation psychological research has concentrated around four important problems: (1) personality determinants of the occupational functioning of pilots, including temperamental factors and the occupational adaptation of pilots; personality determinants (i.e., manifested attitudes toward vocation) of the occupational adjustment of pilots; personality correlates of the psychosomatic costs of pilots' vocational adjustments; (2) perceptual efficiency mechanisms of task performance in flight simulators (i.e., to study visual-motor mechanisms associated with compensatory perception in the process of training for aviation tasks requiring visual-motor coordination); (3) psychological criteria in predicting success in pilot training; and (4) computer assisted psychological research. Author

**A91-51023**

**DETERMINING FLIGHT TASK PROFICIENCY OF STUDENTS - A MATHEMATICAL DECISION AID**

WILLIAM C. MCDANIEL (U.S. Navy, Personnel Research and Development Center, San Diego, CA) and WILLIAM C. RANKIN (U.S. Navy, Naval Training Systems Center, Orlando, FL) Human Factors (ISSN 0018-7208), vol. 33, June 1991, p. 293-308. refs

Copyright

Accurate appraisal of student performance during and after training is important for the proper functioning of the training system and realization of training goals. Training systems - and particularly flight training programs - rely heavily on expert assessors' determination of student proficiency. Research is needed that will lead to improvements in the reliability and accuracy of these assessments. Recent research in decision-making suggests that errors are frequently introduced because of the limited capabilities of people to integrate information and reach accurate conclusions. Mathematical decision aids appear to be helpful in reducing these errors. A decision aid using Wald's binomial probability ratio test and the sequential examination of student task performances was adapted to a training application. The decision aid required



significantly less task trial information and predicted subsequent task performance more accurately than did expert assessors using the current assessment method. When students performed inconsistently and below the required flight task standards, instructors were more willing to declare proficiency than was the decision aid. This finding was especially apparent on the more difficult flight tasks. Author

A91-51218

#### AN ORAL TASK-ORIENTED DIALOGUE FOR AIR-TRAFFIC CONTROLLER TRAINING

K. MATROUF, J. L. GAUVAIN, F. NEEL, and J. MARIANI (CNRS, Laboratoire d'Informatique pour la Mécanique et les Sciences de l'Ingenieur, Orsay, France) IN: Applications of artificial intelligence VIII; Proceedings of the Meeting, Orlando, FL, Apr. 17-19, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 826-837. refs  
Copyright

An oral dialogue system designed for air-traffic controller training is presented. The system has to handle the dialogue with a student air-traffic controller and communicate the student's requests to the air-traffic simulator in the form of a sequence of instructions expressed in a formal command language. The system has been developed with two main objectives in mind: attempts were made to make it both user-friendly and robust. Different knowledge sources including the vocabulary, the phraseology, the task model, and the history of dialogue, are evolving during the dialogue. These knowledge bases are represented in a unified form of hierarchical frames. The message analysis and interpretation consist of two phases: categorization and instantiation. Correction procedures have also been developed to improve speech recognition performance. The speech recognition system which is being used is AMADEUS, which is a DTW-based continuous speech recognizer. The representation of the language model used to limit the DTW search space is described as well as the way it is modified by the dialogue manager to permit or prohibit messages and improve recognition. Author

A91-51550

#### PERCEPTION OF 3-D TRANSPARENT ILLUSORY SURFACE IN BINOCULAR FUSION

MASANORI IDESAWA (Institute of Physical and Chemical Research, Wako, Japan) Japanese Journal of Applied Physics, Part 2 (ISSN 0021-4922), vol. 30, July 15, 1991, p. L1289-L1292. refs

Copyright

The principles involved in the phenomenon of the illusion of 3D transparent surface perception in the binocular fusion are discussed. The transparency of surfaces was investigated. It was shown that, when adequate visual stimuli are suitably arranged along the surface boundary or beyond the occluding illusory surface, a transparent or translucent illusory surfaces can be seen and that human visual system can perceive a 3D structure in the opacity and/or transparency of a surface. I.S.

N91-29723# California Univ., Berkeley. Lawrence Berkeley Lab.

#### QUANTUM MEASUREMENT AND THE MIND-BRAIN CONNECTION

H. P. STAPP 17 Oct. 1990 28 p Presented at the Symposium on the Foundations of Modern Physics, Joensuu (Finland), 13-17 Aug. 1990

(Contract DE-AC03-76SF-00098)

(DE91-012343; LBL-29594; CONF-900862-2) Avail: NTIS HC/MF A03

It is argued that quantum measurements do pose a problem, within the context created by the fundamental aim of science, which is identified as the construction of a cohesive, comprehensive, and rationally coherent idea of the nature of the world in which we live. Models of nature are divided into two classes: (1) those in which there is a selection process that, for any possible measurement, would, if that measurement were to be performed, pick out one single outcome, and (2) all others. It

is proved that any model of class that reproduces the predictions of quantum theory must violate the condition that there be no faster-than-light influences of any kind. This result is used to motivate the study of models in which unitary evolution is maintained and there is no selection of unique outcomes. A consideration of ontic probabilities, historical records, and the form of the mind-brain connection leads to an elaboration of the Everett many-worlds interpretation that appears to provide the basis of satisfactory solution of the measurement problem. DOE

N91-29724# Naval Medical Research and Development Command, Bethesda, MD.

#### DEVELOPMENT AND EVALUATION OF A HUMAN PERFORMANCE ASSESSMENT BATTERY Final Report, 21

Apr. 1984 - 30 Sep. 1989

JOHN SCHROT 1 Sep. 1990 13 p

(Contract DA PROJ. 3M4-63807-D-993)

(AD-A237391) Avail: NTIS HC/MF A03 CSDL 06/5

The antihistamine-PAB validation study was completed during the reporting period. Preliminary analysis of the results indicates that Benadryl and Seldane produced different effects on different tests of the battery. Benadryl produced more profound effects than Seldane on both accuracy and speed of responding. This laboratory also participated in the testing and evaluation of version 2.1 of the UTC-PAB software systems. The information obtained, along with standards specifications for certain PAB component tasks was provided to the Director, JWGD3 MILPERF. GRA

N91-29725# Reading Univ. (England).

#### PREDICTING PERFORMANCE BREAKDOWN IN PILOTS THROUGH OBJECTIVE MEASURES OF STRESS SENSITIVITY Final Report, Oct. 1988 - Oct. 1990

FRANK P. MCKENNA and DINKBAR SHARMA Apr. 1991 56 p

(Contract DAJA45-88-C-0024; DA PROJ. 2Q1-61102-B-74-F)

(AD-A237540; ARI-RN-91-40) Avail: NTIS HC/MF A04 CSDL 05/8

It is well known that stress can have an adverse effect on performance and that individual differences in responses to stress are varied. The potential is explored of developing an objective measure of stress resistance and the possibility of developing a laboratory model of the effects of stress on performance. The paradigm developed reveals that (1) emotional stimuli disrupt performance, (2) the disruption is exacerbated by time pressure and task difficulty, (3) repetition of the emotional stimuli (habituation) eliminates the disruptive effect, (4) it is not the emotionality of the stimulus, but rather the threat component that is critical to the disruptive effect. These results parallel effects in everyday life and suggest that the paradigm shows great promise for developing a measure of stress resistance and a laboratory model of the effects of stress. GRA

N91-29726# Indiana Univ., Bloomington.

#### INSTITUTE FOR THE STUDY OF HUMAN CAPABILITIES: SUMMARY DESCRIPTIONS OF RESEARCH FOR THE PERIOD DECEMBER 1989 THROUGH SEPTEMBER 1990 Final Report, 1 Nov. 1986 - 30 Sep. 1990

CHARLES S. WATSON 30 May 1991 61 p

(Contract AF-AFOSR-0089-87; AF PROJ. 3484)

(AD-A237767; AFOSR-91-0564TR) Avail: NTIS HC/MF A04 CSDL 05/8

Two new psychophysical testing stations were used in cross-modality sensory and cognitive research and a third was constructed for auditory-visual projects. Initial experiments underway with these systems include a visual detection task with auditory cuing, a tactile-visual identification experiment, and a basic investigation of cross modality temporal acuity. A conference was planned on the subject of Human Error. GRA

N91-29727# - New York Univ., New York. Neuromagnetism Lab. COGNITION AND THE BRAIN Annual Technical Report, 15

Feb. 1990 - 14 Feb. 1991

LLOYD KAUFMAN and SAMUEL J. WILLIAMSON 10 May 1991

62 p  
 (Contract AF-AFOSR-0221-90; AF PROJ. 2313)  
 (AD-A237846; AFOSR-91-0571TR) Avail: NTIS HC/MF A04  
 CSCL 05/8

Using an array of 14 superconducting magnetic field sensors we succeeded in establishing the locations of neuronal activity that produce the dominant alpha rhythm recorded in the electroencephalogram and magnetoencephalogram. Of particular interest is our observation that spontaneous alpha activity is suppressed over the visual area when a person is engaged in mental imagery, and over other functional areas when appropriate cognitive tasks are performed. Computer simulations of the changes in patterns of alpha field power reveal how the power map is related to the underlying cortical topography when suppression occurs. In studies of sensory evoked cortical activity, an analysis of published current source density measurements on animals provides information from which we obtain the first realistic measure for the spatial extent of cortical activity in human cortex when responding to sensory stimuli. Measurements with a 5-sensor system for chrominance and luminance stimuli shows that the sites of response in visual cortex coincide. The separation of color information processing apparently takes place at a later stage, if at all. Responses in human auditory cortex to appropriate sound stimuli reveal activity not previously identified, which has characteristics that suggest it is related to sensory memory functions. GRA

**N91-29728#** Naval Aerospace Medical Research Lab., Pensacola, FL.

**ANALYSIS OF NAVAL AVIATION SELECTION TEST DATA WITH NONLINEAR MODELS. PART 1: PARAMETER ESTIMATION Interim Report, Dec. 1988 - Dec. 1989**

DAVID J. BLOWER Dec. 1990 34 p  
 (AD-A238244; NAMRL-TM-90-2) Avail: NTIS HC/MF A03  
 CSCL 12/1

An algorithm is described for estimating the parameters of a nonlinear model. This algorithm is called simulated annealing. The actual workings of this algorithm are examined in some detail. The reason for studying this algorithm is because statistical analysis of naval aviation selection test data has always relied on the use of linear regression models. Linear models represent only a small subset of possible mathematical models that could be used as an empirical tool to predict aviator performance. Specifically, the whole class of nonlinear models was not addressed. Recent research into neural networks and parallel distributed processing has uncovered some interesting nonlinear models. The test scores of student naval aviators will be reanalyzed with a nonlinear model borrowed from the neural network literature. It is hoped that this new class of nonlinear models will be a more powerful tool in predicting aviator performance and will result in an improved naval aviator selection test battery. GRA

**N91-29729#** Naval Aerospace Medical Research Lab., Pensacola, FL.

**PERFORMANCE OF MARINE AV-8B (HARRIER) PILOTS ON A COGNITIVE/PSYCHOMOTOR TEST BATTERY: COMPARISON AND PREDICTION Interim Report, Jan. - Jul. 1990**

R. N. SHULL Dec. 1990 15 p  
 (AD-A238563; NAMRL-1362) Avail: NTIS HC/MF A03 CSCL  
 05/9

Several studies have suggested the possibility of predicting pilot flight performance in various aviation environments. The current report concerns the use of an automated performance-based test battery, measuring various aspects of cognitive and psychomotor function, to eventually predict the flight performance of Marine jet pilots during various stages of flight training while comparing their test results to those of other aviation communities. A group of Marine jet pilots assigned to operate the AV-8B vertical takeoff/landing attack jet were tested. No significant differences in test performance were found among the various subgroups of student and experienced AV-8B pilots tested. The subject group, as a whole, performed most like pilots of other

types of jet aircraft on some tests and more like helicopter pilots on other tests. GRA

**N91-29730#** Naval Aerospace Medical Research Lab., Pensacola, FL.

**PERFORMANCE OF SEVERAL DIFFERENT NAVAL AVIATOR COMMUNITIES ON A COGNITIVE/PSYCHOMOTOR TEST BATTERY: PIPELINE COMPARISON AND PREDICTION Interim Report, Dec. 1988 - Dec. 1989**

R. N. SHULL and G. R. GRIFFIN Dec. 1990 18 p  
 (AD-A238564; NAMRL-1361) Avail: NTIS HC/MF A03 CSCL  
 05/8

Research is currently being conducted to develop reliable predictor tests which might aid in the making of decisions concerning aircrew assignment. The current approach involves comparing the performance of several different aviator communities on a test battery measuring various aspects of cognitive and psychomotor functioning. Four groups of pilots (two experienced jet groups, one experienced helicopter (helo) group, and one untrained student group) were tested on this battery. Overall, the jet groups performed in general. Within this student group, pilot trainees who were assigned to the jet pipeline did significantly better on several of these tests than those trainees who were assigned to either helicopter or land-based fixed-wing pipelines. Many of the test performance differences seen between these jet and helo student pipeline groups were also seen between the experienced jet and helo pilots tested. GRA

**N91-29731#** Reading Univ. (England).

**PREDICTING PERFORMANCE BREAKDOWN IN PILOTS THROUGH OBJECTIVE MEASURES OF STRESS SENSITIVITY Annual Report, Oct. 1988 - Oct. 1989**

Apr. 1991 39 p  
 (Contract DAJA45-88-C-0024)  
 (AD-A238597; ARI-RN-91-39) Avail: NTIS HC/MF A03 CSCL  
 05/8

While the adverse effects of stress are widely recognized, researchers have difficulty in developing appropriate measures. Previous research has rested heavily on subjective measures. The present approach is based on development of a simple objective performance-based measure. By showing that emotional stimuli disrupt performance, the basis of a test of stress resistance is formed. Major progress has been made by putting the test on a computer, where a more detailed investigation reveals that: (1) the performance decrement due to emotional stimuli occurs early in the test; and (2) the time pressure results in large fatigue effects. Both these findings have implications for future developments of the test. GRA

**N91-29732#** Carnegie-Mellon Univ., Pittsburgh, PA.

**THE FUNCTIONAL ARCHITECTURE OF VISUAL OBJECT RECOGNITION Final Report, 1 May 1989 - 31 Dec. 1990**

MARTHA J. FARAH Jul. 1991 10 p  
 (Contract N00014-89-J-3016; NR PROJ. RR0-4206)  
 (AD-A238617) Avail: NTIS HC/MF A02 CSCL 05/8

The goal of this grant was to constrain our theories of visual object recognition, including face and printed word recognition, using evidence from brain-damaged and normal subjects. By observing the patterns of association and dissociation among abilities after brain damage, one can infer the architecture of those abilities in the normal brain. In the case of object recognition, the different forms of agnosia can provide clues to the representations underlying normal object recognition. GRA

**N91-30696#** Massachusetts Inst. of Tech., Cambridge. Dept. of Brain and Cognitive Sciences.

**REPRESENTATIONS IN MENTAL MODELS Final Technical Report**

WHITMAN RICHARDS Sep. 1990 34 p  
 (Contract AF-AFOSR-0177-90)  
 (AD-A229401; AFOSR-90-1127TR) Avail: NTIS HC/MF A03  
 CSCL 05/8

On March 12 to 13 an interdisciplinary group of thirty-five,

composed of computer scientists, experimental psychologists, linguists, philosophers and connectionists met to share views on representations and their role in mental models. Although at least two books and several papers directly address these issues, the nature of mental models is far from clear. The meeting shed some light on why understanding mental models is difficult. Simply put, the reason is that mental processes are described in many different ways and at quite different levels of abstraction, depending upon the researcher. For example, some emphasize the cognitive properties of mental models, whereas others are more concerned with the internal data structures. Still others may stress the logical form and content of the mental process, as contrasted with the actual computational machinery. The diversity of these viewpoints is clear upon reading the abstracts prepared by the participants. Further study is needed to examine how these diverse viewpoints fit together into a useful, integrated framework. GRA

**N91-30697\*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**THREE-DIMENSIONAL VIRTUAL ACOUSTIC DISPLAYS**

ELIZABETH M. WENZEL Jul. 1991 36 p  
(NASA-TM-103835; A-91061; NAS 1.15:103835) Avail: NTIS HC/MF A03 CSCL 05/3

The development of an alternative medium for displaying information in complex human-machine interfaces is described. The 3-D virtual acoustic display is a means for accurately transferring information to a human operator using the auditory modality; it combines directional and semantic characteristics to form naturalistic representations of dynamic objects and events in remotely sensed or simulated environments. Although the technology can stand alone, it is envisioned as a component of a larger multisensory environment and will no doubt find its greatest utility in that context. The general philosophy in the design of the display has been that the development of advanced computer interfaces should be driven first by an understanding of human perceptual requirements, and later by technological capabilities or constraints. In expanding on this view, current and potential uses are addressed of virtual acoustic displays, such displays are characterized, and recent approaches to their implementation and application are reviewed, the research project at NASA-Ames is described in detail, and finally some critical research issues for the future are outlined. Author

**N91-30698** Institute for Perception RVO-TNO, Soesterberg (Netherlands). Audiologie/Visuologie Group.

**SPATIOTEMPORAL EDGE PERCEPTION Final Report**

J. T. MARCUS and A. TOET 25 Oct. 1990 40 p  
(IZF-1990-B-15; TD-90-3405; ETN-91-99824) Copyright Avail: Institute for Perception RVO-TNO, P.O. Box 23, 3769 ZG Soesterberg, Netherlands

The edges of straight bars in a square wave luminance grating appear to undulate to an observer when the retinal image of this pattern is in motion. The amplitude of the perceived undulations increases linearly with retinal image speed with an average slope of 30 plus or minus 4 ms. The period of the motion induced bulges is 2.5 plus or minus 0.5 degrees and shows no consistent variation with the retinal image velocity of the pattern. There is a close quantitative agreement between the spatiotemporal extent of this effect and recent estimates of the spatiotemporal parameters of human motion-sensitive mechanisms. As a tentative explanation for these observations, it is hypothesized that a moving luminance edge is encoded on a sparse neural sampling grid of motion sensitive cells in the central nervous system. These cells have a fixed time constant but change their shape and size with retinal image velocity. ESA

**N91-30699** Institute for Perception RVO-TNO, Soesterberg (Netherlands). Cognitive Psychology Group.

**HUMAN COGNITIVE PROCESSES IN COMMAND AND CONTROL PLANNING. 1: IDENTIFICATION OF RESEARCH ISSUES Final Report**

C. A. MCCANN (Defence and Civil Inst. of Environmental Medicine, North York, Ontario) 28 Dec. 1990 48 p

(IZF-1990-B-18; TD-90-3423; ETN-91-99826) Copyright Avail: Institute for Perception RVO-TNO, P.O. Box 23, 3769 ZG Soesterberg, Netherlands

The activity of planning is an important component of command and control but the cognitive processes associated with human planning are not yet understood. Research that has been done on planning to determine the concepts and theory concerning human cognitive processes in planning that might be extended into the context of the command and control domain is reviewed. A particular focus is the role of computer assistance in planning. Several major factors that influence planning and that would need to be controlled in experiments studying command and control planning are identified. Important issues that should be addressed in research on command and control planning are identified. ESA

**N91-30700#** Technische Univ., Eindhoven (Netherlands). Faculty of Electrical Engineering.

**PRELIMINARY INVESTIGATIONS OF TACTILE PERCEPTION OF GRAPHICAL PATTERNS**

X. WANG (Institute for Perception RVO-TNO, Soesterberg, Netherlands) Apr. 1990 28 p  
(EUT-90-E-239; ISBN-90-6144-239-7; ISSN-0167-9708; ETN-91-99619) Avail: NTIS HC/MF A03

Investigations on tactile perception of graphical patterns are presented. The tactile patterns used in the two experiments were generated on an Optacon vibrating array, with a modified system. The setup built for these experiments is described. The design of the experimental paradigms with the aim of solving a problem in the related literature is discussed. Preliminary results from the experiments show an agreement with the literature, even though the data were obtained from a different paradigm. ESA

**N91-30701#** Technische Univ., Eindhoven (Netherlands). Faculty of Electrical Engineering.

**A MEMBRANE MODEL FOR SPATIOTEMPORAL COUPLING**

A. C. DENBRINKER Jun. 1990 27 p  
(EUT-90-E-241; ISBN-90-6144-241-9; ISSN-0167-9708; ETN-91-99621) Avail: NTIS HC/MF A03

A model for spatiotemporal coupling within the transient visual system is proposed. The main features of the model are linearity, rotation symmetry, and parsimonious use of parameters. The spatial transfer function of the model has a low pass character with a cut off frequency that depends on the temporal frequency. For the transient system the model can be completely parametrized using subthreshold measurements of impulse responses. The model is in agreement with physiological data on lateral information spread within the retina. The model was tested for predictions on flashed and sinusoidal stimuli and agrees in all major aspects with the experimental data. ESA

## MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

**A91-48530\*** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**THERMAL DESIGN, ANALYSIS, AND TESTING OF THE CETA SPACE SHUTTLE FLIGHT EXPERIMENT**

AMY K. WITSIL and RICHARD A. FOSS (NASA, Langley Research Center, Hampton, VA) SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Oct. 1-4, 1990. 10 p. refs (SAE PAPER 901790) Copyright

Attention is given to the Crew and Equipment Translation Aid (CETA) Space Shuttle flight experiment designed to demonstrate techniques and equipment for propelling and restraining crew during

EVA. Emphasis is placed on the thermal analysis of the CETA hardware, including thermal design trade-offs, modeling assumptions, temperature predictions, and testing activities.

O.G.

**A91-48658**

**ROTORCRAFT HUMAN FACTORS - MAN...MACHINE...ENVIRONMENT**

ROBERT R. WILKINS (Boeing Defense and Aerospace Group, Helicopter Div., Philadelphia, PA) SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Oct. 1-4, 1990. 28 p. refs

(SAE PAPER 902001) Copyright

The emergence of such radically novel VTOL technologies as the tilt-rotor configuration, fly-by-wire, multifunction cockpit displays, night vision systems, and cockpit resource management techniques, have increased the human factors design-related task facing rotorcraft engineers. Attention is given to the illustrative case of the V-22 tiltrotor aircraft's Vertical and Horizontal Situation Displays. Recommendations are made with respect to crew training, tiltrotor task training, and operational safety.

O.C.

**A91-48787**

**SCENE CONTENT AND RUNWAY BREADTH EFFECTS ON SIMULATED LANDING APPROACHES**

GAVAN LINTERN and MICHAEL B. WALKER (Illinois, University, Urbana) International Journal of Aviation Psychology (ISSN 1050-8414), vol. 1, no. 2, 1991, p. 117-132. refs

(Contract MDA903-86-C-0169)

Copyright

Eight experienced pilots flew landing approaches in a light-aircraft simulator with a computer-generated landing display. Scene content and runway breadth were manipulated. Approaches were lower with reduced scene content and to the narrow runways, and trial-to-trial variability was higher with reduced scene content. There was no significant interaction between scene content and runway breadth. The data were used to evaluate two projective geometry models for prediction of glideslope control during an aircraft approach to landing. These models did not permit an entirely satisfactory account of the data. It is concluded that the landing approach is guided by visual properties other than those entered into these models.

Author

**A91-48938**

**THE FLOATING WORLD AT ZERO G**

DOUG STEWART Air and Space (ISSN 0886-2257), vol. 6, Aug.-Sept. 1991, p. 38-44.

Copyright

The relevance of astronauts' experience of prolonged weightlessness while living aboard Skylab to the prospective NASA Space Station is discussed. Stays of as many as 84 days allowed the final Skylab crew to explore the long-term effects of zero-G on working and social habits, and sharpened skills for daily life in such an environment. These lessons are also pertinent to Mars missions currently in the planning stage.

O.C.

**A91-49329**

**A QUASI-POWER THEOREM FOR BULK CONDUCTORS - COMMENTS ON RHOENCEPHALOGRAPHY**

CHARLES P. HATSELL (USAF, Human Systems Div., Brooks AFB, TX) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. 38, July 1991, p. 665-669. refs

A special case of Tellegen's theorem, the quasi-power theorem, is developed for bulk conductors, and a bulk conductor analog of Cohn's theorem is developed that can be used to predict the sensitivity of impedance plethysmographic measurements to tissue impedance changes in a system of bulk conductors. An example addressing the effects of scalp and cranium on the inference of regional blood flow in brain tissue raises questions about the origins of the REG (rheoencephalogram). While this work suggests further investigation into the origins of the REG is warranted, its clinical usefulness, based on validated correlations with cerebral blood flow, remains undisputed.

I.E.

**A91-49597\*#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**ACTIVE VIBRATION DAMPING OF THE SPACE SHUTTLE REMOTE MANIPULATOR SYSTEM**

MICHAEL A. SCOTT, MICHAEL G. GILBERT (NASA, Langley Research Center, Hampton, VA), and MARTHA E. DEMEO (Charles Stark Draper Laboratory, Inc., Cambridge, MA) IN: AIAA Guidance, Navigation and Control Conference, New Orleans, LA, Aug. 12-14, 1991, Technical Papers. Vol. 1. Washington, DC, American Institute of Aeronautics and Astronautics, 1991, p. 194-204. refs

(AIAA PAPER 91-2621) Copyright

The feasibility of providing active damping augmentation of the Space Shuttle Remote Manipulator System (RMS) following normal payload-handling operations is investigated. The approach used in the analysis is described and the results from both linear and nonlinear performance analyses of candidate laws are presented, demonstrating that significant improvement in the RMS dynamic response can be achieved through active control using measured RMS tip acceleration data for feedback.

I.S.

**A91-49767#**

**AN EXPERIMENTAL SYSTEM FOR FREE-FLYING SPACE ROBOTS AND ITS SYSTEM IDENTIFICATION**

YOSHISADA MUROTSU, SHOZO TSUJIO, AKIRA MITSUYA, and KEI SENDA (Osaka Prefecture, University, Sakai, Japan) IN: AIAA Guidance, Navigation and Control Conference, New Orleans, LA, Aug. 12-14, 1991, Technical Papers. Vol. 3. Washington, DC, American Institute of Aeronautics and Astronautics, 1991, p. 1899-1909. Research supported by MOESC. refs

(AIAA PAPER 91-2825) Copyright

An experimental system simulating free-flying space robots is used to verify the feasibility of modeling, identification methods, and control schemes. The system is described, and the scope and goals of an experimental study are presented. Two methods of system identification are discussed: in the first one, the experimental manipulator is identified by using an identification method for conventional manipulators when the satellite is fixed to an inertial foundation, the other estimates the dynamic parameters of free-flying manipulators moving on a two-dimensional plane from the kinematics of the manipulators. The feasibility of the second method is verified on a two-body system on a two-dimensional plane.

V.T.

**A91-49770\*#** Draper (Charles Stark) Lab., Inc., Cambridge, MA.

**MULTIVARIABLE CONTROL OF THE SPACE SHUTTLE REMOTE MANIPULATOR SYSTEM**

NEIL J. ADAMS, BRENT D. APPLEBY (Charles Stark Draper Laboratory, Inc., Cambridge, MA), and OM PRAKASH, II IN: AIAA Guidance, Navigation and Control Conference, New Orleans, LA, Aug. 12-14, 1991, Technical Papers. Vol. 3. Washington, DC, American Institute of Aeronautics and Astronautics, 1991, p. 1923-1931. refs

(Contract NAS9-18147)

(AIAA PAPER 91-2828) Copyright

Linear controllers are designed to regulate the end effector of the Space Shuttle Remote Manipulator System (SRMS) operating in position hold mode. Design techniques used include H2 and H-infinity optimization. The nonlinear SRMS is linearized by modeling the effects of the significant nonlinearities as uncertain parameters. Each regulator design is evaluated for robust stability using both the small gain theorem with an H-infinity norm and the less conservative mu-analysis test. Regulator designs offer significant improvement over the current system for the nominal plant. Unfortunately, the SRMS model suffers from lightly damped poles with real parametric uncertainty. Under such conditions, the mu-analysis test, which allows for complex perturbations, cannot guarantee robust stability.

Author

**A91-49792#**

**INTERVENTION OF HUMAN OPERATORS IN AUTOMATED SPACECRAFT RENDEZVOUS AND DOCKING GNC**

A. TOBIAS, W. FEHSE (ESTEC, Noordwijk, Netherlands), D. WILDE (MBB-ERNO, Bremen, Federal Republic of Germany), J. M. PAIROT

## 54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

(Matra Espace, Toulouse, France), and F. PAOLI (Aerospatiale, Cannes, France) AIAA, Guidance, Navigation and Control Conference, New Orleans, LA, Aug. 12-14, 1991. 8 p. refs (Contract ESA-8369/89)  
(AIAA PAPER 91-2791) Copyright

The Hermes Space Vehicle and the Columbus Free Flyer (CFF) will be the key elements in the immediate European scenario in low earth orbit. Hermes is a ground-based manned Space Shuttle that carries crew and goods to the CFF and has also the capability to visit other Space Stations as Freedom and Mir. The CFF is a space-based unmanned laboratory serviced by Hermes and for which also the visit to the Station Freedom for servicing has been considered. Rendezvous and Docking is a key operational technique in this scenario. Human operators can be involved on board the chaser, the target or both spacecraft and on ground. Though both Hermes and CFF have a high degree of automation, the intervention of the operator could enhance safety and the probability of mission success. This paper presents candidate concepts for the role of the operators in Mission and Vehicle Management and in Guidance Navigation and Control tasks including an innovative concept in which the operator replaces or corrects the Rendezvous sensor measurements for estimation update. Author

**A91-50473**

### **EVALUATION OF EYE TRACKING MEASUREMENT SYSTEMS FOR USE WITH THE FIBER OPTIC HELMET MOUNTED DISPLAY**

PAUL A. WETZEL (Dayton, University, Williams AFB, AZ), MELVIN L. THOMAS (USAF, Human Resources Laboratory, Williams AFB, AZ), and TERRENCE T. WILLIAMS (CAE Electronics, Montreal, Canada) IN: Cockpit displays and visual simulation; Proceedings of the Meeting, Orlando, FL, Apr. 17, 18, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 163-174. refs  
(Contract F33615-81-C-0012)  
Copyright

The Fiber Optic Helmet Mounted Display (FOHMD) projects high and low resolution computer generated imagery via fiber optic bundles through collimated helmet mounted optics to each eye. Combined head and eye position information is then used to position a high resolution area of interest within the head tracked low resolution background. Methods for evaluation of the eye tracker are described and experimental results presented that reveal its present performance characteristics. Author

**A91-50527**

### **ADVANCED ENVIRONMENTAL/THERMAL CONTROL AND LIFE SUPPORT SYSTEMS; INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, 20TH, WILLIAMSBURG, VA, JULY 9-12, 1990, TECHNICAL PAPERS**

Conference sponsored by SAE. Warrendale, PA, Society of Automotive Engineers, Inc. (SAE SP-831), 1990, 260 p. For individual items see A91-50528 to A91-50542.  
(SAE SP-831) Copyright

The present conference on advanced environmental/thermal control and life-support systems encompasses ongoing research and development activities pertinent to life-support requirements and technologies for future planetary exploration missions, with special attention given to energy efficient systems with recycling capabilities for air, water, and waste. Specific issues addressed include low-temperature thermal control for a lunar base, long-term life support for space exploration, a test facility for crop research in space, the conversion of lignocellulosics to fermentable sugars, and CO-removal and waste-collection systems for the Extended Duration Orbiter. Also addressed are a phase-change water-recovery system, an air revitalization system, the electrooxidation of organics in waste water, salt nucleation and growth during waste-water oxidation, closed-loop water recycling, and a conceptual design for a lunar-base CELSS. C.C.S.

**A91-50528\*** National Aeronautics and Space Administration, Washington, DC.

### **LONG TERM LIFE SUPPORT FOR SPACE EXPLORATION**

JOHN D. RUMMEL (NASA, Life Sciences Div., Washington, DC) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 67-73. refs  
(SAE PAPER 901277) Copyright

A general strategy for the development of life-support systems is discussed in terms of present and future requirements for NASA exploration missions. A general life-support strategy is delineated for both intravehicular activity (IVA) and extravehicular activity (EVA) for lunar and Mars transfer vehicles, Mars habitats, and pressurized rovers. The baseline capability presented corresponds to the systems needs for the Space Station Freedom permanently manned capability and the Shuttle Extended Duration Orbiter. Design guidelines and system design goals are given for IVA life support with an emphasis on closed-loop systems, and the design prerogatives for EVA include a minimum time to transition between IVA and EVA, and minimum restriction for human activity. C.C.S.

**A91-50529\*** Bionetics Corp., Moffett Field, CA.

### **THE CELSS TEST FACILITY - A FOUNDATION FOR CROP RESEARCH IN SPACE**

C. L. STRAIGHT (Bionetics Corp., Moffett Field, CA) and R. D. MACELROY (NASA, Ames Research Center, Moffett Field, CA) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 75-80. refs  
(SAE PAPER 901279) Copyright

Under the NASA Space Biology Initiative, a CELSS Test Facility (CTF) is being planned for installation on Space Station Freedom. The CTF will be used to study the productivity of typical CELSS higher plant crops under the microgravity conditions of the Space Station Freedom (SSF). Such science studies will be supported under the CELSS Space Research Project. The CTF will be used to evaluate fundamental issues of crop productivity, such as the production rates of O<sub>2</sub>, food and transpired water, and CO<sub>2</sub> uptake. A series of precursor tests that are essential to the development of the CTF will be flown on Space Shuttle flights. The tests will be used to validate and qualify technology concepts and to answer specific questions regarding seed germination, root/shoot orientation, water condensation and recycling, nutrient delivery, and liquid/gas phase interactions. Author

**A91-50530\*** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA.

### **SALAD MACHINE - A VEGETABLE PRODUCTION UNIT FOR LONG DURATION SPACE MISSIONS**

M. KLISS and R. D. MACELROY (NASA, Ames Research Center, Moffett Field, CA) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 81-88. refs  
(SAE PAPER 901280) Copyright

A review of NASA CELSS development specific to vegetable cultivation during space missions is presented in terms of enhancing the quality of life for space crews. A cultivation unit is being developed to permit the production of 600 grams of edible salad vegetables per week, thereby allowing one salad per crew member three times weekly. Plant-growth requirements are set forth for the specific vegetables, and environmental subsystems are listed. Several preprototype systems are discussed, and one particular integrated-systems design concept is presented in detail with views of the proposed rack configuration. The Salad Machine is developed exclusively from CELSS-derived technology, and the major challenge is the mitigation of the effects of plant-growth requirements on other space-mission facility operations. C.C.S.

**A91-50531\*** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**THE CONVERSION OF LIGNOCELLULOSICS TO FERMENTABLE SUGARS - A SURVEY OF CURRENT RESEARCH AND APPLICATIONS TO CELSS**

GENE R. PETERSEN and LARRY BARESI (JPL, Pasadena, CA) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 89-100. refs (SAE PAPER 901282) Copyright

This report provides an overview options for converting lignocellulosics into fermentable sugars in CELSS. A requirement for pretreatment is shown. Physical-chemical and enzymatic hydrolysis processes for producing fermentable sugars are discussed. At present physical-chemical methods are the simplest and best characterized options, but enzymatic processes will be the likely method of choice in the future. The use of pentose sugars by microorganisms to produce edibles is possible. The use of mycelial food production on pretreated but not hydrolyzed lignocellulosics is also possible. Simple trade-off analyses to regenerate waste lignocellulosics for two pathways are made, one of which is compared to complete oxidation. Author

**A91-50532\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**EXPANDED CAPABILITIES OF THE EXTENDED DURATION ORBITER**

PETER J. CERNA (NASA, Johnson Space Center, Houston, TX) and DAVID E. WILLIAMS (McDonnell Douglas Space Systems Co., Houston, TX) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 101-107.

(SAE PAPER 901290) Copyright

The Extended Duration Orbiter (EDO) is presented emphasizing the ability of the program to enhance the stay times of Spacelab, Spacehab, and Commercially Developed Space Facility missions. An overview of EDO is given with particular attention given to the modifications required for the implementation of Environmental Control and Life Support Systems specific to the Space Shuttle. The configuration, operation, and location of proposed regenerative CO<sub>2</sub> removal, N<sub>2</sub> supply, improved waste-collection, and power-reactant storage and distribution systems are described in detail. The EDO also includes a trash compactor, additional cryogenic hydrogen and oxygen, extra gaseous nitrogen, and a method for reducing stowed lithium hydroxide. The first utilization of the EDO system is a 13-day mission on the space shuttle Columbia planned for March 1992. C.C.S.

**A91-50533\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**THE EXTENDED DURATION ORBITER WASTE COLLECTION SYSTEM**

HUBERT J. BRASSEAU, JR., H. E. WINKLER (NASA, Johnson Space Center, Houston, TX), JEFFREY D. NORTH (Rockwell International Corp., Space Div., Downey, CA), and SAMUEL P. ORLANDO (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 109-116. refs

(SAE PAPER 901291) Copyright

A new waste collection system (WCS) is undergoing development for use in the extended duration orbiter (EDO). Requirements for missions up to 18 days and the capability for missions up to 30 days necessitate the development of a new WCS that will have the appropriate capacity. The new system incorporates design features from both Skylab and Space Shuttle Orbiter WCSs. The system for EDO utilizes redundant fans and

urine separators. Plans call for the new WCS to be implemented for OV-105 (Endeavor) as well as for EDO. This paper describes the design and development status of the new WCS. Author

**A91-50534\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**THE EXTENDED DURATION ORBITER REGENERABLE CO<sub>2</sub> REMOVAL SYSTEM**

FRED A. OUELLETTE, H. E. WINKLER (NASA, Johnson, Space Center, Houston, TX), and GAIL S. SMITH (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 117-131. refs

(SAE PAPER 901292) Copyright

A new carbon dioxide scrubber system is undergoing development for extended duration orbiter (EDO) missions. The EDO requirements of missions up to 18 days and the capability for future missions up to 30 days necessitated the development and implementation of a regenerative CO<sub>2</sub> removal process. This new system will reduce the launch weight and stowage volume as compared to the present method of CO<sub>2</sub> removal, lithium hydroxide, which is stowed in canisters. The selected design, called the Regenerable CO<sub>2</sub> Removal System (RCRS), uses a solid amine material to adsorb carbon dioxide and water vapor and periodically desorb these to space vacuum. The RCRS, which is located below the middeck floor, interfaces with the orbiter's cabin Atmospheric Revitalization System and is adjustable from four to seven crewmembers. The RCRS is designed to automatically cycle the beds from adsorb to vacuum-desorb every 30 minutes. Also incorporated into the design are features such consumable recovery, external leak protection, trace contaminant control and automatic control logic operation. Author

**A91-50535**

**SUMMARY OF STATIC FEED WATER ELECTROLYSIS TECHNOLOGY DEVELOPMENTS AND APPLICATIONS FOR THE SPACE STATION AND BEYOND**

DAVID J. GRIGGER, B.-J. CHANG, and ANDREW J. KOVACH (Life Systems, Inc., Cleveland, OH) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 133-144. refs

(SAE PAPER 901293) Copyright

The development and application possibilities of the alkaline-based Static Feed Electrolyzer (SFE) are described with specific reference to NASA and NASA space missions. Fundamental advances in technology leading to the SFE are listed including those related to electrode performance, cell design, module construction, integrated ancillary mechanical components, and control/monitor instrumentation. Electrode catalyzation, unitized cell cores, and injection molding are important improvements for the static-feed water-electrolysis process. The SFE technology provides the efficient generation of O<sub>2</sub> and H<sub>2</sub> and can be applied to a variety of advanced space-mission technologies. Specific applications include environmental control and life-support systems, energy storage, propulsion, and extravehicular activities. C.C.S.

**A91-50536**

**PHASE CHANGE WATER RECOVERY FOR THE SPACE STATION FREEDOM AND FUTURE EXPLORATION MISSIONS**

LARRY D. NOBLE, FRANZ H. SCHUBERT, RICK J. PUDOKA (Life Systems, Inc., Cleveland, OH), and JANIE H. MIERNIK (Boeing Aerospace Co., Huntsville, AL) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale,



PA, Society of Automotive Engineers, Inc., 1990, p. 145-158. refs

(SAE PAPER 901294) Copyright

The recovery of water from waste water on advanced missions is discussed in terms of the Vapor Compression Distillation (VCD) technology with attention given to the development and application of the phase-change system to the Space Station Freedom. The VCD process and VCD subsystems are described, and general operating characteristics are given including specific energy, still-motor power, compressor speed, water-recovery percentages, and solids concentrations. Specific technological advances are described that affect water-production rates, water quality, specific energy, pretreatment concepts, and pump designs. VCD technology can be applied to urine processing, ultrapure and hygiene water processing, and centrifuge facilities, and these applications are found to be important for space stations such as the Space Station Freedom. C.C.S.

**A91-50537\*** Bend Research, Inc., OR.

**PRELIMINARY EVALUATION OF A MEMBRANE-BASED SYSTEM FOR REMOVING CO<sub>2</sub> FROM AIR**

SCOTT B. MCCRAY, RANDI W. WYTCHERLEY, DWAYNE T. FRIESEN, and ROD J. RAY (Bend Research Inc., OR) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 159-166. refs

(Contract NAS9-18085)

(SAE PAPER 901295) Copyright

Processes to remove and/or recover CO<sub>2</sub> from air are essential to the long-term success of the U.S. space program. The results of a preliminary investigation of the use of a novel membrane-based system for removal of CO<sub>2</sub> from air are presented. Features of this technology that make it attractive include the following: (1) it is lightweight; (2) it requires no consumables or expendables; (3) it is relatively simple; and (4) it does not rely directly on other subsystems. Preliminary designs of systems for removing CO<sub>2</sub> from spacecraft cabin atmospheres and from the extravehicular mobility unit are presented. Author

**A91-50538\*** Honeywell, Inc., Bloomington, MN.

**ELECTROCHEMICAL AMPEROMETRIC GAS SENSORS FOR ENVIRONMENTAL MONITORING AND CONTROL**

H. V. VENKATASETTY (Honeywell Sensor and System Development Center, Bloomington, MN) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 167-169. Research supported by NASA. refs

(SAE PAPER 901296) Copyright

Theoretical considerations and experimental results regarding a unique class of vapor sensors are presented, and the sensors are compared to semiconductor-based sensors. The electrochemical sensors are based on nonaqueous electrolytes, and gas-detection selectivity achieved by applying a known potential to the sensing electrode using a reference electrode and a counter electrode. Results are given regarding the detection of oxygen and carbon dioxide using one cell, the detection of 3-percent carbon dioxide in nitrogen, and the detection of carbon dioxide in air at percentages ranging from 3 to 6. The sensors are found to be effective in the detection of toxic chemical species including CO, NO<sub>2</sub>, and formaldehyde; the sensors are further found to require minimal power, operate over long periods of time, and function over a wide temperature range. C.C.S.

**A91-50539\*** Life Systems, Inc., Cleveland, OH.

**HYBRID AIR REVITALIZATION SYSTEM FOR A CLOSED ECOSYSTEM**

M. G. LEE (Life Systems, Inc., Cleveland, OH) and MARIANN F. BROWN (NASA, Johnson Space Center, Houston, TX) IN: Advanced environmental/thermal control and life support systems;

Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 171-177. refs

(Contract NAS9-17913)

(SAE PAPER 901311) Copyright

An air-revitalization concept is presented with experimental results to assess the practicality and applicability of the proposed system to extended-duration manned missions. The Hybrid Air Revitalization System (HARS) uses plants in a habitat to remove metabolic CO<sub>2</sub> and moisture and produce oxygen and food. CO<sub>2</sub> and O<sub>2</sub> partial pressures, temperature, and humidity are regulated by means of electrochemical CO<sub>2</sub> and O<sub>2</sub> chemical separators and a moisture condenser separator. A cell-test facility is described in which the electrochemical CO<sub>2</sub> removal processes are investigated with and without using H<sub>2</sub>. Performance is optimized by using 25-30 percent Teflon in the gas-diffusion-type electrode, employing a thin electrolyte matrix, operating at higher temperatures and lower dew points. The HARS concept is found to be a feasible approach to the electrochemical separation of CO<sub>2</sub> and O<sub>2</sub>. C.C.S.

**A91-50540\*** Texas A&M Univ., College Station.

**ELECTROOXIDATION OF ORGANICS IN WASTE WATER**

G. D. HITCHENS, OLIVER J. MURPHY, LAMINE KABA (Texas A & M University, College Station), and CHARLES E. VEROSTKO (NASA, Johnson Space Center, Houston, TX) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 179-188. refs

(Contract NAG9-350)

(SAE PAPER 901312) Copyright

Electrooxidation is a means of removing organic solutes directly from waste waters without the use of chemical expendables. Research sponsored by NASA is currently being pursued to demonstrate the feasibility of the concept for oxidation of organic impurities common to urine, shower waters and space-habitat humidity condensates. Electrooxidation of urine and waste water ersatz was experimentally demonstrated. This paper discusses the electrooxidation principle, reaction kinetics, efficiency, power, size, experimental test results and water-reclamation applications. Process operating potentials and the use of anodic oxidation potentials that are sufficiently low to avoid oxygen formation and chloride oxidation are described. The design of an electrochemical system that incorporates a membrane-based electrolyte based on parametric test data and current fuel-cell technology is presented. Author

**A91-50541\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**CELSS SIMULATIONS FOR A LUNAR OUTPOST**

H. S. CULLINGFORD (NASA, Johnson Space Center, Houston, TX), W. P. BENNETT, W. A. HOLLEY, J. G. CARNES, and P. S. JONES (Lockheed Engineering and Sciences Co., Houston, TX) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 223-232. refs

(Contract NAS9-17900)

(SAE PAPER 901281) Copyright

The paper describes a five-year simulation of two mission scenarios consisting of 14 different 'events' that could take place at a lunar outpost. The time-dependent status of the life support consumables was calculated in response to the two selected mission scenarios. This application demonstrates that complex sequences of events are reproducible for understanding of integrated mission operations. A Controlled Ecological Life Support System (CELSS) can regenerate air, water, and food from the wastes generated in the habitat and do so with safety and reliability. The CELSS Emulator is under development at the NASA's Johnson

Space Center with a purpose of investigating computer simulations of integrated CELSS operations involving humans, plants, process machinery, and reservoirs. The Emulator Version 2.0 has been implemented to provide a mission-scenario-analysis capability. Thus, the future space exploration missions, lunar or Mars, can be analyzed by using 'events' to build mission timelines. Author

**A91-50542\*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

**PHYSICAL/CHEMICAL CLOSED-LOOP WATER-RECYCLING FOR LONG-DURATION MISSIONS**

CAL C. HERRMANN (NASA, Ames Research Center; Bionetics Corp., Moffett Field, CA) and TED WYDEVEN (NASA, Ames Research Center, Moffett Field, CA) IN: Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 233-246. Previously announced in STAR as N91-24052. refs (SAE PAPER 901446) Copyright

Water needs, water sources, and means for recycling water are examined in terms appropriate to the water quality requirements of a small crew and spacecraft intended for long duration exploration missions. Inorganic, organic, and biological hazards are estimated for waste water sources. Sensitivities to these hazards for human uses are estimated. The water recycling processes considered are humidity condensation, carbon dioxide reduction, waste oxidation, distillation, reverse osmosis, pervaporation, electrodialysis, ion exchange, carbon sorption, and electrochemical oxidation. Limitations and applications of these processes are evaluated in terms of water quality objectives. Computerized simulation of some of these chemical processes is examined. Recommendations are made for development of new water recycling technology and improvement of existing technology for near term application to life support systems for humans in space. The technological developments are equally applicable to water needs on earth, in regions where extensive water recycling is needed or where advanced water treatment is essential to meet EPA health standards. Author

**A91-50543**

**SPACE STATION AND ADVANCED EVA TECHNOLOGIES; INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, 20TH, WILLIAMSBURG, VA, JULY 9-12, 1990, TECHNICAL PAPERS**

Conference sponsored by SAE. Warrendale, PA, Society of Automotive Engineers, Inc. (SAE SP-830), 1990, 149 p. For individual items see A91-50544 to A91-50549. (SAE SP-830) Copyright

A collection of papers is presented with a wide spectrum of EVA subjects, including component technology development, SSF design for integration of EVA, optimization of crew and robotic EVA, and the EVA requirements for the lunar and Mars missions. Particular attention is given to development of a fuel cell for the EMU, advanced technology application in the production of spacesuit gloves, telerobotics as an EVA tool, design considerations for future planetary space suits, a methodology for choosing candidate materials for the fabrication of planetary space suit structures, development of a regenerable metal oxide CO removal system, characterization of metal oxide absorbents for regenerative carbon dioxide and water vapor removal for advanced portable life support systems, an air bearing fan for EVA suit ventilation, and a direct-interface fusible heat sink for astronaut cooling. O.G.

**A91-50544\*** Hamilton Standard, Windsor Locks, CT.

**SHUTTLE EXTRAVEHICULAR MOBILITY UNIT (EMU) OPERATIONAL ENHANCEMENTS**

ROBERT BALINSKAS (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT), JAMES W. MCBARRON, II (NASA, Johnson Space Center, Houston, TX), and PHILIP M. SPAMPINATO (ILC Dover, Frederica, DE) IN: Space Station and advanced EVA technologies; Intersociety Conference on

Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 1-10.

(SAE PAPER 901317) Copyright

An EMU program activity is considered aimed at achieving a 25 percent reduction in ground turnaround man-hours and processing time between missions and extending EVA on-orbit capabilities. Tasks being implemented with expected benefits to NASA-manned spaceflight programs are identified and described. It is concluded that the EMU enhancements made to increase durability and reduce ground processing time will also provide the capability for on-orbit suit resizing and make possible the extension of the present on-orbit certification limit from 3 to 5 EVAs. O.G.

**A91-50546\*** Lockheed Engineering and Sciences Co., Houston, TX.

**INVESTIGATION INTO VENTING AND NON-VENTING TECHNOLOGIES FOR THE SPACE STATION FREEDOM EXTRAVEHICULAR ACTIVITY LIFE SUPPORT SYSTEM**

JOHN L. WILSON (Lockheed Engineering and Sciences Co., Houston, TX) and B. MICHAEL LAWSON (NASA, Johnson Space Center, Houston, TX) IN: Space Station and advanced EVA technologies; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 19-33. refs

(SAE PAPER 901319) Copyright

Various venting and non-venting technologies for SSF EVA life support system are described, and the estimated weights and volumes for the options on a component and system level are reviewed. It is noted that a final design concept for the SSF extravehicular mobility unit has not been chosen. O.G.

**A91-50547**

**TELEROBOTICS AS AN EVA TOOL**

DAVID E. ANDERSON and LISA M. ROCKOFF (McDonnell Douglas Space Systems Co., Space Station Div., Huntington Beach, CA) IN: Space Station and advanced EVA technologies; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 43-49. refs

(SAE PAPER 901397) Copyright

Possible uses of telerobotic devices in EVA are discussed, drawing from Propellant Tank Farm neutral buoyancy testing. Recommendations are presented for using telerobots such as the flight telerobotic servicer, the special-purpose dexterous manipulator, the remote manipulator system, and the Japanese experiment module arms in the evolution of SSF. It is concluded that to maintain feasibility and control cost, more extensive and routine use of telerobots will be required. Addition of ground control capability of on-orbit telerobots will substitute ground crew time for space crew time, considerably reducing operational costs. O.G.

**A91-50627**

**PRESCRIPTIVE EYEGLASS USE BY U.S. NAVY JET PILOTS - EFFECTS ON AIR-TO-AIR TARGET DETECTION**

LEONARD A. TEMME and DAVID L. STILL (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 62, Sept. 1991, p. 823-826. Research supported by U.S. Navy. refs Copyright

Air-to-air target detection distances, age, career jet flight hours, and total career flight hours were obtained for 167 U.S. Navy fighter pilots participating in air combat maneuver training at Naval Air Station, Oceana, VA. Of the pilots sampled, 22 used a prescribed spectacle correction while flying and 145 did not. The air-to-air target detection distances between the two groups of pilots, those with corrective glasses and those without, were compared. Sunglasses and tinted filters were not factors in the present study. The results strongly suggest that, as a group, the pilots without glasses were able to detect targets at a greater distance than the pilots with glasses. When the pilots were matched



on the basis of age and flight experience, the difference in air-to-air target detection capabilities of the two groups increased. The pilots without glasses were able to detect their adversary at a distance more than 20 percent farther than the pilots with glasses.

Author

**A91-50975**

**THE MARTIAN IMPERATIVE - INNOVATIVE APPROACHES TO LIFE SUPPORT FOR ADVANCED SPACE MISSIONS**

STEVEN H. SCHWARTZKOPF (Lockheed Missiles and Space Co., Inc., Space Systems Div., Sunnyvale, CA) Lockheed Horizons (ISSN 0459-6773), Aug. 1991, p. 14-21.

Studies being undertaken to develop life support systems for use on Mars bases are discussed. Technologies for life support, food production, waste recycling, and waste processing are addressed. Antarctica is considered as a possible testbed for Mars bases. I.E. C.D.

**A91-50981**

**CONSIDERATIONS FOR THE OPERATOR-ROBOT INTERFACE IN TELEOPERATION**

RONALD G. JULIAN (USAF, Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: IEEE International Conference on Systems Engineering, 2nd, Pittsburgh, PA, Aug. 9-11, 1990, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 90-93. refs

The human role in the overall system design and the key human characteristics that must be considered by the designers of teleoperated systems are discussed. Control and feedback in teleoperation differ considerably from typical manufacturing robotic systems. Human-in-the-loop operation incorporates the human element in the control loop from two key perspectives. Information about the robot's interaction with its work environment is presented to the operator for cognitive processing and decisions. Additionally, human processing time for the information and the subsequent reaction time to direct the robot are critical control considerations. I.E.

**A91-50983**

**DESIGN OF AN EXOSKELETON WITH KINESTHETIC FEEDBACK - LESSONS LEARNED**

STEVEN J. REMIS (USAF, Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: IEEE International Conference on Systems Engineering, 2nd, Pittsburgh, PA, Aug. 9-11, 1990, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 109-112. refs

The design of a bilateral (force-reflecting) exoskeleton with kinesthetic feedback is discussed. The design process was hindered by a lack of fundamental biodynamic data, which had to be synthesized from other studies. Areas of human performance research are identified to verify the biodynamic assumptions made during this project. Areas of manipulation research, using a kinematically redundant slave robot, are described to quantify the expected improvements in telemanipulation resulting from the kinesthetic feedback provided by this exoskeleton. I.E.

**A91-50987**

**ON CONTROL AND PLANNING OF A SPACE STATION ROBOT WALKER**

HIROSHI UENO, YANGSHENG XU, H. B. BROWN, JR., MIYUKI UENO, and TAKEO KANADE (Carnegie Mellon University, Pittsburgh, PA) IN: IEEE International Conference on Systems Engineering, 2nd, Pittsburgh, PA, Aug. 9-11, 1990, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 220-223. refs

Copyright

A walking robot which can step from one node of a space station trusswork to the next is described. The five-degree-of-freedom (DOF) robot consists of two light-weight flexible links, configured like an upside-down V, with a rotary joint at the vertex and a gripper connected by two-DOF joints at each free end. The development of the control software, including the control strategy for the walking motion, low-level control schemes

for the robot, and the trajectory planning, is presented. One step of the walking motion is divided into four phases: coarse motion, fine motion, insertion, and extraction. In the coarse motion, the robot moves its gripper from one node to the vicinity of another node. In the fine motion, the robot moves precisely to the top of the hole. Once the gripper is at the top of the hole, it is inserted along the vertical motion to complete one step, and the other gripper is extracted to start the next step. The low-level controllers were designed based on a rigid model, with low-pass filtering used to eliminate the high-mode vibration of the flexible links. Acceleration feedback was introduced in the control to improve the system bandwidth. A trajectory for specific walking motion is presented for generating efficient and stable motion. I.E.

**A91-50988\*** Research Triangle Inst., Research Triangle Park, NC.

**APPLICATION OF STRUCTURED ANALYSIS TO A TELEROBOTIC SYSTEM**

ERIC DASHMAN, DAVID MCLIN (Research Triangle Institute, Research Triangle Park, NC), F. W. HARRISON, DONALD SOLOWAY, and STEVEN YOUNG (NASA, Langley Research Center, Hampton, VA) IN: IEEE International Conference on Systems Engineering, 2nd, Pittsburgh, PA, Aug. 9-11, 1990, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 258-263. (Contract NAS1-17964)

Copyright

The analysis and evaluation of a multiple arm telerobotic research and demonstration system developed by the NASA Intelligent Systems Research Laboratory (ISRL) is described. Structured analysis techniques were used to develop a detailed requirements model of an existing telerobotic testbed. Performance models generated during this process were used to further evaluate the total system. A commercial CASE tool called Teamwork was used to carry out the structured analysis and development of the functional requirements model. A structured analysis and design process using the ISRL telerobotic system as a model is described. Evaluation of this system focused on the identification of bottlenecks in this implementation. The results demonstrate that the use of structured methods and analysis tools can give useful performance information early in a design cycle. This information can be used to ensure that the proposed system meets its design requirements before it is built. I.E.

**A91-51000\*** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**A MODULAR TELEROBOTIC TASK EXECUTION SYSTEM**

PAUL G. BACKES, KAM S. TSO, SAMAD HAYATI, and THOMAS S. LEE (JPL, Pasadena, CA) IN: IEEE International Conference on Systems Engineering, 2nd, Pittsburgh, PA, Aug. 9-11, 1990, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 511-514. refs

Copyright

A telerobot task execution system is proposed to provide a general parametrizable task execution capability. The system includes communication with the calling system, e.g., a task planning system, and single- and dual-arm sensor-based task execution with monitoring and reflexing. A specific task is described by specifying the parameters to various available task execution modules including trajectory generation, compliance control, teleoperation, monitoring, and sensor fusion. Reflex action is achieved by finding the corresponding reflex action in a reflex table when an execution event has been detected with a monitor. I.E.

**A91-51001\*** Jet Propulsion Lab., California Inst. of Tech., Pasadena.

**GENERALIZED COMPLIANT MOTION TASK DESCRIPTION AND EXECUTION WITHIN A COMPLETE TELEROBOTIC SYSTEM**

PAUL G. BACKES (JPL, Pasadena, CA) IN: IEEE International Conference on Systems Engineering, 2nd, Pittsburgh, PA, Aug.

9-11, 1990, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1990, p. 515-518. refs  
Copyright

A motion primitive for use in compliant motion robot task execution is described. The primitive has a rich input parameter set to provide for execution of a variety of specific tasks such as door opening, crank turning, bolt seating and turning, pushing, sliding, pin insertion/removal, and leveling, as well as termination conditions which specify conditions for ending the motion, such as allowable position and force error bounds. A split rate force control technique is used for force control. Force and torque data from a six-axis force sensor are read, and gravity compensation using load mass properties is done to determine contact forces.

I.E.

**A91-51022****AN INFORMATIONAL PERSPECTIVE ON SKILL TRANSFER IN HUMAN-MACHINE SYSTEMS**

GAVAN LINTERN (Illinois, University, Savoy) Human Factors (ISSN 0018-7208), vol. 33, June 1991, p. 251-266. refs  
(Contract MDA903-86-C-0169)

Copyright

Differentiation of perceptual invariants is proposed as a theoretical approach to explain skill transfer for control at the human-machine interface. It is proposed that sensitivity to perceptual invariants is enhanced during learning and that this sensitivity forms the basis for transfer of skill from one task to another. The hypothesis implies that detection and discrimination of critical features, patterns, and dimensions of difference are important for learning and for transfer. This account goes beyond other similarity conceptions of transfer. To the extent that those conceptions are specific, they cannot account for effects in which performance is better following training on tasks that are less rather than more similar to the criterion task. In essence, this is a theory about the central role of low-dimensional informational patterns for control of behavior with a high-dimensional environment, and about the adjustment of an actor's sensitivity to changes in those low-dimensional patterns.

Author

**A91-51076****HELMET-MOUNTED DISPLAYS II; PROCEEDINGS OF THE MEETING, ORLANDO, FL, APR. 19, 20, 1990**

RONALD J. LEWANDOWSKI, ED. (Honeywell, Inc., Minneapolis, MN) Meeting sponsored by SPIE. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers (SPIE Proceedings. Vol. 1290), 1990, 273 p. For individual items see A91-51077 to A91-51100.

(SPIE-1290) Copyright

Various papers on helmet-mounted displays are presented. Individual topics addressed include: holographic helmet-mounted display (HMD) application for the extravehicular mobility unit, development of the combiner-eyepiece night-vision goggle, developments in CRTs for HMD applications, low-light-level television systems in HMDs, use of holographic optical elements in HMDs, route map as a helmet display option, requirements of an HMS/D for a night-flying helicopter, design and flight testing of an electronic visibility system. Also discussed are: real-time space-stabilized digital gimbal, development of an aviator's helmet-mounted night-vision goggle system, implications of visual processing for HMDs, fundamental monocular/binocular HMD human factors, development and usage of HMDs, F-16 HMD flight evaluations, evaluation of virtual cockpit concepts during simulated missions, head movement during simulated air-to-air engagements, aim sight.

C.D.

**A91-51077****A HOLOGRAPHIC HELMET MOUNTED DISPLAY APPLICATION FOR THE EXTRAVEHICULAR MOBILITY UNIT**

M. WEINSTOCK, W. PISHTHEY, J. LARUSSA (Technology Innovation Group, Inc., Pleasantville, NY), and C. L. TRITSCH (Lockheed Engineering and Sciences Co., Houston, TX) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando,

FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 2-8. refs  
Copyright

The design of a helmet-mounted display (HMD) created for use in the Space Station Extravehicular Mobility Unit (EMU) is described. This HMD provides the user with a biocular virtual image in a 25 deg diagonal field of view, maximum combiner transparency, minimal volume dimension, and an unencumbered working field of view.

C.D.

**A91-51078\*** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**A FULL-COLOR WIDE-FIELD-OF-VIEW HOLOGRAPHIC HELMET-MOUNTED DISPLAY FOR PILOT/VEHICLE INTERFACE DEVELOPMENT AND HUMAN FACTORS STUDIES**

JAMES R. BURLEY, II (NASA, Langley Research Center, Hampton, VA) and JOSEPH A. LARUSSA (Technology Innovation Group, Inc., Pleasantville, NY) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 9-15. refs

Copyright

The application of advanced display concepts and helmet-mounted display (HMD) technology to air-to-air combat in highly maneuverable aircraft is discussed. The concepts considered include control authority, aircraft attitude, and energy maneuverability, and an HMD system designed for simulation studies is described. The human factors issues involved are addressed.

C.D.

**A91-51079****THE DEVELOPMENT OF THE COMBINER EYEPiece NIGHT VISION GOGGLE**

ALEXANDER A. CAMERON (GEC Avionics, Ltd., Rochester, England) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 16-29. refs

Copyright

Conventional night vision goggles (NVGs) have disadvantages in fast jet aircraft equipped with fixed FLIR sensor displayed on the HUD in that the FLIR image can be viewed only through the NVG. The development of the combiner eyepiece NVG has overcome this problem by giving the pilot a direct view through a transparent eyepiece into which the intensified night scene is projected such that it overlies the real world with a 1:1 correspondence. This paper outlines some of the design constraints specific to combiner eyepiece NVGs. The development of one of these NVGs, called the Cat's Eyes Night Vision Goggle, and the further development of the combiner eyepiece concept into an ejection-safe integrated night vision helmet, are discussed.

C.D.

**A91-51082****TRACKING A HEAD-MOUNTED DISPLAY IN A ROOM-SIZED ENVIRONMENT WITH HEAD-MOUNTED CAMERAS**

JIH-FANG WANG, RONALD AZUMA, GARY BISHOP, VERNON CHI, JOHN EYLES, and HENRY FUCHS (North Carolina, University, Chapel Hill) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 47-57. Previously announced in STAR as N90-27266. refs  
(Contract N00014-86-K-0680; NIH-RR-02170-05)

Copyright

This paper presents efforts to accurately track a head mounted display (HMD) in a large environment. A current benchtop prototype is reviewed, and plans for building the full-scale system are described. Both systems use an inside-out optical tracking scheme, where lateral-effect photodiodes mounted on the user's helmet view flashing infrared beacons placed in the environment. Church's method uses the measured 2D image positions and the known 3D beacon locations to recover the 3D position and orientation of the helmet in real-time. Also discussed are the implementation and performance of the benchtop prototype. The full-scale system design includes ceiling panels that hold the infrared beacons and

a new sensor arrangement of two photodiodes with holographic lenses. In the full-scale system, the user can walk almost anywhere under the grid of ceiling panels, making the working volume nearly as large as the room. Author

A91-51083

#### LOW LIGHT LEVEL TELEVISION SYSTEMS IN HELMET MOUNTED DISPLAYS

M. SCHRIJVERS HOF, J. VAN DEN BERG, and J. B. J. SCHELEN (Optische Industrie De Oude Delft, Netherlands) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 60-69. refs  
Copyright

The characteristics are examined of a low light level television system that can be used as a helmet-mounted vision system as an alternative to night vision goggles for aircraft guidance. The system layout and control are examined and its implementation in aircraft is addressed. C.D.

A91-51090

#### HUMAN FACTORS AND SAFETY CONSIDERATIONS OF NIGHT VISION SYSTEMS FLIGHT USING THERMAL IMAGING SYSTEMS

CLARENCE E. RASH, JOHN S. CROWLEY (U.S. Army, Fort Rucker, AL), and ROBERT W. VERONA (U.S. Army, Night Vision and Electro-Optics Laboratory, Fort Belvoir, VA) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 142-164. Previously announced in STAR as N90-27263. refs  
Copyright

Military aviation night vision systems enhance the aviator's capability to operate effectively during periods of low illumination, adverse weather, and in the presence of obscurants. Current fielded systems allow aviators to conduct terrain flight during conditions which would be extremely dangerous, if not impossible, using only unaided vision. In night vision systems, trade-offs are made that enhance some visual parameters and compromise others. Examples of visual parameters which are traded off include acuity, field-of-view, spectral sensitivity, and depth perception. Cost, weight, and size constraints also lead to compromises between the ideal and a viable system design. Thermal imaging sensors introduce enhanced night vision capabilities along with new problems associated with the interpretation of visual information based on spectral and spatial characteristics differing from those provided by unaided vision. Author

A91-51091

#### VISUAL PROCESSING - IMPLICATIONS FOR HELMET MOUNTED DISPLAYS

J. L. CALDWELL, R. L. S. CORNUM, R. L. STEPHENS, and C. E. RASH (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, AL) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 165-172. Previously announced in STAR as N90-29916. refs  
Copyright

A study was conducted to compare the performance of AH-64 (Apache) pilots to other Army pilots on visual tasks. Each pilot was given a task presented monocularly to the right eye, a task presented monocularly to the left eye, and a task presented to both eyes simultaneously in a dichotic task. Results indicated no performance difference between the groups of pilots on the dichotic task, but indicated better performance on the left monocular task for the AH-64 pilots. These results indicate that AH-64 pilots who are required to switch their attention from their left eyes to their right eyes in order to obtain needed information are capable of processing information efficiently and effectively using only one eye. The implications of these results for the Integrated Helmet and Display Sighting System (IHADSS) are discussed. Author

A91-51092

#### THE EFFECT ON VISUAL RECOGNITION PERFORMANCE OF MISREGISTRATION AND OVERLAP FOR A BIOCULAR HELMET MOUNTED DISPLAY

FRANCINE LANDAU (Hughes Aircraft Co., El Segundo, CA) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 173-184. refs  
Copyright

A within-subjects design was employed to evaluate three factors: divergence (.45 to 1.8 degrees of subtended angle); divergence (.83 to 3.3 degrees); and overlap (35 to 100 percent). Using a configuration composed of a computer graphics engine, two monitors and a two-channel optical relay system focused at infinity, imagery simulating FLIR detail and contrast was shown to subjects who searched the field for dynamic alphanumeric and geometric targets. Objective dependent measures were target recognition accuracy and response time. Subjective measures included verbal report of headaches, eyestrain, blurred or double vision any time during experimental trials. Although the extent of misregistration was not statistically significant, a breakpoint in performance was observed for each type of misalignment. Accuracy and latency measures indicated that performance deteriorated significantly as overlap area was decreased. Subjective measures indicated subjects were aware of blurring and doubling as misalignment levels increased and complained of eyestrain when overlap area was decreased. Author

A91-51093

#### FUNDAMENTAL MONOCULAR/BINOCULAR HMD HUMAN FACTORS

THOMAS M. LIPPERT (Honeywell, Inc., Minneapolis, MN) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 185-191. refs  
Copyright

Five laboratory studies were conducted in order to establish image alignment tolerances for wide field of view monocular/binocular/binocular helmet mounted displays (HMD). Apache Helicopter-type production HMD oculars were used by night vision trained pilots in the studies, the results of which underscore the operational advantage of maintaining one dark adapted eye and quantify the pilots' perceptual sensitivities to display system sources of binocular misalignment. Author

A91-51094

#### HEAD TRACKING ACCURACY IN VIEW OF BORESIGHTING AND PARALLAX COMPENSATION

W. E. AXT and E.-A. MUELLER (Telefunken Systemtechnik GmbH, Wedel, Federal Republic of Germany) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 192-203. refs  
Copyright

A mathematical substantiation is provided of the errors expected due to the influence of incorrect boresighting and of parallax on the exactness of head targeting in head tracking systems. Methods of obtaining acceptable values from the complete system are suggested. C.D.

A91-51095

#### RESOLUTION AND SIGNAL-TO-NOISE MEASUREMENT U.S. ARMY NIGHT VISION GOGGLES

ANDRE RIVAMONTE (U.S. Army, Redstone Arsenal, AL) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 206-215. (Contract DAAG29-81-D-0100)  
Copyright

A tightly integrated, computer-assisted system for characterizing the performance of night vision goggles is described. The system quantitatively measures relative image quality and absolute resolution by converting a video camera into a specialized

oscilloscope probe. The lens, camera, and oscilloscope can be mixed, matched, or substituted with available equipment to provide a cost-effective solution to a particular application. The system is easy to use due to a custom electronic circuit which provides the proper trigger input to an oscilloscope whose trace corresponds to the highlighted region of the image viewed on a monitor. C.D.

**A91-51099****HEAD MOVEMENTS DURING SIMULATED AIR-TO-AIR ENGAGEMENTS**

MAXWELL J. WELLS (Logicon Technical Services, Dayton, OH) and MICHAEL W. HAAS (USAF, Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 246-257. refs Copyright

Head movement data collected from F-15C pilots wearing helmet-mounted displays and sights during simulated air-to-air engagements were analyzed. There was significantly more head movement during engagements which were conducted within visual range than those which commence beyond visual range, and there were significantly larger displacements and faster movements in azimuth than in elevation. C.D.

**A91-51100****AIM SIGHT**

RALPH J. ST. JOHN and BRADLEY D. PURVIS (USAF, Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990. Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1990, p. 258-264. refs Copyright

Aim Sight, an effort to introduce helmet-mounted displays (HMDs) into the B-1B bomber, is discussed. The key elements of the chosen HMD system and the testing of the system are described. C.D.

**A91-51356****SPACE STATION ENVIRONMENTAL/THERMAL CONTROL AND LIFE SUPPORT SYSTEMS; PROCEEDINGS OF THE 20TH INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, WILLIAMSBURG, VA, JULY 9-12, 1990**

Conference sponsored by SAE. Warrendale, PA, Society of Automotive Engineers, Inc. (SAE SP-829), 1990, 191 p. For individual items see A91-51357 to A91-51369. (SAE SP-829) Copyright

The present conference on Space Station environmental/thermal control and life-support systems encompasses design issues for systems pertinent to the Space Station Freedom, such as thermal technologies for microgravity environments ranging from insulation blankets to two-phase fluid-transport systems, heat exchangers, resource-allocation processes, and life-support technologies. Specific issues addressed include water recovery and management-test support modeling, a contaminant removal system, the testing of a CO<sub>2</sub> removal assembly, the containment of solid human waste, an analysis of a passive thermal control system, the electrodeionization of water, and the survival and selectivity of bacteria in water systems. Also addressed are water-treatment systems for reagent-grade water, the development of a water-quality monitor, the fatigue testing of corrugated and Teflon hoses, a method for thermal modeling, and thermal-resource allocation for Space Station Freedom and future planetary missions. C.C.S.

**A91-51357****SMOKE AND CONTAMINANT REMOVAL SYSTEM FOR SPACE STATION**

FREDERICK SRIBNIK, PHILIP J. BIRBARA, JEFFREY J. FASZCZA, and TIMOTHY A. NALETTE (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) IN: Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental

Systems, Williamsburg, VA, July 9-12, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 41-49. refs (SAE PAPER 901391) Copyright

A design for a self-contained smoke and contaminant removal system (SCRS) and its capabilities in removing airborne particulates and toxic gases generated from a Space Station fire are presented. Based on potential fire scenarios, an SCRS has been sized to weigh 52 lbs, consume 50 watts and occupy less than 3 cu ft. The replaceable filter/sorbent beds provide the SCRS with the capability of handling multiple contaminant challenges. The SCRS will reduce the necessity to compromise mission objectives by changing out Space Station air. The SCRS option provides the crew with the added flexibility of restoring and maintaining the quality of the habitable environment. Author

**A91-51358****SPACE STATION FREEDOM PREDEVELOPMENT OPERATIONAL SYSTEM TEST (POST) CARBON DIOXIDE REMOVAL ASSEMBLY**

LORI WOODWARD and ROBERT KAY (Allied-Signal Aerospace Co., Torrance, CA) IN: Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 51-56. (SAE PAPER 901392) Copyright

The predevelopment operational system test (POST) assembly of a CO<sub>2</sub>-removal system is reported in which closed-loop operation is demonstrated with hardware that is similar to the system for the Space Station Freedom. The goals of the regenerative system include removing CO<sub>2</sub> from the air-supply stream, preventing the accumulation of CO<sub>2</sub> within the cabin, concentrating CO<sub>2</sub> for downstream processing, and recovering oxygen. The POST apparatus is a four-bed system that meets the requirements of the Freedom flight system, and detailed descriptions of component integration and specific components are given. Schematic diagrams are delineated for normal operation and the residual-air pump-down mode, and elements are described, such as the desiccant bed, precooler, CO<sub>2</sub>-removal bed, and check valves. The regenerative system offers the advantages of minimizing logistics support and closing the cabin oxygen loop. C.C.S.

**A91-51359****COLLECTION AND CONTAINMENT OF SOLID HUMAN WASTE FOR SPACE STATION**

D. W. RETHKE and J. W. STEELE (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) IN: Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 57-67. refs (SAE PAPER 901393) Copyright

Test data and general considerations are presented with respect to the development of a subsystem for handling solid human waste on the Space Station Freedom. Convenience, safety, and efficiency are primary considerations for the proposed commode, and attention is given to minimizing the power requirement and avoiding overboard venting. The proposed system employs individual disposable collection bags, mechanized compaction, and natural biodegradation of the solid waste during the flight. Evaluation techniques are described for the collection bags, the fecal compaction technique, microbial control, the toilet-seat configuration, nonventilation, and the stabilization method. The resulting prototype commode is found to be an effective subsystem for long-duration space-flight missions. Natural biodegradation of human wastes is an effective storage technique and can lead to the ultimate regenerative use of solid human waste. C.C.S.

**A91-51361****A PRELIMINARY ANALYSIS OF THE PASSIVE THERMAL CONTROL SYSTEM FOR SPACE STATION FREEDOM**

M. E. SCHLAPBACH, J. B. SHARP, and M. D. SZETO (Boeing Aerospace and Electronics, Huntsville, AL) IN: Space Station

environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 77-92. (SAE PAPER 901403) Copyright

A passive thermal control system (PTCS) and concepts related to PTCS operation are described in relation to the requirements of the Space Station Freedom. The PTCS combines multilayer insulation (MLI), thermal control coatings, electric heaters, thermal isolators, and plumbing insulation to keep the temperature below 113 F to protect the crew and above 62 F to prevent condensation. Design considerations for MLI materials are set forth, and issues such as emissivity, meteoroid damage, and cost-effectiveness are addressed individually. Extensive graphic descriptions are given of MLI treatment, types of thermal control coatings, and thermal performance data. Potential tests are outlined for the MLI, meteoroid protection, the performance of the thermal vacuum, the use of an IR camera, and the applications of heaters. A general outline is given of the basic requirements for an effective PTCS as required by a mission such as that of the Space Station Freedom. C.C.S.

**A91-51362**  
**WATER QUALITY AFTER ELECTRODEIONIZATION**

ANITA K. HIGHSMITH, BILL M. KAYLOR, CAROL J. REED, and EDWIN W. ADES (Centers for Disease Control, Water Quality Laboratory, Atlanta, GA) IN: Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 93-96. refs (SAE PAPER 901421) Copyright

Municipal water was purified by an electrodeionization (ED) process for use in the research and diagnostic laboratory. Except for elevated silica levels electrodeionization product water met NCCLS Type II water specifications. An extensive battery of physical, microbiologic, and chemical tests were performed to determine the effect of this technology on water quality and to demonstrate the interaction with the other components of a typical water purification system. Author

**A91-51363**  
**SURVIVAL OF MYCOPLASMAS AND UREAPLASMAS IN WATER AND AT ELEVATED TEMPERATURES**

RUTH B. KUNDSIN (Brigham and Women's Hospital; Harvard University, Boston, MA) and ROBERT E. PERKINS (Brigham and Women's Hospital, Boston, MA) IN: Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 97-100. refs (SAE PAPER 901422) Copyright

The survival of *Mycoplasma hominis*, *Mycoplasma salivarium*, *Mycoplasma pneumoniae*, and *Ureaplasma urealyticum* in water and at elevated temperatures is a cause for concern. These microorganisms are pathogens. Some are implicated in serious genitourinary tract infections in men and women resulting in significant perinatal mortality and morbidity; others can cause respiratory tract infections. *M. hominis* has been implicated in wound infections, osteomyelitis, and infections of the heart valve. Because these microorganisms are pathogens, their survival in a closed water system has relevance to the well-being of crew members in an enclosed space. Consideration must be given to the elimination of these bacteria during recycling of water. Author

**A91-51364**  
**BACTERIAL SELECTIVITY IN THE COLONIZATION OF SURFACE MATERIALS FROM GROUNDWATER AND PURIFIED WATER SYSTEMS**

W. BLOOM, S. POPE (Ionic Atlanta, Inc., GA), J. C. RICHARDSON, and A. T. MIKELL, JR. (Alabama, University; Consortium for the Space Life Sciences, Huntsville) IN: Space Station

environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 101-111. refs (SAE PAPER 901423) Copyright

A variety of metals and surface modification techniques were evaluated for corrosion and biofilm resistivity. Coupons in a modified Robbins' Spool device contacted water in a parallel-flow manifold test bed. System water was obtained from a water well with a chronic history of fouling and corrosion. Several surface types resisted corrosion; however, no metal or surface modification prevented attachment of bacteria as revealed by epifluorescence microscopy or classical culturing techniques. Different surfaces did result in modified bacterial consortia. In a separate series of experiments, stainless steel coupons and Teflon in laminar flow cells were exposed to multi-cartridge purified water exceeding 17 megohms resistivity. These coupons were heavily colonized with bacteria in 30 days. However, coupons in static stirred reactors charged with the same water demonstrated little colonization. Author

**A91-51365**  
**EVALUATION OF WATER TREATMENT SYSTEMS PRODUCING REAGENT GRADE WATER**

ANITA HIGHSMITH, BILL M. KAYLOR, CAROL J. REED, and EDWIN W. ADES (Centers for Disease Control, Atlanta, GA) IN: Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 113-117. refs (SAE PAPER 901424) Copyright

General considerations are set forth with respect to water treatment, and prototype water-treatment systems are evaluated with respect to design, operation, and resulting water quality. The specifications for high-purity water are discussed, and the major classes of contaminants are listed. High-purity reagent water is defined as water that is free of organic contaminants, and water-purification systems are discussed in terms of the grades of water that are available by means of the systems. Four water-treatment systems - three prototypes and one existing system - are evaluated in detail in terms of the production of reagent-grade water. Inconsistent results are reported for systems including prefilter, reverse osmosis, carbon absorption, deionization, ultrafiltration, and membrane filtration. It is found that it is possible and cost-beneficial to produce a grade of water for both general and specific uses by carefully selecting an appropriate treatment system. C.C.S.

**A91-51366**  
**DEVELOPMENT OF A WATER QUALITY MONITOR FOR SPACE STATION FREEDOM LIFE SUPPORT SYSTEM**

WILLIAM NIU, DAVID BURCHFIELD, GORDON SNYDER (Perkin-Elmer Corp., Norwalk, CT), and KEITH CONKLIN (Boeing Aerospace and Electronics, Seattle, WA; Arthur D. Little, Inc., Cambridge, MA) IN: Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 127-136. Research supported by Boeing Aerospace and Electronics. refs (SAE PAPER 901426) Copyright

Specifications, design considerations, and preliminary results are presented for a water-quality monitor (WQM) intended for use with the Environmental Control and Life Support System (ECLSS) on the Space Station Freedom. The WQM comprises 8 water-parameter monitor mechanisms, and is intended to monitor impurities in both potable and hygiene water samples. The WQM includes a chromatograph to measure inorganics, a UV/VIS spectrometer to measure color, a mercury detector, a carbon analyzer, a sensor to monitor pH, conductivity, and temperature, and a sampling system. The use of the monitor subsystems under the microgravitational conditions of space is considered. The

conceptual design (under development) calls for a single rack and allows for automated operation, and the components are based on existing technologies except where gas/liquid separation is required. C.C.S.

**A91-51367\*** Lockheed Engineering and Sciences Co., Houston, TX.

**MODULAR, THERMAL BUS-TO-RADIATOR INTEGRAL HEAT EXCHANGER DESIGN FOR SPACE STATION FREEDOM**

JOE CHAMBLISS (Lockheed Engineering and Sciences Co., Houston, TX) and MICHAEL EWERT (NASA, Johnson Space Center, Houston, TX) IN: Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990. Warrendale, PA, Society of Automotive Engineers, Inc., 1990, p. 137-148. refs (Contract NAS9-17900)

(SAE PAPER 901435) Copyright

The baseline concept is introduced for the 'integral heat exchanger' (IHX) which is the interface of the two-phase thermal bus with the heat-rejecting radiator panels. A direct bus-to-radiator heat-pipe integral connection replaces the present interface hardware to reduce the weight and complexity of the heat-exchange mechanism. The IHX is presented in detail and compared to the baseline system assuming certain values for heat rejection, mass per unit width, condenser capacity, contact conductance, and assembly mass. The spreadsheet comparison can be used to examine a variety of parameters such as radiator length and configuration. The IHX is shown to permit the reduction of panel size and system mass in response to better conductance and packaging efficiency. The IHX is found to be a suitable heat-rejection system for the Space Station Freedom because it uses present technology and eliminates the interface mechanisms. C.C.S.

**A91-52128**

**APPLICATIONS OF ADAPTIVE FILTERING TO ECG ANALYSIS - NOISE CANCELLATION AND ARRHYTHMIA DETECTION**

NITISH V. THAKOR (Johns Hopkins University, Baltimore, MD) and YI-SHENG ZHU (University of Science and Technology of China, Beijing, People's Republic of China) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. 38, Aug. 1991, p. 785-794. refs

(Contract NIH-HL-01509; NSF ENG-84-51491)

Copyright

Several adaptive filter structures are proposed for noise cancellation and arrhythmia detection. The adaptive filter essentially minimizes the mean-squared error between a primary input, which is the noisy electrocardiogram (ECG), and a reference input, which is either noise that is correlated in some way with the noise in the primary input or a signal that is correlated only with ECG in the primary input. Different filter structures are presented to eliminate the diverse forms of noise: baseline wander, 60-Hz power line interference, muscle noise, and motion artifact. An adaptive recurrent filter structure is proposed for acquiring the impulse response of the normal QRS complex. The primary input of the filter is the ECG signal to be analyzed, while the reference input is an impulse train coincident with the QRS complexes. This method is applied to the detection of P-waves and premature ventricular complexes and recognition of conduction block, atrial fibrillation, and paced rhythm. I.E.

**A91-52837**

**UNLOCKING G-LOC**

JAMES F. O'BRYON (DOD, Office of the Secretary of Defense, Washington, DC) Aerospace America (ISSN 0740-722X), vol. 29, Sept. 1991, p. 60-63.

Copyright

Operational problems and suggested solutions are presented with respect to g-loss of consciousness (G-LOC) occurring more frequently with the ever increasing high performance of fighter aircraft. Accelerating g-buildup can be so rapid that pilots no longer experience the gray-out warning period before total loss of

consciousness, as the eye-level arterial pressure drops at a rate too high to give warning signals. New technologies to avoid G-LOC by raising body g-load tolerance include anti-g suits with gluteal compression panels and reticulated foam, air/liquid flight suits, supine cockpit seating, and breathing techniques/ gas additives, such as partial pressure breathing to 1 psi. Attention is given to the addition of an automatic deadstick override that would take over the flying duties of an unconscious pilot until such time as consciousness is regained. R.E.P.

**N91-29733#** Department of Transportation, Cambridge, MA. National Transportation Systems Center.

**THE USE AND DESIGN OF FLIGHTCREW CHECKLISTS AND MANUALS Final Report, Sep. 1988 - Jan. 1990**

JOHN W. TURNER and M. S. HUNTLEY, JR. Apr. 1991 71 p (AD-A237206; DOT/FAA/AM-91/7) Avail: NTIS HC/MF A04 CSCL 06/11

A survey of aircraft checklists and flight manuals was conducted to identify impediments to their use and to determine if standards or guidelines for their design were needed. Information for this purpose was collected through the review of checklists and manuals from six Part 121 and nine Part 135 carriers, review of NTSB and ASRS reports, analysis of an ALPA survey of air carrier pilots, and by direct observation in air carrier cockpits. The survey revealed that some checklists and manuals were difficult to locate and were poorly designed for use in the cockpit environment, the use of checklists by flight crews was not always well defined, the use of checklists interfered with other flight operations, and flight operations often made it difficult to use checklists effectively. Recommendations are made for the formatting and content of checklists and manuals, their use by flight crews, and areas of research relevant to checklist design. GRA

**N91-29734#** Chemical Research and Development Center, Aberdeen Proving Ground, MD.

**VENTILATION KINETICS TESTING OF A STEEL FRAME/RUBBER FABRIC UNDERGROUND SHELTER Final Report, Aug. 1989 - Aug. 1990**

ALAN T. SEITZINGER May 1991 24 p (AD-A237469; CRDEC-TR-278) Avail: NTIS HC/MF A03 CSCL 13/13

Design modifications were implemented on a respectively new steel frame/rubber fabric underground shelter to improve its collective protection characteristics for usage in an NBC warfare environment. Design changes were evaluated by analyzing volumetric air flow and pressure data collected from ventilation tests conducted for each design modification. Modifications to doors within the shelter proved to have significant impact on its performance. One door modification utilized velcro and rubber adhesives to attach the doorflap on the positive pressure side of the doorway. This modification increased maximum overpressure attained by the shelter from 0.125 inches of water (in.WG) to 1.8 in.WG over its original design. Test results indicated that this was due to a substantial decrease in the effective leakage areas associated with all of the doorways. At this higher overpressure, the risk of airborne nuclear fallout, biological agents, or vapors from chemical agents or aerosols penetrating into the shelter during exit/entry operations would be greatly reduced. GRA

**N91-29735#** Army Aeromedical Research Lab., Fort Rucker, AL.

**HUMAN FACTORS OF NIGHT VISION DEVICES: ANECDOTES FROM THE FIELD CONCERNING VISUAL ILLUSIONS AND OTHER EFFECTS Final Report**

JOHN S. CROWLEY May 1991 49 p (AD-A237641; USAARL-91-15) Avail: NTIS HC/MF A03 CSCL 23/2

To investigate the breadth of visual illusions experienced by aviators flying with night vision devices (NVDs), an open-ended questionnaire was distributed to the military helicopter community in the fall of 1989. Of the 242 returned questionnaires, there were 221 night vision goggle (NVG) reports and 21 thermal imaging system (FLIR) reports. Most sensory events occurred at night,



during low illumination, good weather, and over varied terrain. Contributing factors included inexperience, division of attention, and fatigue. Frequently reported illusions were misjudgements of drift, clearance, height above the terrain, and attitude. Also reported were illusions due to external lights, and distributed depth perception caused by differences in brightness between NVG tubes. Other respondents cited hardware problems and physiological effects. There were no obvious differences between the experiences of NVG users and FLIR users. Although incidence rates cannot be inferred from these data, the variety of expected aviator anecdotes in this report will be useful to all those concerned with human factors and safety of NVDs. GRA

**N91-29736#** Naval Aerospace Medical Research Lab., Pensacola, FL.

**THE EFFECT OF THREE LEVELS OF LASER GLARE ON THE SPEED AND ACCURACY OF TARGET LOCATION**

**PERFORMANCE WHEN VIEWING A BRIEFLY PRESENTED VISUAL ARRAY Interim Report, 1 Oct. 1989 - 30 Sep. 1990**

M. D. REDDIX, T. L. DEVIETTI, J. C. KNEPTON, and J. A. DANDREA Nov. 1990 20 p  
(AD-A238565; NAMRL-1359) Avail: NTIS HC/MF A03 C5CL 09/3

The effect of three levels of low-intensity laser glare on the visual search performance of student aviators was investigated. Subjects were exposed to laser glare while seated in a cockpit simulation trainer with attached F/15 windshield assembly. The experimental task was designed to maximize visual attentional demands to a degree that might be expected in normal flight. Thus, speed and accuracy of performance were monitored while subjects located targets in a complex, briefly presented (about 1 s), visual array under simulated dusk conditions. Low-level argon laser-induced glare (a factor 3700 times below the ANSI maximum permissible exposure for a 902-ms laser presentation) caused significant decrements in visual search performance for briefly displayed visual information. Subjects identified significantly fewer targets when experiencing low-intensity laser glare relative to a no-glare control. In addition, the speed with which correctly identified targets were located was significantly reduced relative to a no-glare control. As incident laser glare increased, significant decrements in the speed and accuracy of target location responses were observed at target eccentricities up to 8.1 deg from the center of the beam path. GRA

**N91-29737\*#** Alabama Univ., Huntsville. Coll. of Science.

**CHEMICAL WASTE DISPOSAL IN SPACE BY PLASMA DISCHARGE Final Report**

JAMES K. BAIRD 31 Mar. 1991 68 p  
(Contract NAS8-37195)

(NASA-CR-184169; NAS 1.26:184169) Avail: NTIS HC/MF A04 C5CL 06/11

An inductively coupled plasma discharge apparatus operating at 13.56 MHz and with electrical power up to 2.5 kW was constructed. The efficiency of this device to destroy various gases expected to be carried aboard the Space Station was tested. By expressing the efficiency of the device in terms of G-value (the number of molecules decomposed per 100 eV of energy absorbed), the results are compared with known efficiencies of ionizing radiation to destroy these same gases. In the case of ammonia, it was found that in the inductively coupled device, the destruction efficiency, G(-NH<sub>3</sub>) varied from 6.0 to 32.0 molecules/100 eV, depending on conditions. It was also found that capacitatively coupled discharges were less efficient in destroying NH<sub>2</sub> than the inductively coupled discharge. In the case NH<sub>2</sub> destruction, it was found that the G(-NH<sub>3</sub>) was a qualitative guide to the efficiencies of plasmas. The plasma device was also used to destroy nitrous oxide and methane. It is shown how the G-value for the destruction of any gas can be computed theoretically from a knowledge of the electron velocity distribution, the various electron molecule scattering cross sections, and the rate constants for the reactions of secondary species. Author

**N91-30671#** Joint Publications Research Service, Arlington, VA.

**FEEDING THE SALYUT-7 CREWS Abstract Only**

V. P. BYCHKOV, S. KALANDAROV, A. N. AGUREYEV, I. G. POPOV, A. N. KOCHETKOVA, and A. S. USHAKOV *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 1 25 Oct. 1990 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 23, no. 4, Jul.-Aug. 1989 p 9-14

Avail: NTIS HC/MF A04

The food products developed for the Salyut-7 crews consists primarily of dehydrated products to be rehydrated with hot or cold water before consumption. They are to be served in four meals a day on a six day menu. The daily ration contains approx. 130 g protein, 120 g fat, 360 g carbohydrates, for a total of 3000 calories. The crews takes multivitamins twice a day. Over the course of five missions on the orbital craft, a broad assortment of products and dishes was brought to the crews by the Progress freighters and the Soyuz-T craft, to supplement the regular menu. Some of the results are discussed of a physiological hygienic evaluation of the food rations supplied to the crews of five long duration Salyut-7 missions ranging from 126 to 211 days in length. Analysis of a 68 day preflight test of the rations and of the five missions aboard the Salyut-7 indicated that all components of the food operations functioned as intended and were generally well thought of by the cosmonauts. The daily diet kept the cosmonauts strong enough to perform their jobs. Author

**N91-30685#** Joint Publications Research Service, Arlington, VA.

**FEEDING THE SALYUT-7 CREWS Abstract Only**

V. P. BYCHKOV, S. KALANDAROV, A. N. AGUREYEV, I. G. POPOV, A. N. KOCHETKOVA, and A. S. USHAKOV *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 1 19 Feb. 1991 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 23, no. 4, Jul.-Aug. 1989 p 9-14

Avail: NTIS HC/MF A04

The food products developed for the Salyut-7 crews consists primarily of dehydrated products to be rehydrated with hot or cold water before consumption. They are served in four meals a day on a six-day menu. The daily ration contains approximately 130 g protein, 120 g fat, 360 g carbohydrates, for a total of 3000 calories. The crews take multivitamins twice a day. Discussed here are some of the results of a physiological-hygienic evaluation of the food rations supplied to the crews of five long-duration Salyut-7 missions ranging from 126 days to 211 days in length. Analysis of a 68-day preflight test of the rations and of the five missions aboard the Salyut-7 indicated that all components of the food operations functioned as intended and were generally well thought of by the cosmonauts. The daily diet kept the cosmonauts strong enough to perform their jobs. Author

**N91-30687#** Joint Publications Research Service, Arlington, VA.

**DIFFERENTIAL CRITERION FOR TOLERANCE OF A BLOW TO THE HEAD IN CERTIFICATION OF PROTECTIVE GEAR Abstract Only**

A. S. BARER, YU. G. KONAKHEVICH, L. N. SHOLPO, D. A. KURME, and L. YA. LEYTENE *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 3 19 Feb. 1991 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina, Moscow (USSR), v. 23, no. 4, Jul.-Aug. 1989 p 76-79

Avail: NTIS HC/MF A04

A probability criterion was previously suggested for certification of pilots' headgear in which the severity of a blow to the head was evaluated in the context of flying conditions, with particular attention devoted to ensuring the pilot's ability to save himself in an emergency situation and survive for an extended period of time in an uninhabited area. The authors sought a more flexible criterion that takes into consideration the specific conditions of an emergency, such as the possibility of the timely arrival of assistance. A differential equation was developed in three stages: selection of clinical parameters for differential evaluation of the effects of a blow to the head; determination of the relationship of clinical signs of head trauma to impact parameters and location; selection of

critical parameters of impact trauma for differential evaluation of protective headgear and their certification. The results of the analysis were used to construct regression equations for the probability of various levels of trauma protection as functions of maximum contact force. Author

**N91-30702#** Analysis and Technology, Inc., New London, CT.  
**EVALUATION OF NIGHT VISION GOGGLES FOR MARITIME SEARCH AND RESCUE. VOLUME 2: DATA APPENDIX Interim Report**

W. H. REYNOLDS, R. Q. ROBE, G. L. HOVER, and J. V. PLOURDE Apr. 1990 87 p  
 (Contract DTCG39-89-C-80671)  
 (AD-A229393; USCG-D-14-90-VOL-2) Avail: NTIS HC/MF A05  
 CSCL 20/6

Three experiments were conducted during 1989 by the U.S. Coast Guard Research and Development (R and D) Center to evaluate night vision goggles (NVGs) for their effectiveness in detecting small targets at night. Three types of NVGs were evaluated: the AN/AVS-6 Aviators Night Vision Imaging System (ANVIS) NVG was tested onboard Coast Guard HH-3 and Ch-3 helicopters, and the AN/PVS-5C and AN/PVS-7A NVGs were tested onboard 41-foot Coast Guard utility boats (STBs). Simulated persons in the water (PIWs), 4- and 6-person life rafts, 18- and 21-foot white boats, and white, personal flotation device (PFD) strobe lights were employed as targets during realistically-simulated search missions. A total of 1,490 target detection opportunities were generated during the experiments. These data were analyzed to determine which of 25 search parameters of interest exerted a statistically-significant influence on target detection probability.

GRA

**N91-30703#** Anacapa Sciences, Inc., Fort Rucker, AL.  
**TASK ANALYSIS AND WORKLOAD PREDICTION MODEL OF THE MH-60K MISSION AND A COMPARISON WITH UH-60A WORKLOAD PREDICTIONS. VOLUME 3: APPENDIXES H THROUGH N Interim Report, Dec. 1988 - Apr. 1990**

CARL R. BIERBAUM and DAVID B. HAMILTON Oct. 1990 259 p  
 (Contract MDA903-87-C-0523)  
 (AD-A229408; ASI690-328-90-III-VOL-3; ARI-RN-91-02-VOL-3)  
 Avail: NTIS HC/MF A12 CSCL 05/8

For this research, a mission scenario was used to conduct a comprehensive task analysis for MH-60K operations. The analysis used a top-down approach to identify 5 phases, 15 segments, 71 functions, and 230 tasks for the mission. Also, the crewmember performing each task was identified, and estimates of the task durations and the sensory, cognitive, and psychomotor workload associated with the tasks were derived. The mission/task/workload analysis data were used to develop a computer model of workload for MH-60K crewmembers. The model used a bottom-up approach to build mission functions from tasks and mission segments from functions. Decision rules were written to specify the procedure for combining tasks into functions and functions into segments. The model permitted an analysis of total workload experienced by the pilot and copilot in the performance of both sequential and concurrent tasks. The predicted workload for the MH-60K pilot and copilot was compared to the UH-60A baseline workload prediction to determine the impact of the MH-60K advanced technology. The comparison indicated very little difference in the predicted workload for the pilot and lower predicted workload for the copilot in the MH-60K. GRA

**N91-30704** McMaster Univ., Hamilton (Ontario). Dept. of Physical Education and Dept. of Medicine.  
**EVALUATION OF ALTERNATIVE METHODS FOR INCREASING TOLERANCE TO +GZ ACCELERATION, PHASE 2 Final Report**

J. D. MACDOUGALL Dec. 1989 26 p  
 (Contract DCIEM-W7711-8-7042/01-SE)  
 (CTN-91-60128) Avail: NTIS HC A03

Unconsciousness can occur during exposure to sustained, headward radial acceleration (G) due to hypotension at head level;

thus, methods of improving G tolerance of pilots of high performance aircraft are required. The aim of these experiments at 1 G was to determine an alternate protocol for forceful leg contractions that could assist the standard anti-G straining maneuver to increase blood pressure. Using an exercise of hip and knee extension in the sitting position, it was found that: (1) isometric, muscular contractions were more effective at increasing mean arterial blood pressure than concentric or eccentric contractions; (2) the relative intensity of the isometric contraction determined the magnitude of the blood pressure increase throughout a knee joint angle range of 75 to 105 deg; (3) simultaneous, double leg contractions produced greater blood pressure increases than alternating, single leg contractions; (4) a continuous 30 sec isometric contraction was superior to repeated 5 sec contractions followed by either 5 or 2 sec relaxation periods; and (5) the increase in blood pressure was independent of individual differences in absolute quadriceps muscle strength and/or muscle cross-sectional area, and was directly related to the relative intensity of contraction effort. Author (CISTI)

**N91-30705** Biokinetics and Associates Ltd., Ottawa (Ontario).  
**CRITIQUE OF A PROCESS PROPOSED TO DETERMINE CF AIRCREW/COCKPIT COMPATIBILITY**

JAMES NEWMAN, TERRANCE SMITH, JOCELYN PEDDER, and SILVANA FILOSO Jul. 1988 44 p Sponsored by Defence and Civil Inst. of Environmental Medicine  
 (DCIEM-R88-7C; CTN-91-60208) Avail: NTIS HC A03

A critique is provided of the aircrew cockpit compatibility evaluation process proposed for use in the review of the Canadian Forces (CF) aircrew selection standards. This process would use a computer man-modelling package known as System for Aiding Man/Machine Interaction Evaluation (SAMMIE). In the critique, discussion has been limited to issues of vision, reach, and clearance. The main points of the critique are as follows: (1) The generation of 2-D criterion envelopes is based on the assumption that each criterion depends on only two parameters. This might not always be true. The validity of the criterion envelope should be tested with the model before it is assumed to be true. (2) The proposed process considers only limiting cases of crew station geometry. This may lead to errors in interpretation when attempting to establish workstation limitations since critical geometries may occur at intermediate configurations. (3) The unlimited manipulation of anthropometric parameters provided by the system is unnecessary. Manipulation of parameters outside human limits would consume a considerable amount of processing time. (4) Specific limitations inherent to the SAMMIE model and workstation data may defeat the purpose of the proposed process and limit its generality. CISTI

**N91-30706** Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).

**CANADIAN FORCES FLIGHT TRIAL OF INDIVIDUALLY MOLDED FIBERGLASS LUMBAR SUPPORTS**

J. R. POPLOW and L. L. M. BOSSI Mar. 1988 35 p  
 (DCIEM-88-RR-12; CTN-91-60212) Avail: NTIS HC A03

Individually molded fibreglass lumbar supports may be useful in alleviating backache in aircrew members. This paper concludes a flying trial of 13 fixed wing (FW) and 25 rotary wing (RW) aircrew. Each aircrew member had been referred with a complaint of recurrent backache in their particular flying environment. Thirty-eight aircrew members were individually fitted, flew from five to 300 hours wearing the lumbar support, then completed a pre- and post-support subjective evaluation. Prior to use of the lumbar support, most subjects experienced frequent or occasional backache of varied duration. Trial participants indicated that the lumbar supports were easy to handle and position in the aircraft with only occasional shifting during flight. Most aircrew were not distracted, and all reported that flying performance was not affected while lumbar supports were worn. The two year study of lumbar support use had the following results: 60 percent of FW subjects and 32 percent of RW subjects reported fatigue relief; 75 percent of FW subjects and 36 percent of RW subjects reported considerably less backache; and 85 percent of the FW subjects



and 45 percent of the RW subjects reported increased sitting comfort. It is speculated that the FW aircrew benefitted more because they were able to sit upright more consistently than RW aircrew and this upright posture allowed the lumbar support to provide its benefits. Author (CISTI)

**N91-30707** McMaster Univ., Hamilton (Ontario). Dept. of Physical Education.

**EVALUATION OF ALTERNATIVE METHODS FOR INCREASING TOLERANCE TO +GZ. A PRELIMINARY STUDY OF DYNAMIC LEG EXERCISE Final Report**

J. D. MACDOUGALL Mar. 1988 44 p  
(Contract DCIEM-W-711-6-9281/01-SE)  
(CTN-91-60213) Avail: NTIS HC A03

Traditionally, pilots exposed to high G forces have attempted to maintain brain level arterial pressure by static contractions of the abdomen and limb muscles. It has been hypothesized that forceful dynamic contractions of the lower limbs, such as a leg press maneuver, would result in greater elevations in arterial blood pressure than can be achieved by the traditional maneuvers, and that such techniques might be a more effective means of increasing high G force tolerance than existing practices. A laboratory study to examine this hypothesis is presented. The study showed that forceful dynamic contractions resulted in considerably greater elevations in mean arterial blood pressure than the traditional maneuvers. In addition, for a given increase in blood pressure, forceful leg contractions are considerably less fatiguing. This suggests that dynamic contraction might have further advantages in situations of sustained high G accelerations. Inflation of an anti-G suit on its own has little effect on arterial pressure at high G, however it exaggerates the blood pressure response to both traditional maneuvers and the dynamic leg press response. The effectiveness of this mechanism is not related to the magnitude of the suit inflation pressure above a pressure of 90 Torr. CISTI

**N91-30708** Institute for Perception RVO-TNO, Soesterberg (Netherlands). Traffic Behavior Group.

**THE USE OF AN ACTIVE GAS-PEDAL AS AN ELEMENT OF AN INTELLIGENT DRIVER SUPPORT SYSTEM: LITERATURE REVIEW AND EXPLORATIVE STUDY Final Report**

J. GODTHELP 29 Nov. 1990 21 p  
(IZF-1990-B-17; TD-90-3415; ETN-91-99825) Copyright Avail:  
Institute for Perception RVO-TNO, P.O. Box 23, 3769 ZG  
Soesterberg, Netherlands

The question whether an active gas pedal may serve as an element of an integrated information system in a car is studied. The idea behind the use of active controls is to reduce driver workload by using the controls, i.e., pedals and steering wheel, not only as control devices but as information systems to the driver. A short literature review is presented in which the effectiveness of conventional speed and headway controlling measures is discussed. The use of active controls in aerospace indicates that an active gaspedal might be an effective feedback system when using the pedal force as information carrier. For the sake of experimentation, a servocontrolled, programmable gas pedal is developed and mounted in the TNO driving simulator. An explorative experiment is carried out to demonstrate the potential effects of such a device. Subjects perform a dual tracking task with the steering wheel and the gas pedal controlling the horizontal and vertical position of a pointer which is projected on a screen in front of the simulator mockup. Different force feedback characteristics of the gas pedal serve as the main independent variable. The results show that force feedback about the tracking error may strongly improve performance. ESA

**N91-30709** Institute for Perception RVO-TNO, Soesterberg (Netherlands). Cognitive Psychology Group.

**AN EXPERIMENTAL COMPARISON BETWEEN DIFFERENT TYPES OF IN-CAR NAVIGATION INFORMATION Final Report**

J. M. C. SCHRAAGEN 23 Jan. 1991 22 p  
(IZF-1991-B-1; TD-91-0034; ETN-91-99827) Copyright Avail:  
Institute for Perception RVO-TNO, P.O. Box 23, 3769 ZG  
Soesterberg, Netherlands

An important design issue in the design of in-car navigation systems is what information to present to the driver. Guidelines for information presentation are developed based on a brief review of the literature. Three different types of navigation information are subsequently compared in a field experiment. The different navigation instructions are: arrows, instructions using road signs (e.g., Follow Utrecht), and multiple instructions presented simultaneously (e.g., Follow Utrecht, Follow Hoogland, Follow Leusden). The instructions are presented on cards. Forty two drivers, twenty one male and twenty one female, took part in the field study. Subjects followed navigation instructions on three different types of roads: highways, main roads within a city, and secondary roads in a residential area. Subjects were unfamiliar with the roads they drove on. Navigation errors, subjective workload estimates, and answers to questionnaires were recorded. The results show that subjects perform worse on all measures when following multiple instructions as compared to single instructions (arrows or road signs). Multiple instructions were found particularly unclear and unreliable on the busy main roads within cities rather than on highways. No differences were found between arrows and single instructions using road signs. ESA

**N91-30710#** Aeritalia S.p.A., Turin (Italy). Simulazione and Human Engineering.

**HUMAN ENGINEERING ACTIVITY FOR THE DEFINITION OF VISUAL AVIONIC SYSTEMS [ATTIVITA DI HUMAN ENGINEERING PER LA DEFINIZIONE DEI SISTEMI AVIONICI DI VISUALIZZAZIONE]**

MAURIZIO SPINONI 1991 24 p In ITALIAN  
(ETN-91-99510) Avail: NTIS HC/MF A03

Basic principles of man machine interactions in visual interface systems and activities pursued for their design are presented. Such methods, for example head up display, multifunction display, and control and helmet mounted display will be integrated to give the crew a complete situation awareness for higher performance. ESA

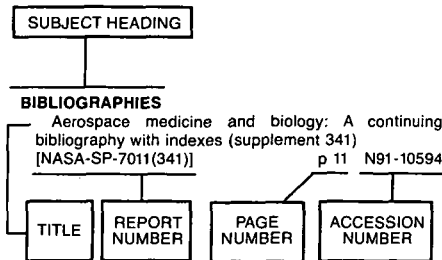
**N91-30711#** Cranfield Inst. of Tech., Bedford (England). Applied Psychology Unit.

**PREVENTING DRIVER ERROR AND MOTORCYCLE ACCIDENT CAUSATION: AN EMPIRICAL INVESTIGATION**

PETER BROOKS Mar. 1991 64 p Sponsored in part by  
Economic and Social Research Council  
(CRANFIELD-AERO-9106; ISBN-1-871564-14-X; ETN-91-99543)  
Avail: NTIS HC/MF A04

A framework which facilitates an understanding of driver error in interactions with Powered Two Wheelers (PTW) is presented. The concepts of technical awareness and social awareness are used to describe conditions which may predispose drivers to errors when interacting with PTW's. An empirical examination of the framework is presented, examining the relationship between lack of technical and/or social awareness and accident involvement. Relevant information was obtained from 700 drivers involved in accidents with PTW's within 9 police divisions in England. This information was compared with responses to a random survey of over 1500 drivers sampled from the same area. The results indicate that some of the most important factors in PTW accidents may be accounted for by the lack of driver technical and social awareness. It is concluded that using training and education to increase the technical and social awareness of drivers would be an area of high potential effectiveness. ESA

### Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of document content, a title extension is added, separated from the title by three hyphens. The accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence.

## A

### ACCELERATION PROTECTION

Evaluation of alternative methods for increasing tolerance to +Gz. A preliminary study of dynamic leg exercise [CTN-91-60213] p 332 N91-30707

### ACCELERATION STRESSES (PHYSIOLOGY)

Unlocking G-LOC p 329 A91-52837  
 Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674  
 Evaluation of alternative methods for increasing tolerance to +Gz. A preliminary study of dynamic leg exercise [CTN-91-60213] p 332 N91-30707

### ACCELERATION TOLERANCE

Unlocking G-LOC p 329 A91-52837  
 Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674  
 Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 2 [CTN-91-60128] p 331 N91-30704  
 Evaluation of alternative methods for increasing tolerance to +Gz. A preliminary study of dynamic leg exercise [CTN-91-60213] p 332 N91-30707

### ACCIDENT PREVENTION

Preventing driver error and motorcycle accident causation: An empirical investigation [CRANFIELD-AERO-9106] p 332 N91-30711

### ACCLIMATIZATION

Maximum oxygen uptake and arterial blood oxygenation during hypoxic exercise in rats p 303 A91-51408  
 Effect of alkalosis on maximum oxygen uptake in rats acclimated to simulated altitude p 303 A91-51409

### ACTIVE CONTROL

Active vibration damping of the Space Shuttle Remote Manipulator System [AIAA PAPER 91-2621] p 319 A91-49597

The use of an active gas-pedal as an element of an intelligent driver support system: Literature review and explorative study [IZF-1990-B-17] p 332 N91-30708

### ADAPTATION

Differences in thermoregulation mechanisms of rats during separate and combined adaptation to cold and heat p 301 A91-49569  
 Typological characteristics of defense reactions during chronophysiological stress p 308 A91-50854

The characteristics of adaptive shifts in participants of the Soviet-American Bering-Bridge expedition. I - The energy aspects of adaptation p 308 A91-50855

### ADAPTIVE FILTERS

Applications of adaptive filtering to ECG analysis - Noise cancellation and arrhythmia detection p 329 A91-52128

### ADHESIVES

Ventilation kinetics testing of a steel frame/rubber fabric underground shelter [AD-A237469] p 329 N91-29734

### ADRENAL GLAND

Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686

### ADRENAL METABOLISM

Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 311 N91-30672

### AEROSPACE MEDICINE

Medical causes of in-flight incapacitation - USAF experience 1978-1987 p 307 A91-50636  
 Human factors for pilots --- Book p 302 A91-50999  
 USSR Space Life Sciences Digest, issue 31 [NASA-CR-3922(37)] p 305 N91-30669  
 JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-90-018] p 311 N91-30670  
 JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-91-005] p 312 N91-30683  
 Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687  
 Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688

### AGRICULTURE

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-90-018] p 311 N91-30670

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-91-005] p 312 N91-30683

### AIR DEFENSE

Prescriptive eyeglass use by U.S. Navy jet pilots - Effects on air-to-air target detection p 323 A91-50627

### AIR TRAFFIC CONTROL

Pilot performance research for TCAS [SAE PAPER 902357] p 315 A91-49864

### AIR TRAFFIC CONTROLLERS (PERSONNEL)

Analysis of routine pilot-controller communication [SAE PAPER 902352] p 315 A91-49861  
 Pilot-controller communications - A controller's perspective [SAE PAPER 902353] p 315 A91-49862  
 An oral task-oriented dialogue for air-traffic controller training p 316 A91-51218

### AIRCRAFT COMMUNICATION

Pilot-controller communications - A controller's perspective [SAE PAPER 902353] p 315 A91-49862

### AIRCRAFT PILOTS

Analysis of routine pilot-controller communication [SAE PAPER 902352] p 315 A91-49861  
 Pilot-controller communications - A controller's perspective [SAE PAPER 902353] p 315 A91-49862  
 Prescriptive eyeglass use by U.S. Navy jet pilots - Effects on air-to-air target detection p 323 A91-50627  
 Dietary intake and blood lipid profile survey of fighter pilots at Tyndall Air Force Base p 306 A91-50630  
 Factors associated with leukocyturia in asymptomatic pilots p 307 A91-50637

Human factors for pilots --- Book p 302 A91-50999  
 Performance of several different Naval aviator communities on a cognitive/psychomotor test battery: Pipeline comparison and prediction [AD-A238564] p 317 N91-29730

The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array [AD-A238565] p 330 N91-29736

Evaluation of night vision goggles for maritime search and rescue. Volume 2: Data appendix [AD-A229393] p 331 N91-30702

Task analysis and workload prediction model of the MH-60K mission and a comparison with UH-60A workload predictions. Volume 3: Appendixes H through N [AD-A229408] p 331 N91-30703

### ALDOSTERONE

Passive heat exposure leads to delayed increase in plasma levels of atrial natriuretic peptide in humans p 306 A91-49207

### ALGAE

Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of Chlamydomonas [DE91-015792] p 304 N91-29713

### ALGORITHMS

Predicting the effect of linear and angular impact acceleration on humans p 311 N91-30678

### ALKALOSIS

Effect of alkalosis on maximum oxygen uptake in rats acclimated to simulated altitude p 303 A91-51409

### ALTITUDE ACCLIMATIZATION

Taxonomic analysis of individual reactions of an organism to hypoxia-related tests p 308 A91-50853  
 Sleep disturbances at high altitude. Role of a PCO2 apneic threshold [AD-A229426] p 312 N91-30680

### ALTITUDE SICKNESS

Relationships between symptoms, moods, performance, and acute mountain sickness at 4,700 meters p 315 A91-50632

### ANAEROBES

Microbiology and physiology of anaerobic fermentations of cellulose [DE91-015239] p 304 N91-29712

### ANALOG SIMULATION

Information processing in the outer retina [RSRE-MEMO-4469] p 313 N91-30694

### ANESTHETICS

Effect of axillary blockade on regional cerebral blood flow during static handgrip p 306 A91-49206

### ANGULAR ACCELERATION

Predicting the effect of linear and angular impact acceleration on humans p 311 N91-30678

### ANIMALS

Biological interactions of extremely-low-frequency electric and magnetic fields [DE90-011927] p 304 N91-29709

### ANTIBODIES

Reshaped human monoclonal antibodies for therapy and passive immunization [AD-A234770] p 312 N91-30682

### ANTIGENS

The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans p 302 A91-50633

### ANTI-HISTAMINICS

Development and evaluation of a human performance assessment battery [AD-A237391] p 316 N91-29724

### APTITUDE

Performance testing as a determinant of fitness-for-duty [SAE PAPER 901870] p 305 A91-48574

### ARCHITECTURE (COMPUTERS)

Studies in neural networks [AD-A237452] p 310 N91-29717

### ARCTIC REGIONS

The role of photoperiodism in the formation of adaptational changes in the human endocrine system in the north p 307 A91-50852

**ARMED FORCES (UNITED STATES)**

Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719

**ARRHYTHMIA**  
Applications of adaptive filtering to ECG analysis - Noise cancellation and arrhythmia detection p 329 A91-52128

**ARTIFICIAL INTELLIGENCE**  
Information processing in the outer retina [RSRE-MEMO-4469] p 313 N91-30694  
Representations in mental models [AD-A229401] p 317 N91-30696

**ATLANTIS (ORBITER)**  
Thermal design, analysis, and testing of the CETA Space Shuttle Flight Experiment [SAE PAPER 901790] p 318 A91-48530

**ATMOSPHERIC TURBULENCE**  
Irradiance distributions on the human retina from a laser observed through the turbulent atmosphere [PB91-196907] p 313 N91-30691

**ATROPHY**  
The effect of a space food bar diet on body and muscle mass in normal and hind-limb suspended rats p 302 A91-50634  
Elevated interstitial fluid volume in rat soleus muscles by hindlimb unweighting p 302 A91-51404

**AUDITORY DEFECTS**  
Damage risk for low-frequency impulse noise; the spectral factor in noise-induced hearing loss [IZF-1990-A-37] p 313 N91-30693

**AUDITORY FATIGUE**  
Damage risk for low-frequency impulse noise; the spectral factor in noise-induced hearing loss [IZF-1990-A-37] p 313 N91-30693

**AUDITORY PERCEPTION**  
Analysis of routine pilot-controller communication [SAE PAPER 902352] p 315 A91-49861  
Pilot-controller communications - A controller's perspective [SAE PAPER 902353] p 315 A91-49862  
Institute for the Study of Human Capabilities: Summary descriptions of research for the period December 1989 through September 1990 [AD-A237767] p 316 N91-29726  
Three-dimensional virtual acoustic displays [NASA-TM-103835] p 318 N91-30697

**AUTOMOBILE ACCIDENTS**  
Preventing driver error and motorcycle accident causation: An empirical investigation [CRANFIELD-AERO-9106] p 332 N91-30711

**AUTOMOBILES**  
The use of an active gas-pedal as an element of an intelligent driver support system: Literature review and explorative study [IZF-1990-B-17] p 332 N91-30708  
An experimental comparison between different types of in-car navigation information [IZF-1991-B-1] p 332 N91-30709

**AVIATION PSYCHOLOGY**  
The measurement of psychophysiological reactions of pilots to a stressor in a flight simulator p 306 A91-50629  
Current research and trends in aviation psychology in Poland p 315 A91-50639  
Human factors for pilots --- Book p 302 A91-50999

**B**

**BACK INJURIES**  
Canadian Forces flight trial of individually molded fiberglass lumbar supports [DCIEM-88-RR-12] p 331 N91-30706

**BACTERIA**  
Bacterial selectivity in the colonization of surface materials from groundwater and purified water systems [SAE PAPER 901423] p 328 A91-51364  
Microbiology and physiology of anaerobic fermentations of cellulose [DE91-015239] p 304 N91-29712

**BACTERIAL DISEASES**  
Survival of Mycoplasmas and Ureaplasmas in water and at elevated temperatures [SAE PAPER 901422] p 328 A91-51363

**BEARING (DIRECTION)**  
Tracking a head-mounted display in a room-sized environment with head-mounted cameras p 325 A91-51082

**BINOCULAR VISION**  
The effect on visual recognition performance of misregistration and overlap for a binocular helmet mounted display p 326 A91-51092  
Fundamental monocular/binocular HMD human factors p 326 A91-51093

Perception of 3-D transparent illusory surface in binocular fusion p 316 A91-51550

**BIOASTRONAUTICS**  
USSR Space Life Sciences Digest, issue 31 [NASA-CR-3922(37)] p 305 N91-30669

**BIOCHEMISTRY**  
Microbiology and physiology of anaerobic fermentations of cellulose [DE91-015239] p 304 N91-29712  
JPRS report: Science and technology, USSR: Life sciences [JPRS-ULS-90-018] p 311 N91-30670  
JPRS report: Science and technology, USSR: Life sciences [JPRS-ULS-91-005] p 312 N91-30683

**BIODYNAMICS**  
Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688

**BIOLOGICAL EFFECTS**  
Carnosine and its biological significance p 303 A91-52601

**BIOLOGICAL MODELS (MATHEMATICS)**  
Physiological modelling using RL [ITLI-CT-90-08] p 314 N91-30695

**BIOMAGNETISM**  
Biological interactions of extremely-low-frequency electric and magnetic fields [DE90-011927] p 304 N91-29709

**BIOMEDICAL DATA**  
Carnosine and its biological significance p 303 A91-52601

**BIOPHYSICS**  
Data acquisition system for collecting biophysical and physiological data [AD-A237654] p 304 N91-29710  
JPRS report: Science and technology, USSR: Life sciences [JPRS-ULS-91-005] p 312 N91-30683

**BIOREACTORS**  
Horizontally rotated cell culture system with a coaxial tubular oxygenator [NASA-CASE-MSC-21294-1] p 305 N91-30667

**BIOTECHNOLOGY**  
JPRS report: Science and technology, USSR: Life sciences [JPRS-ULS-90-018] p 311 N91-30670  
JPRS report: Science and technology, USSR: Life sciences [JPRS-ULS-91-005] p 312 N91-30683

**BLACKOUT (PHYSIOLOGY)**  
Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 2 [CTN-91-60128] p 331 N91-30704

**BLACKOUT PREVENTION**  
Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 2 [CTN-91-60128] p 331 N91-30704  
Evaluation of alternative methods for increasing tolerance to +Gz. A preliminary study of dynamic leg exercise [CTN-91-60213] p 332 N91-30707

**BLOOD**  
Influence of long-term antihypokinesia on activity of enzymes involved in energy and plastic metabolism p 311 N91-30675

**BLOOD CELLS**  
The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans p 302 A91-50633

**BLOOD CIRCULATION**  
A review: The 13th Annual Conference on Shock [AD-A237300] p 313 N91-30690  
Physiological modelling using RL [ITLI-CT-90-08] p 314 N91-30695

**BLOOD FLOW**  
Effect of axillary blockade on regional cerebral blood flow during static handgrip p 306 A91-49206  
Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405

**BLOOD PLASMA**  
Passive heat exposure leads to delayed increase in plasma levels of atrial natriuretic peptide in humans p 306 A91-49207  
Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674

**BLOOD PRESSURE**  
Effect of axillary blockade on regional cerebral blood flow during static handgrip p 306 A91-49206  
Passive heat exposure leads to delayed increase in plasma levels of atrial natriuretic peptide in humans p 306 A91-49207

Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 2 [CTN-91-60128] p 331 N91-30704

**BODY FLUIDS**

Hypobaric hypoxia (380 Torr) decreases intracellular and total body water in goats p 301 A91-49201  
Elevated interstitial fluid volume in rat soleus muscles by hindlimb unweighting p 302 A91-51404

**BODY TEMPERATURE**  
Effects of invariant sympathetic activity on cutaneous circulatory responses to heat stress p 301 A91-49202  
Heat loss from the human head during exercise p 306 A91-49204

Fundamentals of body energetics: Theoretical and practical aspects. I - The basic energetics, heat exchange, and thermoregulation --- Russian book p 304 A91-52726  
Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719

**BODY WEIGHT**  
The effect of a space food bar diet on body and muscle mass in normal and hind-limb suspended rats p 302 A91-50634

**BORESIGHTS**  
Head tracking accuracy in view of boresighting and parallax compensation p 326 A91-51094  
Aim Sight p 327 A91-51100

**BRAIN**  
Psychophysical studies of visual cortical function [AD-A238663] p 310 N91-29720  
Cognition and the brain [AD-A237846] p 316 N91-29727

**BRAIN DAMAGE**  
The functional architecture of visual object recognition [AD-A238617] p 317 N91-29732

**BRAIN STEM**  
High pressure modifies respiratory activity in isolated rat brain stem-spinal cord p 301 A91-49203

**BRIGHTNESS**  
Methods for evaluating discomfort glare [PB91-185132] p 310 N91-29722

**BUBBLES**  
Doppler indices of gas phase formation in hypobaric environments: Time-intensity analysis [NASA-TM-102176] p 313 N91-30692

**C**

**CALCIUM METABOLISM**  
Influence of long-term antihypokinesia on activity of enzymes involved in energy and plastic metabolism p 311 N91-30675

**CALORIC REQUIREMENTS**  
Feeding the Salyut-7 crews p 330 N91-30685

**CAMERAS**  
Tracking a head-mounted display in a room-sized environment with head-mounted cameras p 325 A91-51082

**CARBON DIOXIDE REMOVAL**  
The Extended Duration Orbiter Regenerable CO2 Removal System [SAE PAPER 901292] p 321 A91-50534

Preliminary evaluation of a membrane-based system for removing CO2 from air [SAE PAPER 901295] p 322 A91-50537  
Hybrid air revitalization system for a closed ecosystem [SAE PAPER 901311] p 322 A91-50539

Smoke and contaminant removal system for Space Station [SAE PAPER 901391] p 327 A91-51357

Space Station Freedom predevelopment operational system test (POST) carbon dioxide removal assembly [SAE PAPER 901392] p 327 A91-51358

**CARBON 13**  
Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of Chlamydomonas [DE91-015792] p 304 N91-29713

**CARDIOVASCULAR SYSTEM**  
Gender-based differences in the cardiovascular response to standing p 306 A91-50631  
The characteristics of adaptive shifts in participants of the Soviet-American Bering-Bridge expedition. I - The energy aspects of adaptation p 308 A91-50855

**CATECHOLAMINE**  
Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686

**CELL MEMBRANES (BIOLOGY)**  
Perturbation techniques for models of bursting electrical activity in pancreatic (beta)-cells [DE91-013901] p 309 N91-29715

**CELLS (BIOLOGY)**  
Studies in neural networks [AD-A237452] p 310 N91-29717

- Horizontally rotated cell culture system with a coaxial tubular oxygenator  
[NASA-CASE-MSC-21294-1] p 305 N91-30667
- Inhibition of olfactory receptor cells: An aquatic model  
[AD-A234437] p 312 N91-30681
- Reshaped human monoclonal antibodies for therapy and passive immunization  
[AD-A234770] p 312 N91-30682
- CELLULOSE**
- The conversion of lignocellulosics to fermentable sugars - A survey of current research and applications to CELSS  
[SAE PAPER 901282] p 321 A91-50531
- Microbiology and physiology of anaerobic fermentations of cellulose  
[DE91-015239] p 304 N91-29712
- CENTRAL NERVOUS SYSTEM**
- Neuromediatory interactions in specific and nonspecific structures of the central nervous system under the unloading of the locomotor apparatus and dosed visceral irritation p 303 A91-52602
- CEREBELLUM**
- Visual motion commands for pursuit eye movements in the cerebellum p 301 A91-48450
- CERTIFICATION**
- Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687
- CHECKOUT**
- The use and design of flightcrew checklists and manuals  
[AD-A237206] p 329 N91-29733
- CHEMICAL COMPOSITION**
- Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674
- CHLOROPHYLLS**
- Specific mutagenesis of a chlorophyll-binding protein  
[DE91-014813] p 304 N91-29711
- Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of *Chlamydomonas*  
[DE91-015792] p 304 N91-29713
- CHLOROPLASTS**
- Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of *Chlamydomonas*  
[DE91-015792] p 304 N91-29713
- CHOLINESTERASE**
- Influence of anticholinesterase on distribution of ventilation and gas exchange  
[AD-A229341] p 312 N91-30679
- CIRCULATORY SYSTEM**
- Effects of invariant sympathetic activity on cutaneous circulatory responses to heat stress p 301 A91-49202
- Effect of axillary blockage on regional cerebral blood flow during static handgrip p 306 A91-49206
- CLINICAL MEDICINE**
- JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-91-005] p 312 N91-30683
- CLOSED ECOLOGICAL SYSTEMS**
- The CELSS Test Facility - A foundation for crop research in space  
[SAE PAPER 901279] p 320 A91-50529
- Salad Machine - A vegetable production unit for long duration space missions  
[SAE PAPER 901280] p 320 A91-50530
- The conversion of lignocellulosics to fermentable sugars - A survey of current research and applications to CELSS  
[SAE PAPER 901282] p 321 A91-50531
- Hybrid air revitalization system for a closed ecosystem  
[SAE PAPER 901311] p 322 A91-50539
- CELSS simulations for a lunar outpost  
[SAE PAPER 901281] p 322 A91-50541
- COCKPIT SIMULATORS**
- Managing the modern cockpit; Proceedings of the 3rd Human Error Avoidance Techniques Conference, Dallas, TX, Dec. 4, 5, 1990  
[SAE P-239] p 314 A91-49857
- Implementation of new technology - A United Airline's perspective  
[SAE PAPER 902342] p 314 A91-49859
- COCKPITS**
- Aim Sight p 327 A91-51100
- The use and design of flightcrew checklists and manuals  
[AD-A237206] p 329 N91-29733
- Critique of a process proposed to determine CF aircrew/cockpit compatibility  
[DCIEM-R88-7C] p 331 N91-30705
- COGNITION**
- Institute for the Study of Human Capabilities: Summary descriptions of research for the period December 1989 through September 1990  
[AD-A237767] p 316 N91-29726
- Cognition and the brain  
[AD-A237846] p 316 N91-29727
- Performance of Marine AV-8B (Harrier) pilots on a cognitive/psychomotor test battery: Comparison and prediction  
[AD-A238563] p 317 N91-29729
- Performance of several different Naval aviator communities on a cognitive/psychomotor test battery: Pipeline comparison and prediction  
[AD-A238564] p 317 N91-29730
- Representations in mental models  
[AD-A229401] p 317 N91-30696
- Human cognitive processes in command and control planning. 1: Identification of research issues  
[IZF-1990-B-18] p 318 N91-30699
- COGNITIVE PSYCHOLOGY**
- Human cognitive processes in command and control planning. 1: Identification of research issues  
[IZF-1990-B-18] p 318 N91-30699
- COLD ACCLIMATIZATION**
- Differences in thermoregulation mechanisms of rats during separate and combined adaptation to cold and heat p 301 A91-49569
- The characteristics of adaptive shifts in participants of the Soviet-American Bering-Bridge expedition. I - The energy aspects of adaptation p 308 A91-50855
- COLLISION AVOIDANCE**
- Pilot performance research for TCAS  
[SAE PAPER 902357] p 315 A91-49864
- COLOR**
- Psychophysical studies of visual cortical function  
[AD-A238663] p 310 N91-29720
- COLOR CODING**
- A full-color wide-field-of-view holographic helmet-mounted display for pilot/vehicle interface development and human factors studies p 325 A91-51078
- COLOR VISION**
- Eye movements and spatial pattern vision  
[AD-A238664] p 310 N91-29721
- COMBAT**
- Head movements during simulated air-to-air engagements p 327 A91-51099
- COMFORT**
- Methods for evaluating discomfort glare  
[PB91-185132] p 310 N91-29722
- Canadian Forces flight trial of individually molded fiberglass lumbar supports  
[DCIEM-88-RR-12] p 331 N91-30706
- COMMAND AND CONTROL**
- A modular telerobotic task execution system  
p 324 A91-51000
- Human cognitive processes in command and control planning. 1: Identification of research issues  
[IZF-1990-B-18] p 318 N91-30699
- COMMERCIAL AIRCRAFT**
- Heart period as a useful index of pilot workload in commercial transport aircraft p 306 A91-48786
- COMMUNICATION EQUIPMENT**
- Preliminary investigations of tactile perception of graphical patterns  
[EUT-90-E-239] p 318 N91-30700
- COMPATIBILITY**
- Critique of a process proposed to determine CF aircrew/cockpit compatibility  
[DCIEM-R88-7C] p 331 N91-30705
- COMPENSATORY TRACKING**
- An informational perspective on skill transfer in human-machine systems p 325 A91-51022
- COMPUTER AIDED DESIGN**
- Thermal design, analysis, and testing of the CETA Space Shuttle Flight Experiment  
[SAE PAPER 901790] p 318 A91-48530
- COMPUTER GRAPHICS**
- Scene content and runway breadth effects on simulated landing approaches p 319 A91-48787
- COMPUTER PROGRAMS**
- Data acquisition system for collecting biophysical and physiological data  
[AD-A237654] p 304 N91-29710
- COMPUTERIZED SIMULATION**
- CELSS simulations for a lunar outpost  
[SAE PAPER 901281] p 322 A91-50541
- Physical/chemical closed-loop water-recycling for long-duration missions  
[SAE PAPER 901446] p 323 A91-50542
- Cognition and the brain  
[AD-A237846] p 316 N91-29727
- Task analysis and workload prediction model of the MH-60K mission and a comparison with UH-60A workload predictions. Volume 3: Appendixes H through N  
[AD-A229408] p 331 N91-30703
- Critique of a process proposed to determine CF aircrew/cockpit compatibility  
[DCIEM-R88-7C] p 331 N91-30705
- CONFERENCES**
- Managing the modern cockpit; Proceedings of the 3rd Human Error Avoidance Techniques Conference, Dallas, TX, Dec. 4, 5, 1990  
[SAE P-239] p 314 A91-49857
- Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers  
[SAE SP-831] p 320 A91-50527
- Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990  
[SPIE-1290] p 325 A91-51076
- Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990  
[SAE SP-829] p 327 A91-51356
- Hardware Implementation of Neuron Nets and Synapses Workshop  
[AD-A237704] p 310 N91-29718
- CONSUMABLES (SPACECREW SUPPLIES)**
- Feeding the Salyut-7 crews p 330 N91-30671
- CONTROL SIMULATION**
- The use of an active gas-pedal as an element of an intelligent driver support system: Literature review and explorative study  
[IZF-1990-B-17] p 332 N91-30708
- CONTROL SYSTEMS DESIGN**
- An experimental system for free-flying space robots and its system identification  
[AIAA PAPER 91-2825] p 319 A91-49767
- Multivariable control of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2828] p 319 A91-49770
- Design of an exoskeleton with kinesthetic feedback - Lessons learned p 324 A91-50983
- On control and planning of a space station robot walker p 324 A91-50987
- A preliminary analysis of the passive thermal control system for Space Station Freedom  
[SAE PAPER 901403] p 327 A91-51361
- CORROSION RESISTANCE**
- Bacterial selectivity in the colonization of surface materials from groundwater and purified water systems  
[SAE PAPER 901423] p 328 A91-51364
- COSMONAUTS**
- Feeding the Salyut-7 crews p 330 N91-30685
- Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686
- COSMOS SATELLITES**
- COSMOS 2044: Lung morphology study, experiment K-7-28  
[NASA-CR-187711] p 305 N91-30668
- COUPLING**
- A membrane model for spatiotemporal coupling  
[EUT-90-E-241] p 318 N91-30701
- CRASH INJURIES**
- Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677
- CREW WORKSTATIONS**
- Critique of a process proposed to determine CF aircrew/cockpit compatibility  
[DCIEM-R88-7C] p 331 N91-30705
- CRITERIA**
- Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687
- CRITICAL FLICKER FUSION**
- Spatiotemporal edge perception  
[IZF-1990-B-15] p 318 N91-30698
- CROP GROWTH**
- The CELSS Test Facility - A foundation for crop research in space  
[SAE PAPER 901279] p 320 A91-50529
- CULTURE TECHNIQUES**
- Horizontally rotated cell culture system with a coaxial tubular oxygenator  
[NASA-CASE-MSC-21294-1] p 305 N91-30667

## D

## DATA ACQUISITION

Data acquisition system for collecting biophysical and physiological data  
[AD-A237654] p 304 N91-29710

## DATA BASES

Medical causes of in-flight incapacitation - USAF experience 1978-1987 p 307 A91-50636

## DATA PROCESSING

Doppler indices of gas phase formation in hypobaric environments: Time-intensity analysis  
[NASA-TM-102176] p 313 N91-30692

## DECISION MAKING

- Factors affecting pilot decision-making in rejected takeoffs  
[SAE PAPER 902344] p 314 A91-49860  
Pilot performance research for TCAS  
[SAE PAPER 902357] p 315 A91-49864  
Determining flight task proficiency of students - A mathematical decision aid p 315 A91-51023

## DECISION THEORY

- Physiological modelling using RL  
[ITLI-CT-90-08] p 314 N91-30695

## DECOMPRESSION SICKNESS

- Doppler indices of gas phase formation in hypobaric environments: Time-intensity analysis  
[NASA-TM-102176] p 313 N91-30692

## DEHYDRATED FOOD

- Feeding the Salyut-7 crews p 330 N91-30671

## DEIONIZATION

- Water quality after electrodeionization  
[SAE PAPER 901421] p 328 A91-51362

## DEOXYRIBONUCLEIC ACID

- Reshaped human monoclonal antibodies for therapy and passive immunization  
[AD-A234770] p 312 N91-30682

## DIETS

- Dietary intake and blood lipid profile survey of fighter pilots at Tyndall Air Force Base p 306 A91-50630  
The effect of a space food bar diet on body and muscle mass in normal and hind-limb suspended rats p 302 A91-50634  
Feeding the Salyut-7 crews p 330 N91-30685

## DISABILITIES

- Compliant walker  
[NASA-CASE-GSC-13348-2] p 309 N91-29714

## DISPLAY DEVICES

- Pilot performance research for TCAS  
[SAE PAPER 902357] p 315 A91-49864  
Three-dimensional virtual acoustic displays  
[NASA-TM-103835] p 318 N91-30697  
An experimental comparison between different types of in-car navigation information  
[ZF-1991-B-1] p 332 N91-30709  
Human engineering activity for the definition of visual avionic systems  
[ETN-91-99510] p 332 N91-30710

## DOPA

- Pressure-induced striatal dopamine release correlates hyperlocomotor activity in rats exposed to high pressure p 301 A91-49205  
Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686

## DRUGS

- Carnosine and its biological significance p 303 A91-52601

## DYNAMIC RANGE

- Information processing in the outer retina  
[RSRE-MEMO-4469] p 313 N91-30694

## E

## EDEMA

- Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405

## EDGES

- Spatiotemporal edge perception  
[IZF-1990-B-15] p 318 N91-30698

## ELECTRIC POTENTIAL

- Perturbation techniques for models of bursting electrical activity in pancreatic (beta)-cells  
[DE91-013901] p 309 N91-29715

## ELECTROCARDIOGRAPHY

- Applications of adaptive filtering to ECG analysis - Noise cancellation and arrhythmia detection p 329 A91-52128

## ELECTROCHEMICAL OXIDATION

- Electrooxidation of organics in waste water  
[SAE PAPER 901312] p 322 A91-50540

## ELECTROCHEMISTRY

- Electrochemical amperometric gas sensors for environmental monitoring and control  
[SAE PAPER 901296] p 322 A91-50538

## ELECTROLYSIS

- Summary of static feed water electrolysis technology developments and applications for the Space Station and beyond  
[SAE PAPER 901293] p 321 A91-50535

## ELECTROLYTE METABOLISM

- Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674

## ELECTROMAGNETIC FIELDS

- Biological interactions of extremely-low-frequency electric and magnetic fields  
[DE90-011927] p 304 N91-29709

## ELECTRON DISTRIBUTION

- Chemical waste disposal in space by plasma discharge  
[NASA-CR-184169] p 330 N91-29737

## ELECTROPHYSIOLOGY

- Perturbation techniques for models of bursting electrical activity in pancreatic (beta)-cells  
[DE91-013901] p 309 N91-29715

## EMERGENCIES

- Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688

## EMOTIONS

- Predicting performance breakdown in pilots through objective measures of stress sensitivity  
[AD-A237540] p 316 N91-29725

## END EFFECTORS

- Multivariable control of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2828] p 319 A91-49770

## ENDOCRINE SYSTEMS

- The role of photoperiodism in the formation of adaptational changes in the human endocrine system in the north p 307 A91-50852

## ENERGY STORAGE

- Summary of static feed water electrolysis technology developments and applications for the Space Station and beyond  
[SAE PAPER 901293] p 321 A91-50535

## ENVIRONMENTAL CONTROL

- Expanded capabilities of the Extended Duration Orbiter  
[SAE PAPER 901290] p 321 A91-50532

- Summary of static feed water electrolysis technology developments and applications for the Space Station and beyond  
[SAE PAPER 901293] p 321 A91-50535

- Electrochemical amperometric gas sensors for environmental monitoring and control  
[SAE PAPER 901296] p 322 A91-50538

## ENVIRONMENTAL MONITORING

- Electrochemical amperometric gas sensors for environmental monitoring and control  
[SAE PAPER 901296] p 322 A91-50538  
Development of a water quality monitor for Space Station Freedom Life Support System  
[SAE PAPER 901426] p 328 A91-51366

## ENZYME ACTIVITY

- Influence of long-term antiorthostatic hypokinesia on activity of enzymes involved in energy and plastic metabolism p 311 N91-30675

## ENZYMES

- Status of lipid peroxidation system in rat tissues after 7-day flight on Kosmos-1667 p 305 N91-30673

## EPIDEMIOLOGY

- JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-91-005] p 312 N91-30683

## EPINEPHRINE

- Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686

## EXERCISE PHYSIOLOGY

- A comparison between computer-controlled and set work rate exercise based on target heart rate p 307 A91-50638  
Evaluation of alternative methods for increasing tolerance to +G acceleration, phase 2  
[CTN-91-60128] p 331 N91-30704

## EXOBIOLGY

- The CELSS Test Facility - A foundation for crop research in space  
[SAE PAPER 901279] p 320 A91-50529  
USSR Space Life Sciences Digest, issue 31  
[NASA-CR-3922(37)] p 305 N91-30669

## EXOSKELETONS

- Design of an exoskeleton with kinesthetic feedback - Lessons learned p 324 A91-50983

## EXPERT SYSTEMS

- An oral task-oriented dialogue for air-traffic controller training p 316 A91-51218

## EXTRAVEHICULAR ACTIVITY

- Space Station and advanced EVA technologies; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers  
[SAE SP-830] p 323 A91-50543  
Investigation into venting and non-venting technologies for the Space Station Freedom extravehicular activity life support system  
[SAE PAPER 901319] p 323 A91-50546  
Telerobotics as an EVA tool  
[SAE PAPER 901397] p 323 A91-50547  
EXTRAVEHICULAR MOBILITY UNITS  
Shuttle extravehicular mobility unit (EMU) operational enhancements  
[SAE PAPER 901317] p 323 A91-50544

- Investigation into venting and non-venting technologies for the Space Station Freedom extravehicular activity life support system  
[SAE PAPER 901319] p 323 A91-50546  
A holographic helmet mounted display application for the Extravehicular Mobility Unit p 325 A91-51077

## EYE MOVEMENTS

- Visual motion commands for pursuit eye movements in the cerebellum p 301 A91-48450  
Evaluation of eye tracking measurement systems for use with the fiber optic helmet mounted display p 320 A91-50473  
Eye movements and spatial pattern vision  
[AD-A238664] p 310 N91-29721  
Ocular-vestibular-motor interactions in experimental labyrinth asymmetry p 311 N91-30676  
EYEPieces  
The development of the combiner eyepiece night vision goggle p 325 A91-51079

## F

## FECES

- Collection and containment of solid human waste for Space Station  
[SAE PAPER 901393] p 327 A91-51359

## FEEDBACK CONTROL

- Considerations for the operator-robot interface in teleoperation p 324 A91-50981

## FERMENTATION

- The conversion of lignocelluloses to fermentable sugars - A survey of current research and applications to CELSS  
[SAE PAPER 901282] p 321 A91-50531  
Microbiology and physiology of anaerobic fermentations of cellulose  
[DE91-015239] p 304 N91-29712

## FIBER OPTICS

- Evaluation of eye tracking measurement systems for use with the fiber optic helmet mounted display p 320 A91-50473

## FIGHTER AIRCRAFT

- Dietary intake and blood lipid profile survey of fighter pilots at Tyndall Air Force Base p 306 A91-50630

## FINGERS

- White finger symptoms - A cross-sectional study p 307 A91-50635

## FIRE CONTROL

- Head movements during simulated air-to-air engagements p 327 A91-51099

## FIRES

- Smoke and contaminant removal system for Space Station  
[SAE PAPER 901391] p 327 A91-51357

## FLIGHT CREWS

- Communication variations and aircrew performance p 314 A91-48789  
Implementation of new technology - A United Airline's perspective  
[SAE PAPER 902342] p 314 A91-49859  
Medical causes of in-flight incapacitation - USAF experience 1978-1987 p 307 A91-50636  
The Martian imperative - Innovative approaches to life support for advanced space missions p 324 A91-50975

- Performance of several different Naval aviator communities on a cognitive/psychomotor test battery: Pipeline comparison and prediction  
[AD-A238564] p 317 N91-29730

- Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688

- Critique of a process proposed to determine CF aircrew/cockpit compatibility  
[DCIEM-R88-7C] p 331 N91-30705

- Canadian Forces flight trial of individually molded fiberglass lumbar supports  
[DCIEM-88-RR-12] p 331 N91-30706

## FLIGHT FITNESS

- Human factors for pilots --- Book p 302 A91-50999

## FLIGHT OPERATIONS

- Analysis of routine pilot-controller communication  
[SAE PAPER 902352] p 315 A91-49861  
The use and design of flightcrew checklists and manuals  
[AD-A237206] p 329 N91-29733

## FLIGHT SAFETY

- Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090

## FLIGHT SIMULATORS

- Factors affecting pilot decision-making in rejected takeoffs  
[SAE PAPER 902344] p 314 A91-49860

- The measurement of psychophysiological reactions of pilots to a stressor in a flight simulator p 306 A91-50629
- Current research and trends in aviation psychology in Poland p 315 A91-50639
- The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array [AD-A238565] p 330 N91-29736
- FLIGHT STRESS (BIOLOGY)**  
Human factors for pilots --- Book p 302 A91-50999
- FLIGHT TESTS**  
Canadian Forces flight trial of individually molded fiberglass lumbar supports [DCIEM-88-RR-12] p 331 N91-30706
- FLIGHT TRAINING**  
Determining flight task proficiency of students - A mathematical decision aid p 315 A91-51023  
Performance of Marine AV-8B (Harrier) pilots on a cognitive/psychomotor test battery: Comparison and prediction [AD-A238563] p 317 N91-29729
- FLIR DETECTORS**  
Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090  
Human factors of night vision devices: Anecdotes from the field concerning visual illusions and other effects [AD-A237641] p 329 N91-29735
- FOOD INTAKE**  
Dietary intake and blood lipid profile survey of fighter pilots at Tyndall Air Force Base p 306 A91-50630  
The effect of a space food bar diet on body and muscle mass in normal and hind-limb suspended rats p 302 A91-50634
- FOOD PRODUCTION (IN SPACE)**  
Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers [SAE SP-831] p 320 A91-50527  
Salad Machine - A vegetable production unit for long duration space missions [SAE PAPER 901280] p 320 A91-50530  
The conversion of lignocellulosics to fermentable sugars - A survey of current research and applications to CELSS [SAE PAPER 901282] p 321 A91-50531
- FRACTIONATION**  
Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of *Chlamydomonas* [DE91-015792] p 304 N91-29713
- G**
- GAS DETECTORS**  
Electrochemical amperometric, gas sensors for environmental monitoring and control [SAE PAPER 901296] p 322 A91-50538
- GAS EXCHANGE**  
Influence of anticholinesterase on distribution of ventilation and gas exchange [AD-A229341] p 312 N91-30679
- GENES**  
Reshaped human monoclonal antibodies for therapy and passive immunization [AD-A234770] p 312 N91-30682
- GENETIC ENGINEERING**  
Microbiology and physiology of anaerobic fermentations of cellulose [DE91-015239] p 304 N91-29712  
Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of *Chlamydomonas* [DE91-015792] p 304 N91-29713  
Reshaped human monoclonal antibodies for therapy and passive immunization [AD-A234770] p 312 N91-30682
- GENETICS**  
JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-90-018] p 311 N91-30670
- GLARE**  
Methods for evaluating discomfort glare [PB91-185132] p 310 N91-29722  
The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array [AD-A238565] p 330 N91-29736
- GOGGLES**  
The development of the combiner eyepiece night vision goggle p 325 A91-51079  
Resolution and signal-to-noise measurement U.S. Army night vision goggles p 326 A91-51095
- Human factors of night vision devices: Anecdotes from the field concerning visual illusions and other effects [AD-A237641] p 329 N91-29735
- Evaluation of night vision goggles for maritime search and rescue. Volume 2: Data appendix [AD-A229393] p 331 N91-30702
- GOVERNMENT PROCUREMENT**  
Implementation of new technology - A United Airline's perspective [SAE PAPER 902342] p 314 A91-49859
- GROUND WATER**  
Bacterial selectivity in the colonization of surface materials from groundwater and purified water systems [SAE PAPER 901423] p 328 A91-51364
- GYRATORS**  
A quasi-power theorem for bulk conductors - Comments on rheoencephalography p 319 A91-49329
- H**
- HAZARDOUS MATERIAL DISPOSAL (IN SPACE)**  
Chemical waste disposal in space by plasma discharge [NASA-CR-184169] p 330 N91-29737
- HAZARDS**  
Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688  
Damage risk for low-frequency impulse noise; the spectral factor in noise-induced hearing loss [IZF-1990-A-37] p 313 N91-30693
- HEAD (ANATOMY)**  
Heat loss from the human head during exercise p 306 A91-49204  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687
- HEAD MOVEMENT**  
Head tracking accuracy in view of boresighting and parallax compensation p 326 A91-51094  
Head movements during simulated air-to-air engagements p 327 A91-51099  
Ocular-vestibular-motor interactions in experimental labyrinth asymmetry p 311 N91-30676
- HEAD-UP DISPLAYS**  
The development of the combiner eyepiece night vision goggle p 325 A91-51079
- HEART RATE**  
Heart rate as a useful index of pilot workload in commercial transport aircraft p 306 A91-48786  
Effect of axillary blockade on regional cerebral blood flow during static handgrip p 306 A91-49206  
Passive heat exposure leads to delayed increase in plasma levels of atrial natriuretic peptide in humans p 306 A91-49207  
A comparison between computer-controlled and set work rate exercise based on target heart rate p 307 A91-50638  
Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719
- HEAT ACCLIMATION**  
Differences in thermoregulation mechanisms of rats during separate and combined adaptation to cold and heat p 301 A91-49569
- HEAT EXCHANGERS**  
Modular, thermal bus-to-radiator integral heat exchanger design for Space Station Freedom [SAE PAPER 901435] p 329 A91-51367
- HEAT TOLERANCE**  
Effects of invariant sympathetic activity on cutaneous circulatory responses to heat stress p 301 A91-49202  
Passive heat exposure leads to delayed increase in plasma levels of atrial natriuretic peptide in humans p 306 A91-49207  
Physiological responses to intermittent exercise as modified by heat stress and protective clothing [AD-A237447] p 309 N91-29716  
Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719
- HEAT TRANSFER**  
Fundamentals of body energetics: Theoretical and practical aspects. I - The basic energetics, heat exchange, and thermoregulation --- Russian book p 304 A91-52726
- HELICOPTER DESIGN**  
Rotorcraft human factors  
Man...machine...environment [SAE PAPER 902001] p 319 A91-48658
- HELICOPTERS**  
Human factors of night vision devices: Anecdotes from the field concerning visual illusions and other effects [AD-A237641] p 329 N91-29735
- Task analysis and workload prediction model of the MH-60K mission and a comparison with UH-60A workload predictions. Volume 3: Appendixes H through N [AD-A229408] p 331 N91-30703
- HELMET MOUNTED DISPLAYS**  
Evaluation of eye tracking measurement systems for use with the fiber optic helmet mounted display p 320 A91-50473  
Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990 [SPIE-1290] p 325 A91-51076  
A holographic helmet mounted display application for the Extravehicular Mobility Unit p 325 A91-51077  
A full-color wide-field-of-view holographic helmet-mounted display for pilot/vehicle interface development and human factors studies p 325 A91-51078  
The development of the combiner eyepiece night vision goggle p 325 A91-51079  
Tracking a head-mounted display in a room-sized environment with head-mounted cameras p 325 A91-51082  
Low light level television systems in helmet mounted displays p 326 A91-51083  
Visual processing - Implications for helmet mounted displays p 326 A91-51091  
The effect on visual recognition performance of misregistration and overlap for a biocular helmet mounted display p 326 A91-51092  
Fundamental monocular/binocular HMD human factors p 326 A91-51093  
Head tracking accuracy in view of boresighting and parallax compensation p 326 A91-51094  
Resolution and signal-to-noise measurement U.S. Army night vision goggles p 326 A91-51095  
Head movements during simulated air-to-air engagements p 327 A91-51099  
Aim Sight p 327 A91-51100  
Human engineering activity for the definition of visual avionic systems [ETN-91-99510] p 332 N91-30710
- HELMETS**  
Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687
- HEMATOCRIT**  
Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405
- HEMODYNAMIC RESPONSES**  
Gender-based differences in the cardiovascular response to standing p 306 A91-50631  
Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 2 [CTN-91-60128] p 331 N91-30704
- HIGH ALTITUDE BREATHING**  
Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405  
Sleep disturbances at high altitude. Role of a PCO2 apneic threshold [AD-A229426] p 312 N91-30680
- HIGH ALTITUDE ENVIRONMENTS**  
The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans p 302 A91-50633
- HIGH GRAVITY ENVIRONMENTS**  
Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 2 [CTN-91-60128] p 331 N91-30704
- HIGH PRESSURE**  
High pressure modifies respiratory activity in isolated rat brain stem-spinal cord p 301 A91-49203  
Pressure-induced striatal dopamine release correlates hyperlocomotor activity in rats exposed to high pressure p 301 A91-49205
- HIGH TEMPERATURE ENVIRONMENTS**  
Survival of *Mycoplasmas* and *Ureaplasmas* in water and at elevated temperatures [SAE PAPER 901422] p 328 A91-51363
- HOLOGRAPHY**  
Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990 [SPIE-1290] p 325 A91-51076  
A holographic helmet mounted display application for the Extravehicular Mobility Unit p 325 A91-51077  
A full-color wide-field-of-view holographic helmet-mounted display for pilot/vehicle interface development and human factors studies p 325 A91-51078  
Tracking a head-mounted display in a room-sized environment with head-mounted cameras p 325 A91-51082

## HORMONE METABOLISMS

The role of photoperiodism in the formation of adaptational changes in the human endocrine system in the north p 307 A91-50852

## HORMONES

Effect of hyperthermia on some hormonal and immunogenic characteristics of humans p 307 A91-50851

## HUMAN BEINGS

Reshaped human monoclonal antibodies for therapy and passive immunization [AD-A234770] p 312 N91-30682

## HUMAN BODY

Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688

## HUMAN FACTORS ENGINEERING

Rotorcraft human factors  
Man...machine...environment [SAE PAPER 902001] p 319 A91-48658  
The floating world at zero G p 319 A91-48938  
Human factors for pilots --- Book p 302 A91-50999  
Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990 [SPIE-1290] p 325 A91-51076

A full-color wide-field-of-view holographic helmet-mounted display for pilot/vehicle interface development and human factors studies p 325 A91-51078

Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090

Fundamental monocular/binocular HMD human factors p 326 A91-51093

Collection and containment of solid human waste for Space Station [SAE PAPER 901393] p 327 A91-51359

Compliant walker [NASA-CASE-GSC-13348-2] p 309 N91-29714

Human factors of night vision devices: Anecdotes from the field concerning visual illusions and other effects [AD-A237641] p 329 N91-29735

Human engineering activity for the definition of visual avionic systems [ETN-91-99510] p 332 N91-30710

## HUMAN PERFORMANCE

Communication variations and aircrew performance p 314 A91-48789

Relationships between symptoms, moods, performance, and acute mountain sickness at 4,700 meters p 315 A91-50632

Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719

Development and evaluation of a human performance assessment battery [AD-A237391] p 316 N91-29724

Institute for the Study of Human Capabilities: Summary descriptions of research for the period December 1989 through September 1990 [AD-A237767] p 316 N91-29726

The use of an active gas-pedal as an element of an intelligent driver support system: Literature review and explorative study [IZF-1990-B-17] p 332 N91-30708

An experimental comparison between different types of in-car navigation information [IZF-1991-B-1] p 332 N91-30709

## HUMAN TOLERANCES

Effect of hyperthermia on some hormonal and immunogenic characteristics of humans p 307 A91-50851

The role of photoperiodism in the formation of adaptational changes in the human endocrine system in the north p 307 A91-50852

Taxonomic analysis of individual reactions of an organism to hypoxia-related tests p 308 A91-50853

Typological characteristics of defense reactions during chronophysiological stress p 308 A91-50854

The characteristics of adaptive shifts in participants of the Soviet-American Bering-Bridge expedition. I - The energy aspects of adaptation p 308 A91-50855

## HUMAN WASTES

The extended duration orbiter waste collection system [SAE PAPER 901291] p 321 A91-50533

Electrooxidation of organics in waste water [SAE PAPER 901312] p 322 A91-50540

Collection and containment of solid human waste for Space Station [SAE PAPER 901393] p 327 A91-51359

## HYPEROXIA

Pulmonary function in men after oxygen breathing at 3.0 ATA for 3.5 h p 308 A91-51403

## HYPERTHERMIA

Heat loss from the human head during exercise p 306 A91-49204

Passive heat exposure leads to delayed increase in plasma levels of atrial natriuretic peptide in humans p 306 A91-49207

Effect of hyperthermia on some hormonal and immunogenic characteristics of humans p 307 A91-50851

## HYPOBARIC ATMOSPHERES

Hypobaric hypoxia (380 Torr) decreases intracellular and total body water in goats p 301 A91-49201

The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans p 302 A91-50633

## HYPOKINESIA

Physical work capacity of the organism in experiments with combined exposure to hypokinesia and radiation p 303 A91-52713

Influence of long-term antiothostatic hypokinesia on activity of enzymes involved in energy and plastic metabolism p 311 N91-30675

Ocular-vestibular-motor interactions in experimental labyrinth asymmetry p 311 N91-30676

## HYPOXEMIA

Maximum oxygen uptake and arterial blood oxygenation during hypoxic exercise in rats p 303 A91-51408

Effect of alkalosis on maximum oxygen uptake in rats acclimated to simulated altitude p 303 A91-51409

## HYPOXIA

Hypobaric hypoxia (380 Torr) decreases intracellular and total body water in goats p 301 A91-49201

Activity of acid phosphatase in the blood serum of rats with different types of hypoxia p 302 A91-49570

The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans p 302 A91-50633

Taxonomic analysis of individual reactions of an organism to hypoxia-related tests p 308 A91-50853

Hypoxia potentiates exercise-induced sympathetic neural activation in humans p 309 A91-51407

Maximum oxygen uptake and arterial blood oxygenation during hypoxic exercise in rats p 303 A91-51408

Effect of alkalosis on maximum oxygen uptake in rats acclimated to simulated altitude p 303 A91-51409

## I

## ILLUSIONS

Human factors of night vision devices: Anecdotes from the field concerning visual illusions and other effects [AD-A237641] p 329 N91-29735

## IMAGE PROCESSING

Visual processing - Implications for helmet mounted displays p 326 A91-51091

A membrane model for spatiotemporal coupling [EUT-90-E-241] p 318 N91-30701

## IMAGE RESOLUTION

Resolution and signal-to-noise measurement U.S. Army night vision goggles p 326 A91-51095

## IMAGERY

Cognition and the brain [AD-A237846] p 316 N91-29727

## IMAGING TECHNIQUES

Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090

## IMMUNE SYSTEMS

Effect of hyperthermia on some hormonal and immunogenic characteristics of humans p 307 A91-50851

Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401

## IMMUNOLOGY

The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans p 302 A91-50633

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-90-018] p 311 N91-30670

Reshaped human monoclonal antibodies for therapy and passive immunization [AD-A234770] p 312 N91-30682

## IMPACT ACCELERATION

Predicting the effect of linear and angular impact acceleration on humans p 311 N91-30678

Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688

## IMPACT DAMAGE

Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687

## INFORMATION PROCESSING (BIOLOGY)

Information processing in the outer retina [RSRE-MEMO-4469] p 313 N91-30694

## INFRARED IMAGERY

Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090

## INFRARED INSTRUMENTS

Tracking a head-mounted display in a room-sized environment with head-mounted cameras p 325 A91-51082

## INHIBITORS

Influence of anticholinesterase on distribution of ventilation and gas exchange [AD-A229341] p 312 N91-30679

## INJURIES

Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687

Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688

## IRRADIANCE

Irradiance distributions on the human retina from a laser observed through the turbulent atmosphere [PB91-196907] p 313 N91-30691

## J

## JET AIRCRAFT

Prescriptive eyeglass use by U.S. Navy jet pilots - Effects on air-to-air target detection p 323 A91-50627

## K

## KINESTHESIA

Design of an exoskeleton with kinesthetic feedback - Lessons learned p 324 A91-50983

## KNOWLEDGE REPRESENTATION

Representations in mental models [AD-A229401] p 317 N91-30696

## L

## LABYRINTH

Ocular-vestibular-motor interactions in experimental labyrinth asymmetry p 311 N91-30676

## LANDING SIMULATION

Scene content and runway breadth effects on simulated landing approaches p 319 A91-48787

## LASER APPLICATIONS

The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array [AD-A238565] p 330 N91-29736

## LASER BEAMS

Irradiance distributions on the human retina from a laser observed through the turbulent atmosphere [PB91-196907] p 313 N91-30691

## LENSES

Tracking a head-mounted display in a room-sized environment with head-mounted cameras p 325 A91-51082

## LEUKOCYTES

Factors associated with leukocyturia in asymptomatic pilots p 307 A91-50637

## LIFE SCIENCES

USSR Space Life Sciences Digest, issue 31 [NASA-CR-3922(37)] p 305 N91-30669

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-90-018] p 311 N91-30670

JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-91-005] p 312 N91-30683

## LIFE SUPPORT SYSTEMS

Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers [SAE SP-831] p 320 A91-50527

Long term life support for space exploration [SAE PAPER 901277] p 320 A91-50528

The CELSS Test Facility - A foundation for crop research in space [SAE PAPER 901279] p 320 A91-50529

Salad Machine - A vegetable production unit for long duration space missions [SAE PAPER 901280] p 320 A91-50530

The conversion of lignocellulosics to fermentable sugars - A survey of current research and applications to CELSS [SAE PAPER 901282] p 321 A91-50531

Expanded capabilities of the Extended Duration Orbiter [SAE PAPER 901290] p 321 A91-50532

Summary of static feed water electrolysis technology developments and applications for the Space Station and beyond [SAE PAPER 901293] p 321 A91-50535

Hybrid air revitalization system for a closed ecosystem [SAE PAPER 901311] p 322 A91-50539



- CELSS simulations for a lunar outpost  
[SAE PAPER 901281] p 322 A91-50541
- The Martian imperative - Innovative approaches to life support for advanced space missions p 324 A91-50975
- Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990  
[SAE SP-829] p 327 A91-51356
- Space Station Freedom predevelopment operational system test (POST) carbon dioxide removal assembly  
[SAE PAPER 901392] p 327 A91-51358
- Collection and containment of solid human waste for Space Station  
[SAE PAPER 901393] p 327 A91-51359
- Development of a water quality monitor for Space Station Freedom Life Support System  
[SAE PAPER 901426] p 328 A91-51366
- LIPID METABOLISM**
- Status of lipid peroxidation system in rat tissues after 7-day flight on Kosmos-1667 p 305 N91-30673
- Influence of long-term antiorthostatic hypokinesia on activity of enzymes involved in energy and plastic metabolism p 311 N91-30675
- LIPIDS**
- Dietary intake and blood lipid profile survey of fighter pilots at Tyndall Air Force Base p 306 A91-50630
- LITHIUM HYDROXIDES**
- The Extended Duration Orbiter Regenerable CO2 Removal System  
[SAE PAPER 901292] p 321 A91-50534
- LOCOMOTION**
- Pressure-induced striatal dopamine release correlates hyperlocomotor activity in rats exposed to high pressure p 301 A91-49205
- Mechanics of running under simulated low gravity p 308 A91-51402
- LONG DURATION SPACE FLIGHT**
- Long term life support for space exploration  
[SAE PAPER 901277] p 320 A91-50528
- Salad Machine - A vegetable production unit for long duration space missions  
[SAE PAPER 901280] p 320 A91-50530
- Expanded capabilities of the Extended Duration Orbiter  
[SAE PAPER 901290] p 321 A91-50532
- The extended duration orbiter waste collection system  
[SAE PAPER 901291] p 321 A91-50533
- The Extended Duration Orbiter Regenerable CO2 Removal System  
[SAE PAPER 901292] p 321 A91-50534
- Preliminary evaluation of a membrane-based system for removing CO2 from air  
[SAE PAPER 901295] p 322 A91-50537
- Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 311 N91-30672
- Status of lipid peroxidation system in rat tissues after 7-day flight on Kosmos-1667 p 305 N91-30673
- LUMBAR REGION**
- Canadian Forces flight trial of individually molded fiberglass lumbar supports  
[DCIEM-88-RR-12] p 331 N91-30706
- LUMINOUS INTENSITY**
- Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090
- LUNAR BASES**
- CELSS simulations for a lunar outpost  
[SAE PAPER 901281] p 322 A91-50541
- LUNAR FLIGHT**
- Radiation dose estimates for typical piloted NTR lunar and Mars mission engine operations  
[AIAA PAPER 91-3407] p 309 A91-52331
- LUNG MORPHOLOGY**
- COSMOS 2044: Lung morphology study, experiment K-7-28  
[NASA-CR-187711] p 305 N91-30668
- LUNGS**
- COSMOS 2044: Lung morphology study, experiment K-7-28  
[NASA-CR-187711] p 305 N91-30668
- LYMPHOCYTES**
- Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401
- LYSOSOMES**
- Activity of acid phosphatase in the blood serum of rats with different types of hypoxia p 302 A91-49570
- M**
- MAGNETIC FIELDS**
- Cognition and the brain  
[AD-A237846] p 316 N91-29727
- MAN MACHINE SYSTEMS**
- Performance testing as a determinant of fitness-for-duty  
[SAE PAPER 901870] p 305 A91-48574
- Rotorcraft human factors  
Man...machine...environment  
[SAE PAPER 902001] p 319 A91-48658
- Considerations for the operator-robot interface in teleoperation p 324 A91-50981
- An informational perspective on skill transfer in human-machine systems p 325 A91-51022
- A full-color wide-field-of-view holographic helmet-mounted display for pilot/vehicle interface development and human factors studies p 325 A91-51078
- Aim Sight p 327 A91-51100
- Compliant walker  
[NASA-CASE-GSC-13348-2] p 309 N91-29714
- Predicting the effect of linear and angular impact acceleration on humans p 311 N91-30678
- Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688
- MAN-COMPUTER INTERFACE**
- An oral task-oriented dialogue for air-traffic controller training p 316 A91-51218
- Three-dimensional virtual acoustic displays  
[NASA-TM-103835] p 318 N91-30697
- An experimental comparison between different types of in-car navigation information  
[IZF-1991-B-1] p 332 N91-30709
- Human engineering activity for the definition of visual avionic systems  
[ETN-91-99510] p 332 N91-30710
- MANNED MARS MISSIONS**
- The Martian imperative - Innovative approaches to life support for advanced space missions p 324 A91-50975
- Radiation dose estimates for typical piloted NTR lunar and Mars mission engine operations  
[AIAA PAPER 91-3407] p 309 A91-52331
- MANNED SPACE FLIGHT**
- Gender-based differences in the cardiovascular response to standing p 306 A91-50631
- MANUAL CONTROL**
- The use of an active gas-pedal as an element of an intelligent driver support system: Literature review and explorative study  
[IZF-1990-B-17] p 332 N91-30708
- MANUALS**
- The use and design of flightcrew checklists and manuals  
[AD-A237206] p 329 N91-29733
- MAP MATCHING GUIDANCE**
- An experimental comparison between different types of in-car navigation information  
[IZF-1991-B-1] p 332 N91-30709
- MATHEMATICAL MODELS**
- Perturbation techniques for models of bursting electrical activity in pancreatic (beta)-cells  
[DE91-013901] p 309 N91-29715
- Quantum measurement and the mind-brain connection  
[DE91-012343] p 316 N91-29723
- Analysis of Naval aviation selection test data with nonlinear models. Part 1: Parameter estimation  
[AD-A238244] p 317 N91-29728
- Predicting the effect of linear and angular impact acceleration on humans p 311 N91-30678
- A membrane model for spatiotemporal coupling  
[EUT-90-E-241] p 318 N91-30701
- Critique of a process proposed to determine CF aircrew/cockpit compatibility  
[DCIEM-R88-7C] p 331 N91-30705
- MEDICAL SERVICES**
- Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677
- MEMBRANES**
- Preliminary evaluation of a membrane-based system for removing CO2 from air  
[SAE PAPER 901295] p 322 A91-50537
- A membrane model for spatiotemporal coupling  
[EUT-90-E-241] p 318 N91-30701
- MENTAL PERFORMANCE**
- Cognition and the brain  
[AD-A237846] p 316 N91-29727
- Representations in mental models  
[AD-A229401] p 317 N91-30696
- METABOLISM**
- Fundamentals of body energetics: Theoretical and practical aspects. I - The basic energetics, heat exchange, and thermoregulation --- Russian book p 304 A91-52726
- Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686
- METABOLITES**
- Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686
- MICROBIOLOGY**
- Microbiology and physiology of anaerobic fermentations of cellulose  
[DE91-015239] p 304 N91-29712
- JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-90-018] p 311 N91-30670
- MICROORGANISMS**
- Survival of Mycoplasmas and Ureaplasmas in water and at elevated temperatures  
[SAE PAPER 901422] p 328 A91-51363
- Specific mutagenesis of a chlorophyll-binding protein  
[DE91-014813] p 304 N91-29711
- MINERAL METABOLISM**
- Influence of long-term antiorthostatic hypokinesia on activity of enzymes involved in energy and plastic metabolism p 311 N91-30675
- MOISTURE CONTENT**
- Hybrid air revitalization system for a closed ecosystem  
[SAE PAPER 901311] p 322 A91-50539
- MONOCULAR VISION**
- Fundamental monocular/binocular HMD human factors p 326 A91-51093
- MOODS**
- Relationships between symptoms, moods, performance, and acute mountain sickness at 4,700 meters p 315 A91-50632
- MOTION SICKNESS**
- Neuromediator interactions in specific and nonspecific structures of the central nervous system under the unloading of the locomotor apparatus and dosed visceral irritation p 303 A91-52602
- MULTIVARIABLE CONTROL**
- Multivariable control of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2828] p 319 A91-49770
- MUSCLES**
- Carnosine and its biological significance p 303 A91-52601
- MUSCULAR STRENGTH**
- The effect of a space food bar diet on body and muscle mass in normal and hind-limb suspended rats p 302 A91-50634
- Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 2  
[CTN-91-60128] p 331 N91-30704
- MUSCULAR TONUS**
- Mechanics of running under simulated low gravity p 308 A91-51402
- MUSCULOSKELETAL SYSTEM**
- Elevated interstitial fluid volume in rat soleus muscles by hindlimb unweighting p 302 A91-51404
- MUTATIONS**
- Specific mutagenesis of a chlorophyll-binding protein  
[DE91-014813] p 304 N91-29711
- Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of Chlamydomonas  
[DE91-015792] p 304 N91-29713
- N**
- NAVIGATION AIDS**
- Rotorcraft human factors  
Man...machine...environment  
[SAE PAPER 902001] p 319 A91-48658
- An experimental comparison between different types of in-car navigation information  
[IZF-1991-B-1] p 332 N91-30709
- NERVOUS SYSTEM**
- Studies in neural networks  
[AD-A237452] p 310 N91-29717
- NETWORK ANALYSIS**
- A quasi-power theorem for bulk conductors - Comments on rheoencephalography p 319 A91-49329
- NETWORK SYNTHESIS**
- A quasi-power theorem for bulk conductors - Comments on rheoencephalography p 319 A91-49329
- NEURAL NETS**
- Studies in neural networks  
[AD-A237452] p 310 N91-29717
- Hardware Implementation of Neuron Nets and Synapses Workshop  
[AD-A237704] p 310 N91-29718
- Representations in mental models  
[AD-A229401] p 317 N91-30696
- NEURONS**
- Hardware Implementation of Neuron Nets and Synapses Workshop  
[AD-A237704] p 310 N91-29718

## NEUROTRANSMITTERS

- Pressure-induced striatal dopamine release correlates hyperlocomotor activity in rats exposed to high pressure p 301 A91-49205
- Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 311 N91-30672
- Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686

## NIGHT FLIGHTS (AIRCRAFT)

- Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090

## NIGHT VISION

- The development of the combiner eyepiece night vision goggle p 325 A91-51079
- Low light level television systems in helmet mounted displays p 326 A91-51083
- Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090
- Resolution and signal-to-noise measurement U.S. Army night vision goggles p 326 A91-51095
- Human factors of night vision devices: Anecdotes from the field concerning visual illusions and other effects [AD-A237641] p 329 N91-29735
- Evaluation of night vision goggles for maritime search and rescue. Volume 2: Data appendix [AD-A229393] p 331 N91-30702

## NOISE (SOUND)

- Damage risk for low-frequency impulse noise; the spectral factor in noise-induced hearing loss [IZF-1990-A-37] p 313 N91-30693

## NOISE INJURIES

- Damage risk for low-frequency impulse noise; the spectral factor in noise-induced hearing loss [IZF-1990-A-37] p 313 N91-30693

## NOISE REDUCTION

- Applications of adaptive filtering to ECG analysis - Noise cancellation and arrhythmia detection p 329 A91-52128

## NONLINEAR SYSTEMS

- Analysis of Naval aviation selection test data with nonlinear models. Part 1: Parameter estimation [AD-A238244] p 317 N91-29728

## NORADRENALINE

- Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686

## NUCLEAR MEDICINE

- JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-91-005] p 312 N91-30683

## NUCLEAR PROPULSION

- Radiation dose estimates for typical piloted NTR lunar and Mars mission engine operations [AIAA PAPER 91-3407] p 309 A91-52331

## NUCLEAR RADIATION

- Ventilation kinetics testing of a steel frame/rubber fabric underground shelter [AD-A237469] p 329 N91-29734

## NUTRITIONAL REQUIREMENTS

- Dietary intake and blood lipid profile survey of fighter pilots at Tyndall Air Force Base p 306 A91-50630
- Feeding the Salyut-7 crews p 330 N91-30671

## O

## OLFACTORY PERCEPTION

- Studies in neural networks [AD-A237452] p 310 N91-29717
- Inhibition of olfactory receptor cells: An aquatic model [AD-A234437] p 312 N91-30681

## OPERATOR PERFORMANCE

- Intervention of human operators in automated spacecraft Rendezvous and Docking GNC [AIAA PAPER 91-2791] p 319 A91-49792

## OPHTHALMOLOGY

- Prescriptive eyeglass use by U.S. Navy jet pilots - Effects on air-to-air target detection p 323 A91-50627

## OPTICAL ILLUSION

- Perception of 3-D transparent illusory surface in binocular fusion p 316 A91-51550

## ORBITAL ASSEMBLY

- Telerobotics as an EVA tool [SAE PAPER 901397] p 323 A91-50547

## ORBITAL RENDEZVOUS

- Intervention of human operators in automated spacecraft Rendezvous and Docking GNC [AIAA PAPER 91-2791] p 319 A91-49792

## ORBITAL SERVICING

- Telerobotics as an EVA tool [SAE PAPER 901397] p 323 A91-50547

## ORGANIC LIQUIDS

- Electrooxidation of organics in waste water [SAE PAPER 901312] p 322 A91-50540

## ORTHOSTATIC TOLERANCE

- Gender-based differences in the cardiovascular response to standing p 306 A91-50631

## OVERPRESSURE

- Ventilation kinetics testing of a steel frame/rubber fabric underground shelter [AD-A237469] p 329 N91-29734

## OXIDATION

- Status of lipid peroxidation system in rat tissues after 7-day flight on Kosmos-1667 p 305 N91-30673

## OXYGEN BREATHING

- Pulmonary function in men after oxygen breathing at 3.0 ATA for 3.5 h p 308 A91-51403

## OXYGEN CONSUMPTION

- Influences of chemical sympathectomy and simulated weightlessness on male and female rats p 302 A91-51406
- Maximum oxygen uptake and arterial blood oxygenation during hypoxic exercise in rats p 303 A91-51408
- Effect of alkalosis on maximum oxygen uptake in rats acclimated to simulated altitude p 303 A91-51409
- Sleep disturbances at high altitude. Role of a PCO2 apneic threshold [AD-A229426] p 312 N91-30680
- OXIGENATION**
- Maximum oxygen uptake and arterial blood oxygenation during hypoxic exercise in rats p 303 A91-51408

## P

## PANCREAS

- Perturbation techniques for models of bursting electrical activity in pancreatic (beta)-cells [DE91-013901] p 309 N91-29715

## PARALLAX

- Head tracking accuracy in view of boresighting and parallax compensation p 326 A91-51094

## PARAMETER IDENTIFICATION

- Analysis of Naval aviation selection test data with nonlinear models. Part 1: Parameter estimation [AD-A238244] p 317 N91-29728

## PATHOGENESIS

- A review: The 13th Annual Conference on Shock [AD-A237300] p 313 N91-30690

## PATHOGENS

- Survival of Mycoplasmas and Ureaplasmas in water and at elevated temperatures [SAE PAPER 901422] p 328 A91-51363

## PATTERN RECOGNITION

- The effect on visual recognition performance of misregistration and overlap for a biocular helmet mounted display p 326 A91-51092
- The functional architecture of visual object recognition [AD-A238617] p 317 N91-29732
- Preliminary investigations of tactile perception of graphical patterns [EUT-90-E-239] p 318 N91-30700

## PEPTIDES

- Carnosine and its biological significance p 303 A91-52601

## PERFORMANCE PREDICTION

- Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719
- Predicting performance breakdown in pilots through objective measures of stress sensitivity [AD-A237540] p 316 N91-29725
- Analysis of Naval aviation selection test data with nonlinear models. Part 1: Parameter estimation [AD-A238244] p 317 N91-29728
- Predicting performance breakdown in pilots through objective measures of stress sensitivity [AD-A238597] p 317 N91-29731

## PERFORMANCE TESTS

- Development and evaluation of a human performance assessment battery [AD-A237391] p 316 N91-29724

## PEROXIDES

- Status of lipid peroxidation system in rat tissues after 7-day flight on Kosmos-1667 p 305 N91-30673

## PERSONNEL

- Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719

## PERSONNEL SELECTION

- Performance testing as a determinant of fitness-for-duty [SAE PAPER 901870] p 305 A91-48574

## PERSPIRATION

- Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719

## PERTURBATION THEORY

- Perturbation techniques for models of bursting electrical activity in pancreatic (beta)-cells [DE91-013901] p 309 N91-29715

## PHASE TRANSFORMATIONS

- Phase change water recovery for the Space Station Freedom and future exploration missions [SAE PAPER 901294] p 321 A91-50536

## PHOTODIODES

- Tracking a head-mounted display in a room-sized environment with head-mounted cameras p 325 A91-51082

## PHOTOSYNTHESIS

- Specific mutagenesis of a chlorophyll-binding protein [DE91-014813] p 304 N91-29711
- Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of Chlamydomonas [DE91-015792] p 304 N91-29713

## PHYSICAL EXAMINATIONS

- Performance testing as a determinant of fitness-for-duty [SAE PAPER 901870] p 305 A91-48574

## PHYSICAL EXERCISE

- Heat loss from the human head during exercise p 306 A91-49204
- A comparison between computer-controlled and set work rate exercise based on target heart rate p 307 A91-50638
- Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401
- Influences of chemical sympathectomy and simulated weightlessness on male and female rats p 302 A91-51406

- Hypoxia potentiates exercise-induced sympathetic neural activation in humans p 309 A91-51407
- Maximum oxygen uptake and arterial blood oxygenation during hypoxic exercise in rats p 303 A91-51408
- Effect of alkalosis on maximum oxygen uptake in rats acclimated to simulated altitude p 303 A91-51409
- Physiological responses to intermittent exercise as modified by heat stress and protective clothing [AD-A237447] p 309 N91-29716
- Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 2 [CTN-91-60128] p 331 N91-30704

## PHYSICAL WORK

- Physical work capacity of the organism in experiments with combined exposure to hypokinesia and radiation p 303 A91-52713

## PHYSIOLOGICAL DEFENSES

- Typological characteristics of defense reactions during chronophysiological stress p 308 A91-50854

## PHYSIOLOGICAL EFFECTS

- Biological interactions of extremely-low-frequency electric and magnetic fields [DE90-011927] p 304 N91-29709
- Data acquisition system for collecting biophysical and physiological data [AD-A237654] p 304 N91-29710
- Physiological responses to intermittent exercise as modified by heat stress and protective clothing [AD-A237447] p 309 N91-29716
- The functional architecture of visual object recognition [AD-A238617] p 317 N91-29732
- Human factors of night vision devices: Anecdotes from the field concerning visual illusions and other effects [AD-A237641] p 329 N91-29735
- Damage risk for low-frequency impulse noise; the spectral factor in noise-induced hearing loss [IZF-1990-A-37] p 313 N91-30693

## PHYSIOLOGICAL RESPONSES

- Physiological responses to intermittent exercise as modified by heat stress and protective clothing [AD-A237447] p 309 N91-29716
- Predicting the effect of linear and angular impact acceleration on humans p 311 N91-30678
- Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688

## PHYSIOLOGICAL TESTS

- Performance testing as a determinant of fitness-for-duty [SAE PAPER 901870] p 305 A91-48574
- Heart period as a useful index of pilot workload in commercial transport aircraft p 306 A91-48786
- Performance of Marine AV-8B (Harrier) pilots on a cognitive/psychomotor test battery: Comparison and prediction [AD-A238563] p 317 N91-29729
- Performance of several different Naval aviator communities on a cognitive/psychomotor test battery: Pipeline comparison and prediction [AD-A238564] p 317 N91-29730
- The functional architecture of visual object recognition [AD-A238617] p 317 N91-29732

- Evaluation of alternative methods for increasing tolerance to +Gz. A preliminary study of dynamic leg exercise  
[CTN-91-60213] p 332 N91-30707
- PHYSIOLOGY**  
Data acquisition system for collecting biophysical and physiological data  
[AD-A237654] p 304 N91-29710  
Microbiology and physiology of anaerobic fermentations of cellulose  
[DE91-015239] p 304 N91-29712  
Micro SAINT modeling of physiological and human performance in the heat  
[AD-A238659] p 310 N91-29719
- PILOT PERFORMANCE**  
Heart period as a useful index of pilot workload in commercial transport aircraft p 306 A91-48786  
Scene content and runway breadth effects on simulated landing approaches p 319 A91-48787  
Managing the modern cockpit; Proceedings of the 3rd Human Error Avoidance Techniques Conference, Dallas, TX, Dec. 4, 5, 1990  
[SAE P-239] p 314 A91-49857  
Pilot performance research for TCAS  
[SAE PAPER 902357] p 315 A91-49864  
The measurement of psychophysiological reactions of pilots to a stressor in a flight simulator p 306 A91-50629  
Current research and trends in aviation psychology in Poland p 315 A91-50639  
Determining flight task proficiency of students - A mathematical decision aid p 315 A91-51023  
Visual processing - Implications for helmet mounted displays p 326 A91-51091  
Fundamental monocular/binocular HMD human factors p 326 A91-51093  
Unlocking G-LOC p 329 A91-52837  
Predicting performance breakdown in pilots through objective measures of stress sensitivity  
[AD-A237540] p 316 N91-29725  
Analysis of Naval aviation selection test data with nonlinear models. Part 1: Parameter estimation  
[AD-A238244] p 317 N91-29728  
Performance of Marine AV-8B (Harrier) pilots on a cognitive/psychomotor test battery: Comparison and prediction  
[AD-A238563] p 317 N91-29729  
Performance of several different Naval aviator communities on a cognitive/psychomotor test battery: Pipeline comparison and prediction  
[AD-A238564] p 317 N91-29730  
Predicting performance breakdown in pilots through objective measures of stress sensitivity  
[AD-A238597] p 317 N91-29731  
The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array  
[AD-A238565] p 330 N91-29736  
Task analysis and workload prediction model of the MH-60K mission and a comparison with UH-60A workload predictions. Volume 3: Appendixes H through N  
[AD-A229408] p 331 N91-30703
- PILOT SELECTION**  
Predicting success in primary flying school from the Canadian automated pilot selection system - Derivation and cross-validation p 314 A91-48790  
Analysis of Naval aviation selection test data with nonlinear models. Part 1: Parameter estimation  
[AD-A238244] p 317 N91-29728
- PILOT TRAINING**  
Rotorcraft human factors -  
Man...machine...environment  
[SAE PAPER 902001] p 319 A91-48658  
Predicting success in primary flying school from the Canadian automated pilot selection system - Derivation and cross-validation p 314 A91-48790  
Implementation of new technology - A United Airline's perspective  
[SAE PAPER 902342] p 314 A91-49859  
Factors affecting pilot decision-making in rejected takeoffs  
[SAE PAPER 902344] p 314 A91-49860  
Current research and trends in aviation psychology in Poland p 315 A91-50639  
Determining flight task proficiency of students - A mathematical decision aid p 315 A91-51023
- PLANNING**  
Human cognitive processes in command and control planning. 1: Identification of research issues  
[IZF-1990-B-18] p 318 N91-30699
- PLASMA CHEMISTRY**  
Chemical waste disposal in space by plasma discharge  
[NASA-CR-184169] p 330 N91-29737
- PLASMA JETS**  
Chemical waste disposal in space by plasma discharge  
[NASA-CR-184169] p 330 N91-29737
- PLETHYSMOGRAPHY**  
A quasi-power theorem for bulk conductors - Comments on rheoencephalography p 319 A91-49329
- PORTABLE LIFE SUPPORT SYSTEMS**  
Space Station and advanced EVA technologies; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers  
[SAE SP-830] p 323 A91-50543  
Shuttle extravehicular mobility unit (EMU) operational enhancements  
[SAE PAPER 901317] p 323 A91-50544  
Investigation into venting and non-venting technologies for the Space Station Freedom extravehicular activity life support system  
[SAE PAPER 901319] p 323 A91-50546
- POTABLE WATER**  
Physical/chemical closed-loop water-recycling for long-duration missions  
[SAE PAPER 901446] p 323 A91-50542
- PREDICTION ANALYSIS TECHNIQUES**  
Predicting success in primary flying school from the Canadian automated pilot selection system - Derivation and cross-validation p 314 A91-48790  
Task analysis and workload prediction model of the MH-60K mission and a comparison with UH-60A workload predictions. Volume 3: Appendixes H through N  
[AD-A229408] p 331 N91-30703
- PREDICTIONS**  
Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688
- PRESSURE EFFECTS**  
High pressure modifies respiratory activity in isolated rat brain stem-spinal cord p 301 A91-49203  
Pressure-induced striatal dopamine release correlates hyperlocomotor activity in rats exposed to high pressure p 301 A91-49205
- PROBABILITY THEORY**  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677  
Predicting the effect of linear and angular impact acceleration on humans p 311 N91-30678  
Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688
- PROGRAMMING LANGUAGES**  
Physiological modelling using RL  
[ITLI-CT-90-08] p 314 N91-30695
- PROJECTIVE GEOMETRY**  
Scene content and runway breadth effects on simulated landing approaches p 319 A91-48787
- PROTECTION**  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687
- PROTECTIVE CLOTHING**  
Physiological responses to intermittent exercise as modified by heat stress and protective clothing  
[AD-A237447] p 309 N91-29716
- PROTEINS**  
Specific mutagenesis of a chlorophyll-binding protein  
[DE91-014813] p 304 N91-29711
- PSYCHOLOGY**  
JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-91-005] p 312 N91-30683
- PSYCHOMOTOR PERFORMANCE**  
Performance of Marine AV-8B (Harrier) pilots on a cognitive/psychomotor test battery: Comparison and prediction  
[AD-A238563] p 317 N91-29729  
Performance of several different Naval aviator communities on a cognitive/psychomotor test battery: Pipeline comparison and prediction  
[AD-A238564] p 317 N91-29730
- PSYCHOPHYSICS**  
Psychophysical studies of visual cortical function  
[AD-A238663] p 310 N91-29720
- PSYCHOPHYSIOLOGY**  
The measurement of psychophysiological reactions of pilots to a stressor in a flight simulator p 306 A91-50629  
Institute for the Study of Human Capabilities: Summary descriptions of research for the period December 1989 through September 1990  
[AD-A237767] p 316 N91-29726
- PUBLIC HEALTH**  
JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-90-018] p 311 N91-30670  
JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-91-005] p 312 N91-30683
- PULMONARY FUNCTIONS**  
Pulmonary function in men after oxygen breathing at 3.0 ATA for 3.5 h p 308 A91-51403  
Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405
- PURIFICATION**  
Bacterial selectivity in the colonization of surface materials from groundwater and purified water systems  
[SAE PAPER 901423] p 328 A91-51364
- PURSUIT TRACKING**  
An informational perspective on skill transfer in human-machine systems p 325 A91-51022
- Q**
- QUALITY CONTROL**  
Development of a water quality monitor for Space Station Freedom Life Support System  
[SAE PAPER 901426] p 328 A91-51366
- QUANTUM MECHANICS**  
Quantum measurement and the mind-brain connection  
[DE91-012343] p 316 N91-29723
- QUANTUM THEORY**  
Quantum measurement and the mind-brain connection  
[DE91-012343] p 316 N91-29723
- R**
- RADIATION CHEMISTRY**  
Chemical waste disposal in space by plasma discharge  
[NASA-CR-184169] p 330 N91-29737
- RADIATION DOSAGE**  
Radiation dose estimates for typical piloted NTR lunar and Mars mission engine operations  
[AIAA PAPER 91-3407] p 309 A91-52331
- RADIATION EFFECTS**  
Physical work capacity of the organism in experiments with combined exposure to hypokinesia and radiation p 303 A91-52713  
Biological interactions of extremely-low-frequency electric and magnetic fields  
[DE90-011927] p 304 N91-29709  
JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-90-018] p 311 N91-30670
- RADIATION PROTECTION**  
Radiation dose estimates for typical piloted NTR lunar and Mars mission engine operations  
[AIAA PAPER 91-3407] p 309 A91-52331
- RADIOACTIVE WASTES**  
Chemical waste disposal in space by plasma discharge  
[NASA-CR-184169] p 330 N91-29737
- RAPID EYE MOVEMENT STATE**  
Sleep disturbances at high altitude. Role of a PCO2 apneic threshold  
[AD-A229426] p 312 N91-30680
- RATINGS**  
Methods for evaluating discomfort glare  
[PB91-185132] p 310 N91-29722
- RATIONS**  
Feeding the Salyut-7 crews p 330 N91-30685
- REDUCED GRAVITY**  
Mechanics of running under simulated low gravity p 308 A91-51402  
Elevated interstitial fluid volume in rat soleus muscles by hindlimb unweighting -  
COSMOS 2044: Lung morphology study, experiment K-7-28  
[NASA-CR-187711] p 305 N91-30668
- REGRESSION ANALYSIS**  
Analysis of Naval aviation selection test data with nonlinear models. Part 1: Parameter estimation  
[AD-A238244] p 317 N91-29728
- RELIABILITY ENGINEERING**  
Shuttle extravehicular mobility unit (EMU) operational enhancements  
[SAE PAPER 901317] p 323 A91-50544
- REMOTE MANIPULATOR SYSTEM**  
Active vibration damping of the Space Shuttle Remote Manipulator System p 319 A91-49597  
Multivariable control of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2621] p 319 A91-49597  
[AIAA PAPER 91-2828] p 319 A91-49770
- RESCUE OPERATIONS**  
Evaluation of night vision goggles for maritime search and rescue. Volume 2: Data appendix  
[AD-A229393] p 331 N91-30702
- RESEARCH AND DEVELOPMENT**  
JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-91-005] p 312 N91-30683

## RESPIRATION

Sleep disturbances at high altitude. Role of a PCO2 apneic threshold  
[AD-A229426] p 312 N91-30680

## RESPIRATORY REFLEXES

High pressure modifies respiratory activity in isolated rat brain stem-spinal cord p 301 A91-49203

## RETINA

Irradiance distributions on the human retina from a laser observed through the turbulent atmosphere  
[PB91-196907] p 313 N91-30691

Information processing in the outer retina  
[RSRE-MEMO-4469] p 313 N91-30694

## RETINAL ADAPTATION

Spatiotemporal edge perception  
[IZF-1990-B-15] p 318 N91-30698

## RETINAL IMAGES

Spatiotemporal edge perception  
[IZF-1990-B-15] p 318 N91-30698

## RHEOENCEPHALOGRAPHY

A quasi-power theorem for bulk conductors - Comments on rheoencephalography p 319 A91-49329

## RHEOLOGY

Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405

## ROBOT ARMS

A modular telerobotic task execution system p 324 A91-51000

## ROBOT CONTROL

An experimental system for free-flying space robots and its system identification  
[AIAA PAPER 91-2825] p 319 A91-49767

Multivariable control of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2828] p 319 A91-49770

Considerations for the operator-robot interface in teleoperation p 324 A91-50981

Design of an exoskeleton with kinesthetic feedback - Lessons learned p 324 A91-50983

On control and planning of a space station robot walker p 324 A91-50987

A modular telerobotic task execution system p 324 A91-51000

Generalized compliant motion task description and execution within a complete telerobotic system p 324 A91-51001

## ROBOT DYNAMICS

An experimental system for free-flying space robots and its system identification  
[AIAA PAPER 91-2825] p 319 A91-49767

On control and planning of a space station robot walker p 324 A91-50987

A modular telerobotic task execution system p 324 A91-51000

Generalized compliant motion task description and execution within a complete telerobotic system p 324 A91-51001

## ROTORCRAFT AIRCRAFT

Rotorcraft human factors  
Man...machine...environment  
[SAE PAPER 902001] p 319 A91-48658

## RUBBER

Ventilation kinetics testing of a steel frame/rubber fabric underground shelter  
[AD-A237469] p 329 N91-29734

## RUNNING

Mechanics of running under simulated low gravity p 308 A91-51402

## RUNWAYS

Scene content and runway breadth effects on simulated landing approaches p 319 A91-48787

## S

## SALYUT SPACE STATION

Feeding the Salyut-7 crews p 330 N91-30685

Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686

## SEATS

Canadian Forces flight trial of individually molded fiberglass lumbar supports  
[DCIEM-88-RR-12] p 331 N91-30706

## SENSE ORGANS

Inhibition of olfactory receptor cells: An aquatic model  
[AD-A234437] p 312 N91-30681

## SENSORY DISCRIMINATION

The functional architecture of visual object recognition  
[AD-A238617] p 317 N91-29732

## SERUMS

Activity of acid phosphatase in the blood serum of rats with different types of hypoxia p 302 A91-49570

## SERVICE LIFE

Shuttle extravehicular mobility unit (EMU) operational enhancements  
[SAE PAPER 901317] p 323 A91-50544

## SEX FACTOR

Gender-based differences in the cardiovascular response to standing p 306 A91-50631

## SHELLFISH

Inhibition of olfactory receptor cells: An aquatic model  
[AD-A234437] p 312 N91-30681

## SHELTERS

Ventilation kinetics testing of a steel frame/rubber fabric underground shelter  
[AD-A237469] p 329 N91-29734

## SHOCK (PHYSIOLOGY)

A review: The 13th Annual Conference on Shock  
[AD-A237300] p 313 N91-30690

## SICKNESSES

Medical causes of in-flight incapacitation - USAF experience 1978-1987 p 307 A91-50636

## SIDES

Ventilation kinetics testing of a steel frame/rubber fabric underground shelter  
[AD-A237469] p 329 N91-29734

## SIGNAL TO NOISE RATIOS

Resolution and signal-to-noise measurement U.S. Army night vision goggles p 326 A91-51095

## SIGNS AND SYMPTOMS

Relationships between symptoms, moods, performance, and acute mountain sickness at 4,700 meters p 315 A91-50632

White finger symptoms - A cross-sectional study p 307 A91-50635

A review: The 13th Annual Conference on Shock  
[AD-A237300] p 313 N91-30690

## SITTING POSITION

Canadian Forces flight trial of individually molded fiberglass lumbar supports  
[DCIEM-88-RR-12] p 331 N91-30706

## SLEEP

Sleep disturbances at high altitude. Role of a PCO2 apneic threshold  
[AD-A229426] p 312 N91-30680

## SMOKE

Smoke and contaminant removal system for Space Station  
[SAE PAPER 901391] p 327 A91-51357

## SOLID WASTES

Collection and containment of solid human waste for Space Station  
[SAE PAPER 901393] p 327 A91-51359

## SPACE ADAPTATION SYNDROME

Ocular-vestibular-motor interactions in experimental labyrinth asymmetry p 311 N91-30676

## SPACE EXPLORATION

Long term life support for space exploration  
[SAE PAPER 901277] p 320 A91-50528

## SPACE FLIGHT

Physical work capacity of the organism in experiments with combined exposure to hypokinesia and radiation p 303 A91-52713

## SPACE FLIGHT FEEDING

The effect of a space food bar diet on body and muscle mass in normal and hind-limb suspended rats p 302 A91-50634

Feeding the Salyut-7 crews p 330 N91-30671

Feeding the Salyut-7 crews p 330 N91-30685

## SPACE FLIGHT STRESS

Gender-based differences in the cardiovascular response to standing p 306 A91-50631

The effect of a space food bar diet on body and muscle mass in normal and hind-limb suspended rats p 302 A91-50634

Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 311 N91-30672

Status of lipid peroxidation system in rat tissues after 7-day flight on Kosmos-1667 p 305 N91-30673

## SPACE MAINTENANCE

Telerobotics as an EVA tool  
[SAE PAPER 901397] p 323 A91-50547

## SPACE MISSIONS

Salad Machine - A vegetable production unit for long duration space missions  
[SAE PAPER 901280] p 320 A91-50530

Phase change water recovery for the Space Station Freedom and future exploration missions  
[SAE PAPER 901294] p 321 A91-50536

## SPACE NAVIGATION

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

## SPACE PERCEPTION

Perception of 3-D transparent illusory surface in binocular fusion p 316 A91-51550

Human factors of night vision devices: Anecdotes from the field concerning visual illusions and other effects  
[AD-A237641] p 329 N91-29735

## SPACE SHUTTLE ORBITERS

Expanded capabilities of the Extended Duration Orbiter  
[SAE PAPER 901290] p 321 A91-50532

The extended duration orbiter waste collection system  
[SAE PAPER 901291] p 321 A91-50533

The Extended Duration Orbiter Regenerable CO2 Removal System  
[SAE PAPER 901292] p 321 A91-50534

## SPACE SHUTTLE PAYLOADS

Thermal design, analysis, and testing of the CETA Space Shuttle Flight Experiment  
[SAE PAPER 901790] p 318 A91-48530

Multivariable control of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2828] p 319 A91-49770

## SPACE SHUTTLES

Active vibration damping of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2621] p 319 A91-49597

## SPACE STATION FREEDOM

The CELSS Test Facility - A foundation for crop research in space  
[SAE PAPER 901279] p 320 A91-50529

Summary of static feed water electrolysis technology developments and applications for the Space Station and beyond  
[SAE PAPER 901293] p 321 A91-50535

Phase change water recovery for the Space Station Freedom and future exploration missions  
[SAE PAPER 901294] p 321 A91-50536

Space Station and advanced EVA technologies; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers  
[SAE SP-830] p 323 A91-50543

Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990  
[SAE SP-829] p 327 A91-51356

Smoke and contaminant removal system for Space Station  
[SAE PAPER 901391] p 327 A91-51357

Space Station Freedom predevelopment operational system test (POST) carbon dioxide removal assembly  
[SAE PAPER 901392] p 327 A91-51358

Collection and containment of solid human waste for Space Station  
[SAE PAPER 901393] p 327 A91-51359

A preliminary analysis of the passive thermal control system for Space Station Freedom  
[SAE PAPER 901403] p 327 A91-51361

Development of a water quality monitor for Space Station Freedom Life Support System  
[SAE PAPER 901426] p 328 A91-51366

Modular, thermal bus-to-radiator integral heat exchanger design for Space Station Freedom  
[SAE PAPER 901435] p 329 A91-51367

The floating world at zero G p 319 A91-48938

On control and planning of a space station robot walker p 324 A91-50987

## SPACE SUITS

Space Station and advanced EVA technologies; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers  
[SAE SP-830] p 323 A91-50543

Shuttle extravehicular mobility unit (EMU) operational enhancements  
[SAE PAPER 901317] p 323 A91-50544

## SPACE TOOLS

An experimental system for free-flying space robots and its system identification  
[AIAA PAPER 91-2825] p 319 A91-49767

## SPACECRAFT CABIN ATMOSPHERES

Preliminary evaluation of a membrane-based system for removing CO2 from air  
[SAE PAPER 901295] p 322 A91-50537

Electrochemical amperometric gas sensors for environmental monitoring and control  
[SAE PAPER 901296] p 322 A91-50538

Hybrid air revitalization system for a closed ecosystem  
[SAE PAPER 901311] p 322 A91-50539

## SPACECRAFT CONTAMINATION

Smoke and contaminant removal system for Space Station  
[SAE PAPER 901391] p 327 A91-51357

## SPACECRAFT DESIGN

The floating world at zero G p 319 A91-48938

## SPACECRAFT DOCKING

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

**SPACECRAFT ENVIRONMENTS**

Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990  
[SAE SP-829] p 327 A91-51356

Smoke and contaminant removal system for Space Station  
[SAE PAPER 901391] p 327 A91-51357

Space Station Freedom predevelopment operational system test (POST) carbon dioxide removal assembly  
[SAE PAPER 901392] p 327 A91-51358

**SPACECRAFT GUIDANCE**

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

**SPACECRAFT RADIATORS**

Modular, thermal bus-to-radiator integral heat exchanger design for Space Station Freedom  
[SAE PAPER 901435] p 329 A91-51367

**SPACECRAFT TEMPERATURE**

Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990  
[SAE SP-829] p 327 A91-51356

A preliminary analysis of the passive thermal control system for Space Station Freedom  
[SAE PAPER 901403] p 327 A91-51361

Modular, thermal bus-to-radiator integral heat exchanger design for Space Station Freedom  
[SAE PAPER 901435] p 329 A91-51367

**SPACECREW TRANSFER**

Thermal design, analysis, and testing of the CETA Space Shuttle Flight Experiment  
[SAE PAPER 901790] p 318 A91-48530

Space Station and advanced EVA technologies; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers  
[SAE SP-830] p 323 A91-50543

**SPACECREWS**

Survival of Mycoplasmas and Ureaplasmas in water and at elevated temperatures  
[SAE PAPER 901422] p 328 A91-51363

Feeding the Salyut-7 crews p 330 N91-30671

Feeding the Salyut-7 crews p 330 N91-30685

**SPATIAL DISTRIBUTION**

Eye movements and spatial pattern vision  
[AD-A238664] p 310 N91-29721

**SPATIAL RESOLUTION**

A membrane model for spatiotemporal coupling  
[EUT-90-E-241] p 318 N91-30701

**SPEECH RECOGNITION**

An oral task-oriented dialogue for air-traffic controller training  
p 316 A91-51218

**SPEED CONTROL**

The use of an active gas-pedal as an element of an intelligent driver support system: Literature review and explorative study  
[IZF-1990-B-17] p 332 N91-30708

**SPINAL CORD**

High pressure modifies respiratory activity in isolated rat brain stem-spinal cord p 301 A91-49203

**SPLEEN**

Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401

**STEREOSCOPIC VISION**

Perception of 3-D transparent illusory surface in binocular fusion p 316 A91-51550

**STRESS (BIOLOGY)**

Typological characteristics of defense reactions during chronophysiological stress p 308 A91-50854

**STRESS (PHYSIOLOGY)**

The measurement of psychophysiological reactions of pilots to a stressor in a flight simulator  
p 306 A91-50629

Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401

Physiological responses to intermittent exercise as modified by heat stress and protective clothing  
[AD-A237447] p 309 N91-29716

**STRESS (PSYCHOLOGY)**

The measurement of psychophysiological reactions of pilots to a stressor in a flight simulator  
p 306 A91-50629

Predicting performance breakdown in pilots through objective measures of stress sensitivity  
[AD-A237540] p 316 N91-29725

Predicting performance breakdown in pilots through objective measures of stress sensitivity  
[AD-A238597] p 317 N91-29731

**SUGARS**

The conversion of lignocellulosics to fermentable sugars - A survey of current research and applications to CELSS  
[SAE PAPER 901282] p 321 A91-50531

**SUPERCONDUCTING MAGNETS**

Cognition and the brain  
[AD-A237846] p 316 N91-29727

**SUPERSATURATION**

Doppler indices of gas phase formation in hypobaric environments: Time-intensity analysis  
[NASA-TM-102176] p 313 N91-30692

**SUPPORTS**

Canadian Forces flight trial of individually molded fiberglass lumbar supports  
[DCIEM-88-RR-12] p 331 N91-30706

**SURFACE PROPERTIES**

Bacterial selectivity in the colonization of surface materials from groundwater and purified water systems  
[SAE PAPER 901423] p 328 A91-51364

**SYMPATHETIC NERVOUS SYSTEM**

Effects of invariant sympathetic activity on cutaneous circulatory responses to heat stress p 301 A91-49202

Influences of chemical sympathectomy and simulated weightlessness on male and female rats p 302 A91-51406

Hypoxia potentiates exercise-induced sympathetic neural activation in humans p 309 A91-51407

Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 311 N91-30672

Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686

**SYNAPSES**

Hardware Implementation of Neuron Nets and Synapses Workshop  
[AD-A237704] p 310 N91-29718

**SYSTEM IDENTIFICATION**

An experimental system for free-flying space robots and its system identification  
[AIAA PAPER 91-2825] p 319 A91-49767

**SYSTEMS ANALYSIS**

Application of structured analysis to a telerobotic system p 324 A91-50988

A preliminary analysis of the passive thermal control system for Space Station Freedom  
[SAE PAPER 901403] p 327 A91-51361

Evaluation of water treatment systems producing reagent grade water  
[SAE PAPER 901424] p 328 A91-51365

**SYSTEMS ENGINEERING**

Investigation into venting and non-venting technologies for the Space Station Freedom extravehicular activity life support system  
[SAE PAPER 901319] p 323 A91-50546

Application of structured analysis to a telerobotic system p 324 A91-50988

Human engineering activity for the definition of visual avionic systems  
[ETN-91-99510] p 332 N91-30710

**SYSTEMS SIMULATION**

The effect on visual recognition performance of microregistration and overlap for a biocular helmet mounted display p 326 A91-51092

Aim Sight p 327 A91-51100

**T****TACTILE DISCRIMINATION**

Preliminary investigations of tactile perception of graphical patterns  
[EUT-90-E-239] p 318 N91-30700

**TAKEOFF**

Factors affecting pilot decision-making in rejected takeoffs  
[SAE PAPER 902344] p 314 A91-49860

**TARGET ACQUISITION**

Head tracking accuracy in view of boresighting and parallax compensation p 326 A91-51094

Evaluation of night vision goggles for maritime search and rescue. Volume 2: Data appendix  
[AD-A229393] p 331 N91-30702

**TARGET RECOGNITION**

Prescriptive eyeglass use by U.S. Navy jet pilots - Effects on air-to-air target detection p 323 A91-50627

The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array  
[AD-A238565] p 330 N91-29736

Evaluation of night vision goggles for maritime search and rescue. Volume 2: Data appendix  
[AD-A229393] p 331 N91-30702

**TASK PLANNING (ROBOTICS)**

A modular telerobotic task execution system p 324 A91-51000

Generalized compliant motion task description and execution within a complete telerobotic system p 324 A91-51001

**TASKS**

Visual processing - Implications for helmet mounted displays p 326 A91-51091

**TAXONOMY**

Taxonomic analysis of individual reactions of an organism to hypoxia-related tests p 308 A91-50853

**TECHNOLOGIES**

JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-91-005] p 312 N91-30683

**TELEOPERATORS**

Considerations for the operator-robot interface in teleoperation p 324 A91-50981

**TELEROBOTICS**

Telerobotics as an EVA tool  
[SAE PAPER 901397] p 323 A91-50547

Design of an exoskeleton with kinesthetic feedback - Lessons learned p 324 A91-50983

Application of structured analysis to a telerobotic system p 324 A91-50988

A modular telerobotic task execution system p 324 A91-51000

Generalized compliant motion task description and execution within a complete telerobotic system p 324 A91-51001

**TELEVISION EQUIPMENT**

Low light level television systems in helmet mounted displays p 326 A91-51083

**TEMPERATURE CONTROL**

Advanced environmental/thermal control and life support systems; Intersociety Conference on Environmental Systems, 20th, Williamsburg, VA, July 9-12, 1990, Technical Papers  
[SAE SP-831] p 320 A91-50527

Space Station environmental/thermal control and life support systems; Proceedings of the 20th Intersociety Conference on Environmental Systems, Williamsburg, VA, July 9-12, 1990  
[SAE SP-829] p 327 A91-51356

A preliminary analysis of the passive thermal control system for Space Station Freedom  
[SAE PAPER 901403] p 327 A91-51361

**TEMPORAL RESOLUTION**

A membrane model for spatiotemporal coupling  
[EUT-90-E-241] p 318 N91-30701

**THERAPY**

Reshaped human monoclonal antibodies for therapy and passive immunization  
[AD-A234770] p 312 N91-30682

**THERMAL ANALYSIS**

Thermal design, analysis, and testing of the CETA Space Shuttle Flight Experiment  
[SAE PAPER 901790] p 318 A91-48530

**THERMAL ENVIRONMENTS**

Micro SAINT modeling of physiological and human performance in the heat  
[AD-A238659] p 310 N91-29719

**THERMAL MAPPING**

Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090

**THERMOREGULATION**

Differences in thermoregulation mechanisms of rats during separate and combined adaptation to cold and heat p 301 A91-49569

The characteristics of adaptive shifts in participants of the Soviet-American Bering-Bridge expedition. I - The energy aspects of adaptation p 308 A91-50855

Fundamentals of body energetics: Theoretical and practical aspects. I - The basic energetics, heat exchange, and thermoregulation --- Russian book p 304 A91-52726

Micro SAINT modeling of physiological and human performance in the heat  
[AD-A238659] p 310 N91-29719

**THYMUS GLAND**

Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401

**TIME DEPENDENCE**

Doppler indices of gas phase formation in hypobaric environments: Time-intensity analysis  
[NASA-TM-102176] p 313 N91-30692

**TISSUES (BIOLOGY)**

Horizontally rotated cell culture system with a coaxial tubular oxygenator  
[NASA-CASE-MSC-21294-1] p 305 N91-30667

Doppler indices of gas phase formation in hypobaric environments: Time-intensity analysis  
[NASA-TM-102176] p 313 N91-30692

**TOILETS**

Collection and containment of solid human waste for Space Station  
[SAE PAPER 901393] p 327 A91-51359

**TOLERANCES (PHYSIOLOGY)**

Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677

Influence of anticholinesterase on distribution of ventilation and gas exchange  
[AD-A229341] p 312 N91-30679

**TOPOGRAPHY**

Cognition and the brain  
[AD-A237846] p 316 N91-29727

**TRACKING (POSITION)**

Evaluation of eye tracking measurement systems for use with the fiber optic helmet mounted display  
p 320 A91-50473

Tracking a head-mounted display in a room-sized environment with head-mounted cameras  
p 325 A91-51082

Head tracking accuracy in view of boresighting and parallax compensation  
p 326 A91-51094

**TRAINING EVALUATION**

Predicting success in primary flying school from the Canadian automated pilot selection system - Derivation and cross-validation  
p 314 A91-48790

Implementation of new technology - A United Airline's perspective  
[SAE PAPER 902342] p 314 A91-49859

Factors affecting pilot decision-making in rejected takeoffs  
[SAE PAPER 902344] p 314 A91-49860

An oral task-oriented dialogue for air-traffic controller training  
p 316 A91-51218

**TRAINING SIMULATORS**

An oral task-oriented dialogue for air-traffic controller training  
p 316 A91-51218

**TRAJECTORY PLANNING**

On control and planning of a space station robot walker  
p 324 A91-50987

**TRANSFER OF TRAINING**

An informational perspective on skill transfer in human-machine systems  
p 325 A91-51022

**TRANSPIRATION**

Heat loss from the human head during exercise  
p 306 A91-49204

**U****U.S.S.R.**

USSR Space Life Sciences Digest, issue 31  
[NASA-CR-3922(37)] p 305 N91-30669

JPRS report: Science and technology. USSR: Life sciences  
[JPRS-ULS-91-005] p 312 N91-30683

**URINALYSIS**

Performance testing as a determinant of fitness-for-duty  
[SAE PAPER 901870] p 305 A91-48574

Factors associated with leukocyturia in asymptomatic pilots  
p 307 A91-50637

**UROLOGY**

Factors associated with leukocyturia in asymptomatic pilots  
p 307 A91-50637

**V****VAPOR PHASES**

Doppler indices of gas phase formation in hypobaric environments: Time-intensity analysis  
[NASA-TM-102176] p 313 N91-30692

**VEGETABLES**

Salad Machine - A vegetable production unit for long duration space missions  
[SAE PAPER 901280] p 320 A91-50530

**VELOCITY DISTRIBUTION**

Chemical waste disposal in space by plasma discharge  
[NASA-CR-184169] p 330 N91-29737

**VENTILATION**

Influence of anticholinesterase on distribution of ventilation and gas exchange  
[AD-A229341] p 312 N91-30679

**VENTING**

Investigation into venting and non-venting technologies for the Space Station Freedom extravehicular activity life support system  
[SAE PAPER 901319] p 323 A91-50546

**VERBAL COMMUNICATION**

Communication variations and aircrew performance  
p 314 A91-48789

**VESTIBULAR NYSTAGMUS**

Ocular-vestibular-motor interactions in experimental labyrinth asymmetry  
p 311 N91-30676

**VIBRATION DAMPING**

Active vibration damping of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2621] p 319 A91-49597

**VIBRATIONAL STRESS**

White finger symptoms - A cross-sectional study  
p 307 A91-50635

**VIRTUAL MEMORY SYSTEMS**

Three-dimensional virtual acoustic displays  
[NASA-TM-103835] p 318 N91-30697

**VISCERA**

Neuromediatory interactions in specific and nonspecific structures of the central nervous system under the unloading of the locomotor apparatus and dosed visceral initiation  
p 303 A91-52602

**VISION**

Psychophysical studies of visual cortical function  
[AD-A238663] p 310 N91-29720

**VISUAL ACUITY**

Human factors and safety considerations of night vision systems flight using thermal imaging systems  
p 326 A91-51090

Fundamental monocular/binocular HMD human factors  
p 326 A91-51093

Institute for the Study of Human Capabilities: Summary descriptions of research for the period December 1989 through September 1990  
[AD-A237767] p 316 N91-29726

**VISUAL DISCRIMINATION**

A membrane model for spatiotemporal coupling  
[EUT-90-E-241] p 318 N91-30701

**VISUAL PERCEPTION**

Visual motion commands for pursuit eye movements in the cerebellum  
p 301 A91-48450

Pilot performance research for TCAS  
[SAE PAPER 902357] p 315 A91-49864

An informational perspective on skill transfer in human-machine systems  
p 325 A91-51022

The effect on visual recognition performance of misregistration and overlap for a binocular helmet mounted display  
p 326 A91-51092

Perception of 3-D transparent illusory surface in binocular fusion  
p 316 A91-51550

The functional architecture of visual object recognition  
[AD-A238617] p 317 N91-29732

The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array  
[AD-A238565] p 330 N91-29736

Spatiotemporal edge perception  
[IZF-1990-B-15] p 318 N91-30698

**VOICE COMMUNICATION**

Communication variations and aircrew performance  
p 314 A91-48789

Analysis of routine pilot-controller communication  
[SAE PAPER 902352] p 315 A91-49861

Pilot-controller communications - A controller's perspective  
[SAE PAPER 902353] p 315 A91-49862

**W****WALKING**

Compliant walker  
[NASA-CASE-GSC-13348-2] p 309 N91-29714

**WALKING MACHINES**

On control and planning of a space station robot walker  
p 324 A91-50987

**WASTE DISPOSAL**

The extended duration orbiter waste collection system  
[SAE PAPER 901291] p 321 A91-50533

The Martian imperative - Innovative approaches to life support for advanced space missions  
p 324 A91-50975

**WASTE TREATMENT**

Physical/chemical closed-loop water-recycling for long-duration missions  
[SAE PAPER 901446] p 323 A91-50542

**WASTE WATER**

The extended duration orbiter waste collection system  
[SAE PAPER 901291] p 321 A91-50533

Electrooxidation of organics in waste water  
[SAE PAPER 901312] p 322 A91-50540

Physical/chemical closed-loop water-recycling for long-duration missions  
[SAE PAPER 901446] p 323 A91-50542

**WATER**

Hypobaric hypoxia (380 Torr) decreases intracellular and total body water in goats  
p 301 A91-49201

**WATER QUALITY**

Physical/chemical closed-loop water-recycling for long-duration missions  
[SAE PAPER 901446] p 323 A91-50542

Water quality after electrodeionization  
[SAE PAPER 901421] p 328 A91-51362

Survival of Mycoplasmas and Ureaplasmas in water and at elevated temperatures  
[SAE PAPER 901422] p 328 A91-51363

Evaluation of water treatment systems producing reagent grade water  
[SAE PAPER 901424] p 328 A91-51365

**Development of a water quality monitor for Space Station**

Freedom Life Support System  
[SAE PAPER 901426] p 328 A91-51366

**WATER RECLAMATION**

Phase change water recovery for the Space Station Freedom and future exploration missions  
[SAE PAPER 901294] p 321 A91-50536

Physical/chemical closed-loop water-recycling for long-duration missions  
[SAE PAPER 901446] p 323 A91-50542

**WATER TREATMENT**

Physical/chemical closed-loop water-recycling for long-duration missions  
[SAE PAPER 901446] p 323 A91-50542

Water quality after electrodeionization  
[SAE PAPER 901421] p 328 A91-51362

Bacterial selectivity in the colonization of surface materials from groundwater and purified water systems  
[SAE PAPER 901423] p 328 A91-51364

Evaluation of water treatment systems producing reagent grade water  
[SAE PAPER 901424] p 328 A91-51365

**WATER VAPOR**

Summary of static feed water electrolysis technology developments and applications for the Space Station and beyond  
[SAE PAPER 901293] p 321 A91-50535

**WEIGHTLESSNESS**

The floating world at zero G  
p 319 A91-48938

Influences of chemical sympathectomy and simulated weightlessness on male and female rats  
p 302 A91-51406

Ocular-vestibular-motor interactions in experimental labyrinth asymmetry  
p 311 N91-30676

**WORK CAPACITY**

Physical work capacity of the organism in experiments with combined exposure to hypokinesia and radiation  
p 303 A91-52713

Work capacity of the organism in experiments with combined exposure to hypokinesia and radiation  
p 303 A91-52713

Work capacity of the organism in experiments with combined exposure to hypokinesia and radiation  
p 303 A91-52713

Work capacity of the organism in experiments with combined exposure to hypokinesia and radiation  
p 303 A91-52713

**WORKLOADS (PSYCHOPHYSIOLOGY)**

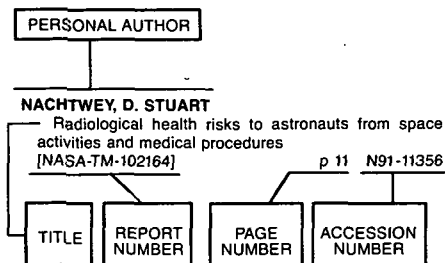
Heart period as a useful index of pilot workload in commercial transport aircraft  
p 306 A91-48786

Physiological responses to intermittent exercise as modified by heat stress and protective clothing  
[AD-A237447] p 309 N91-29716

Predicting performance breakdown in pilots through objective measures of stress sensitivity  
[AD-A237540] p 316 N91-29725

Task analysis and workload prediction model of the MH-60K mission and a comparison with UH-60A workload predictions. Volume 3: Appendixes H through N  
[AD-A229408] p 331 N91-30703

## Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document listed (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the title. Under any one author's name the accession numbers are arranged in sequence.

### A

- ABRAINI, JACQUES H.**  
Pressure-induced striatal dopamine release correlates hyperlocomotor activity in rats exposed to high pressure p 301 A91-49205
- ACHE, BARRY W.**  
Inhibition of olfactory receptor cells: An aquatic model [AD-A234437] p 312 N91-30681
- ADAMS, NEIL J.**  
Multivariable control of the Space Shuttle Remote Manipulator System [AIAA PAPER 91-2828] p 319 A91-49770
- ADES, EDWIN W.**  
Water quality after electrodeionization [SAE PAPER 901421] p 328 A91-51362  
Evaluation of water treatment systems producing reagent grade water [SAE PAPER 901424] p 328 A91-51365
- AGUREYEV, A. N.**  
Feeding the Salyut-7 crews p 330 N91-30671  
Feeding the Salyut-7 crews p 330 N91-30685
- AIDARALIEV, A. A.**  
The characteristics of adaptive shifts in participants of the Soviet-American Bering-Bridge expedition. I - The energy aspects of adaptation p 308 A91-50855
- ALLEN, R. W.**  
Performance testing as a determinant of fitness-for-duty [SAE PAPER 901870] p 305 A91-48574
- ANDERSON, DAVID E.**  
Telerobotics as an EVA tool [SAE PAPER 901397] p 323 A91-50547
- ANTONOVA, I. I.**  
Activity of acid phosphatase in the blood serum of rats with different types of hypoxia p 302 A91-49570
- APPLEBY, BRENT D.**  
Multivariable control of the Space Shuttle Remote Manipulator System [AIAA PAPER 91-2828] p 319 A91-49770
- AREND, LAWRENCE E.**  
Eye movements and spatial pattern vision [AD-A238664] p 310 N91-29721

- ARJAMAA, O.**  
Passive heat exposure leads to delayed increase in plasma levels of atrial natriuretic peptide in humans p 306 A91-49207
- ARLASHCHENKO, N. I.**  
Physical work capacity of the organism in experiments with combined exposure to hypokinesia and radiation p 303 A91-52713
- AXT, W. E.**  
Head tracking accuracy in view of boresighting and parallax compensation p 326 A91-51094
- AZUMA, RONALD**  
Tracking a head-mounted display in a room-sized environment with head-mounted cameras p 325 A91-51082

### B

- BACKES, PAUL G.**  
A modular telerobotic task execution system p 324 A91-51000  
Generalized compliant motion task description and execution within a complete telerobotic system p 324 A91-51001
- BAERTSCH, P.**  
Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405
- BAIRD, JAMES K.**  
Chemical waste disposal in space by plasma discharge [NASA-CR-184169] p 330 N91-29737
- BALINSKAS, ROBERT**  
Shuttle extravehicular mobility unit (EMU) operational enhancements [SAE PAPER 901317] p 323 A91-50544
- BANDERET, LOUIS E.**  
Relationships between symptoms, moods, performance, and acute mountain sickness at 4,700 meters p 315 A91-50632
- BARBOUR, LARRY L.**  
Pilot-controller communications - A controller's perspective [SAE PAPER 902353] p 315 A91-49862
- BARER, A. S.**  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687
- BARESI, LARRY**  
The conversion of lignocellulosics to fermentable sugars - A survey of current research and applications to CELSS [SAE PAPER 901282] p 321 A91-50531
- BENBASSAT, JOCHANAN**  
Factors associated with leukocyturia in asymptomatic pilots p 307 A91-50637
- BENNETT, W. P.**  
CELSS simulations for a lunar outpost [SAE PAPER 901281] p 322 A91-50541
- BIERBAUM, CARL R.**  
Task analysis and workload prediction model of the MH-60K mission and a comparison with UH-60A workload predictions. Volume 3: Appendixes H through N [AD-A229408] p 331 N91-30703
- BIRBARA, PHILIP J.**  
Smoke and contaminant removal system for Space Station [SAE PAPER 901391] p 327 A91-51357
- BISELLI, R.**  
The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans p 302 A91-50633
- BISHOP, GARY**  
Tracking a head-mounted display in a room-sized environment with head-mounted cameras p 325 A91-51082
- BLOOM, W.**  
Bacterial selectivity in the colonization of surface materials from groundwater and purified water systems [SAE PAPER 901423] p 328 A91-51364

- BLOWER, DAVID J.**  
Analysis of Naval aviation selection test data with nonlinear models. Part 1: Parameter estimation [AD-A238244] p 317 N91-29728
- BOLDYREV, ALEKSANDR A.**  
Carnosine and its biological significance p 303 A91-52601
- BOROWSKI, STANLEY K.**  
Radiation dose estimates for typical piloted NTR lunar and Mars mission engine operations [AIAA PAPER 91-3407] p 309 A91-52331
- BOSSI, L. L. M.**  
Canadian Forces flight trial of individually molded fiberglass lumbar supports [DCIEM-88-RR-12] p 331 N91-30706
- BOUSHEL, ROBERT C.**  
Elevated interstitial fluid volume in rat soleus muscles by hindlimb unweighting p 302 A91-51404
- BOYNTON, J. E.**  
Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of Chlamydomonas [DE91-015792] p 304 N91-29713
- BRASSEAU, HUBERT J., JR.**  
The extended duration orbiter waste collection system [SAE PAPER 901291] p 321 A91-50533
- BROOKS, PETER**  
Preventing driver error and motorcycle accident causation: An empirical investigation [CRANFIELD-AERO-9106] p 332 N91-30711
- BROWN, H. B., JR.**  
On control and planning of a space station robot walker p 324 A91-50987
- BROWN, MARIANN F.**  
Hybrid air revitalization system for a closed ecosystem [SAE PAPER 901311] p 322 A91-50539
- BURCHFIELD, DAVID**  
Development of a water quality monitor for Space Station Freedom Life Support System [SAE PAPER 901426] p 328 A91-51366
- BURLEY, JAMES R., II**  
A full-color wide-field-of-view holographic helmet-mounted display for pilot/vehicle interface development and human factors studies p 325 A91-51078
- BUSHOV, IU. V.**  
Taxonomic analysis of individual reactions of an organism to hypoxia-related tests p 308 A91-50853
- BYCHKOV, V. P.**  
Feeding the Salyut-7 crews p 330 N91-30671  
Feeding the Salyut-7 crews p 330 N91-30685

### C

- CABANAC, M.**  
Heat loss from the human head during exercise p 306 A91-49204
- CALDWELL, J. L.**  
Visual processing - Implications for helmet mounted displays p 326 A91-51091
- CAMERON, ALEXANDER A.**  
The development of the combiner eyepiece night vision goggle p 325 A91-51079
- CARNES, J. G.**  
CELSS simulations for a lunar outpost [SAE PAPER 901281] p 322 A91-50541
- CERNA, PETER J.**  
Expanded capabilities of the Extended Duration Orbiter [SAE PAPER 901290] p 321 A91-50532
- CHAMBLISS, JOE**  
Modular, thermal bus-to-radiator integral heat exchanger design for Space Station Freedom [SAE PAPER 901435] p 329 A91-51367
- CHANG, B.-J.**  
Summary of static feed water electrolysis technology developments and applications for the Space Station and beyond [SAE PAPER 901293] p 321 A91-50535



- CHANG, M. S.**  
Data acquisition system for collecting biophysical and physiological data  
[AD-A237654] p 304 N91-29710
- CHAPPELL, SHERYL L.**  
Pilot performance research for TCAS  
[SAE PAPER 902357] p 315 A91-49864
- CHI, VERNON**  
Tracking a head-mounted display in a room-sized environment with head-mounted cameras  
p 325 A91-51082
- CHURNSIDE, J. H.**  
Irradiance distributions on the human retina from a laser observed through the turbulent atmosphere  
[PB91-196907] p 313 N91-30691
- CLANCY, RICHARD L.**  
Maximum oxygen uptake and arterial blood oxygenation during hypoxic exercise in rats p 303 A91-51408  
Effect of alkalosis on maximum oxygen uptake in rats acclimated to simulated altitude p 303 A91-51409
- CLARK, J. M.**  
Pulmonary function in men after oxygen breathing at 3.0 ATA for 3.5 h p 308 A91-51403
- COLLINS, S.**  
Information processing in the outer retina  
[RSRE-MEMO-4469] p 313 N91-30694
- CONKLIN, KEITH**  
Development of a water quality monitor for Space Station Freedom Life Support System  
[SAE PAPER 901426] p 328 A91-51366
- COPP, ELIZABETH K.**  
Dietary intake and blood lipid profile survey of fighter pilots at Tyndall Air Force Base p 306 A91-50630
- CORNUM, R. L. S.**  
Visual processing - Implications for helmet mounted displays p 326 A91-51091
- COTE, J.**  
Heat loss from the human head during exercise  
p 306 A91-49204
- CRANE, J. ALLEN**  
Compliant walker  
[NASA-CASE-GSC-13348-2] p 309 N91-29714
- CROWLEY, JOHN S.**  
Human factors and safety considerations of night vision systems flight using thermal imaging systems  
p 326 A91-51090  
Human factors of night vision devices: Anecdotes from the field concerning visual illusions and other effects  
[AD-A237641] p 329 N91-29735
- CULLINGFORD, H. S.**  
CELLS simulations for a lunar outpost  
[SAE PAPER 901281] p 322 A91-50541
- CYMERMAN, A.**  
Hypobaric hypoxia (380 Torr) decreases intracellular and total body water in goats p 301 A91-49201
- D**
- D'AMELIO, R.**  
The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans  
p 302 A91-50633
- DANDREA, J. A.**  
The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array  
[AD-A238565] p 330 N91-29736
- DASHMAN, ERIC**  
Application of structured analysis to a telerobotic system p 324 A91-50988
- DAVYDOVA, N. A.**  
Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft  
p 311 N91-30672  
Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft  
p 312 N91-30686
- DEGEUS, FRED**  
Physiological modelling using RL  
[ITLI-CT-90-08] p 314 N91-30695
- DELENYAN, N. V.**  
Status of lipid peroxidation system in rat tissues after 7-day flight on Kosmos-1667 p 305 N91-30673
- DEMEO, MARTHA E.**  
Active vibration damping of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2621] p 319 A91-49597
- DENBRINKER, A. C.**  
A membrane model for spatiotemporal coupling  
[EUT-90-E-241] p 318 N91-30701
- DEVIETTI, T. L.**  
The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array  
[AD-A238565] p 330 N91-29736

- DIMBERG, LENNART**  
White finger symptoms - A cross-sectional study  
p 307 A91-50635
- DMITRIEV, A. S.**  
Neuromediation interactions in specific and nonspecific structures of the central nervous system under the unloading of the locomotor apparatus and dosed visceral irritation p 303 A91-52602
- DROZDOVA, T. YE.**  
Influence of long-term antihypostatic hypokinesia on activity of enzymes involved in energy and plastic metabolism p 311 N91-30675
- DUDINA, T. V.**  
Neuromediation interactions in specific and nonspecific structures of the central nervous system under the unloading of the locomotor apparatus and dosed visceral irritation p 303 A91-52602
- DURKOT, M. J.**  
Hypobaric hypoxia (380 Torr) decreases intracellular and total body water in goats p 301 A91-49201

## E

- EKLUND, WAYNE**  
Compliant walker  
[NASA-CASE-GSC-13348-2] p 309 N91-29714
- EL-HABAZI, ABDELLAH**  
Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401
- ELKINA, A. I.**  
Neuromediation interactions in specific and nonspecific structures of the central nervous system under the unloading of the locomotor apparatus and dosed visceral irritation p 303 A91-52602
- ELLIOTT, ANN R.**  
COSMOS 2044: Lung morphology study, experiment K-7-28  
[NASA-CR-187711] p 305 N91-30668
- EWERT, MICHAEL**  
Modular, thermal bus-to-radiator integral heat exchanger design for Space Station Freedom  
[SAE PAPER 901435] p 329 A91-51367
- EYLES, JOHN**  
Tracking a head-mounted display in a room-sized environment with head-mounted cameras  
p 325 A91-51082

## F

- FARAH, MARTHA J.**  
The functional architecture of visual object recognition  
[AD-A238617] p 317 N91-29732
- FARRACE, S.**  
The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans  
p 302 A91-50633
- FASZCZA, JEFFREY J.**  
Smoke and contaminant removal system for Space Station  
[SAE PAPER 901391] p 327 A91-51357
- FATTOROSSO, A.**  
The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans  
p 302 A91-50633
- FEHSE, W.**  
Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792
- FERRY, ARNAUD**  
Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401
- FILOSO, SILVANA**  
Critique of a process proposed to determine CF aircrew/cockpit compatibility  
[DCIEM-R88-7C] p 331 N91-30705
- FLANNAGAN, M.**  
Methods for evaluating discomfort glare  
[PB91-185132] p 310 N91-29722
- FOLK, VALERIE G.**  
Communication variations and aircrew performance  
p 314 A91-48789
- FORTE, V. A., JR.**  
Hypobaric hypoxia (380 Torr) decreases intracellular and total body water in goats p 301 A91-49201
- FOSS, RICHARD A.**  
Thermal design, analysis, and testing of the CETA Space Shuttle Flight Experiment  
[SAE PAPER 901790] p 318 A91-48530
- FREGOSI, RALPH F.**  
Hypoxia potentiates exercise-induced sympathetic neural activation in humans p 309 A91-51407
- FREY, MARY A. B.**  
Gender-based differences in the cardiovascular response to standing p 306 A91-50631

- FRIBERG, L.**  
Effect of axillary blockade on regional cerebral blood flow during static handgrip p 306 A91-49206
- FRIEDMAN, D. B.**  
Effect of axillary blockade on regional cerebral blood flow during static handgrip p 306 A91-49206
- FRIESEN, DWAYNE T.**  
Preliminary evaluation of a membrane-based system for removing CO<sub>2</sub> from air  
[SAE PAPER 901295] p 322 A91-50537
- FROOM, PAUL**  
Factors associated with leukocyturia in asymptomatic pilots p 307 A91-50637
- FUCHS, HENRY**  
Tracking a head-mounted display in a room-sized environment with head-mounted cameras  
p 325 A91-51082

## G

- GACHKOVSKII, P. V.**  
Activity of acid phosphatase in the blood serum of rats with different types of hypoxia p 302 A91-49570
- GARSHNEK, VICTORIA**  
USSR Space Life Sciences Digest, issue 31  
[NASA-CR-3922(37)] p 305 N91-30669
- GAUVAIN, J. L.**  
An oral task-oriented dialogue for air-traffic controller training p 316 A91-51218
- GELFAND, R.**  
Pulmonary function in men after oxygen breathing at 3.0 ATA for 3.5 h p 308 A91-51403
- GELLATLY, A. W.**  
Methods for evaluating discomfort glare  
[PB91-185132] p 310 N91-29722
- GILBERT, MICHAEL G.**  
Active vibration damping of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2621] p 319 A91-49597
- GILLHAM, N. W.**  
Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of *Chlamydomonas*  
[DE91-015792] p 304 N91-29713
- GLOD, G. D.**  
Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674
- GODTHELP, J.**  
The use of an active gas-pedal as an element of an intelligent driver support system: Literature review and explorative study  
[IZF-1990-B-17] p 332 N91-30708
- GONZALEZ, NORBERTO C.**  
Maximum oxygen uptake and arterial blood oxygenation during hypoxic exercise in rats p 303 A91-51408  
Effect of alkalosis on maximum oxygen uptake in rats acclimated to simulated altitude p 303 A91-51409
- GONZALEZ, RICHARD R.**  
Physiological responses to intermittent exercise as modified by heat stress and protective clothing  
[AD-A237447] p 309 N91-29716
- GOTSHALL, ROBERT W.**  
Gender-based differences in the cardiovascular response to standing p 306 A91-50631
- GRADWELL, DAVID**  
Human factors for pilots p 302 A91-50999
- GREEN, NANCY R.**  
Dietary intake and blood lipid profile survey of fighter pilots at Tyndall Air Force Base p 306 A91-50630
- GREEN, ROGER G.**  
Human factors for pilots p 302 A91-50999
- GREEN, ROGER L.**  
Human factors for pilots p 302 A91-50999
- GRIFFIN, G. R.**  
Performance of several different Naval aviator communities on a cognitive/psychomotor test battery: Pipeline comparison and prediction  
[AD-A238564] p 317 N91-29730
- GRIGGER, DAVID J.**  
Summary of static feed water electrolysis technology developments and applications for the Space Station and beyond  
[SAE PAPER 901293] p 321 A91-50535
- GROSSMAN, YORAM**  
High pressure modifies respiratory activity in isolated rat brain stem-spinal cord p 301 A91-49203
- GUEZENNEC, CHARLES Y.**  
Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401

## H

- HAAS, MICHAEL W.**  
Head movements during simulated air-to-air engagements p 327 A91-51099
- HAMILTON, DAVID B.**  
Task analysis and workload prediction model of the MH-60K mission and a comparison with UH-60A workload predictions. Volume 3: Appendixes H through N [AD-A229408] p 331 N91-30703
- HARRIS, BERNARD A., JR.**  
A comparison between computer-controlled and set work rate exercise based on target heart rate p 307 A91-50638
- HARRIS, WILLIAM J.**  
*Reshaped human monoclonal antibodies for therapy and passive immunization* [AD-A234770] p 312 N91-30682
- HARRISON, F. W.**  
Application of structured analysis to a telerobotic system p 324 A91-50988
- HATSELL, CHARLES P.**  
A quasi-power theorem for bulk conductors - Comments on rheoencephalography p 319 A91-49329
- HATINGH, JOHANN**  
The measurement of psychophysiological reactions of pilots to a stressor in a flight simulator p 306 A91-50629
- HAYATI, SAMAD**  
A modular telerobotic task execution system p 324 A91-51000
- HAYES, JUDITH C.**  
A comparison between computer-controlled and set work rate exercise based on target heart rate p 307 A91-50638
- HE, JIPING**  
Mechanics of running under simulated low gravity p 308 A91-51402
- HERRMANN, CAL C.**  
Physical/chemical closed-loop water-recycling for long-duration missions [SAE PAPER 901446] p 323 A91-50542
- HIGHSMITH, ANITA**  
Evaluation of water treatment systems producing reagent grade water [SAE PAPER 901424] p 328 A91-51365
- HIGHSMITH, ANITA K.**  
Water quality after electrodeionization [SAE PAPER 901421] p 328 A91-51362
- HILL, R. J.**  
Irradiance distributions on the human retina from a laser observed through the turbulent atmosphere [PB91-196907] p 313 N91-30691
- HILLER, W. D. B.**  
Pulmonary function in men after oxygen breathing at 3.0 ATA for 3.5 h p 308 A91-51403
- HITCHENS, G. D.**  
Electrooxidation of organics in waste water [SAE PAPER 901312] p 322 A91-50540
- HOLLEY, W. A.**  
CELSS simulations for a lunar outpost [SAE PAPER 901281] p 322 A91-50541
- HOKE, LYDIA RAZRAN**  
USSR Space Life Sciences Digest, issue 31 [NASA-CR-3922(37)] p 305 N91-30669
- HOVER, G. L.**  
Evaluation of night vision goggles for maritime search and rescue. Volume 2: Data appendix [AD-A229393] p 331 N91-30702
- HOYT, R. W.**  
Hypobaric hypoxia (380 Torr) decreases intracellular and total body water in goats p 301 A91-49201
- HUBBARD, L. J.**  
Hypobaric hypoxia (380 Torr) decreases intracellular and total body water in goats p 301 A91-49201
- HUNTLEY, M. S., JR.**  
The use and design of flightcrew checklists and manuals [AD-A237206] p 329 N91-29733

## I

- IDESAWA, MASANORI**  
Perception of 3-D transparent illusory surface in binocular fusion p 316 A91-51550
- IRWIN, CHERYL M.**  
Communication variations and aircrew performance p 314 A91-48789
- IVANOV, KIRILL P.**  
Fundamentals of body energetics: Theoretical and practical aspects. I - The basic energetics, heat exchange, and thermoregulation p 304 A91-52726

## J

- JACKSON, R. M.**  
Pulmonary function in men after oxygen breathing at 3.0 ATA for 3.5 h p 308 A91-51403
- JAMES, MELANIE**  
Human factors for pilots p 302 A91-50999
- JOHNSON, DAVID G.**  
Hypoxia potentiates exercise-induced sympathetic neural activation in humans p 309 A91-51407
- JONES, P. S.**  
CELSS simulations for a lunar outpost [SAE PAPER 901281] p 322 A91-50541
- JULIAN, RONALD G.**  
Considerations for the operator-robot interface in teleoperation p 324 A91-50981

## K

- KABA, LAMINE**  
Electrooxidation of organics in waste water [SAE PAPER 901312] p 322 A91-50540
- KALANDAROV, S.**  
Feeding the Salyut-7 crews p 330 N91-30671  
Feeding the Salyut-7 crews p 330 N91-30685
- KANADE, TAKEO**  
On control and planning of a space station robot walker p 324 A91-50987
- KANDARIAN, SUSAN C.**  
Elevated interstitial fluid volume in rat soleus muscles by hindlimb unweighting p 302 A91-51404
- KANDYBO, T. S.**  
Neuromediation interactions in specific and nonspecific structures of the central nervous system under the unloading of the locomotor apparatus and dosed visceral irritation p 303 A91-52602
- KANKI, BARBARA G.**  
Communication variations and aircrew performance p 314 A91-48789
- KAUFMAN, LLOYD**  
Cognition and the brain [AD-A237846] p 316 N91-29727
- KAY, ROBERT**  
Space Station Freedom predevelopment operational system test (POST) carbon dioxide removal assembly [SAE PAPER 901392] p 327 A91-51358
- KAYLOR, BILL M.**  
Water quality after electrodeionization [SAE PAPER 901421] p 328 A91-51362  
Evaluation of water treatment systems producing reagent grade water [SAE PAPER 901424] p 328 A91-51365
- KAYSER, B.**  
Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405
- KERLEY, JAMES J.**  
Compliant walker [NASA-CASE-GSC-13348-2] p 309 N91-29714
- KEVORKIAN, J.**  
Perturbation techniques for models of bursting electrical activity in pancreatic (beta)-cells [DE91-013901] p 309 N91-29715
- KLISS, M.**  
Salad Machine - A vegetable production unit for long duration space missions [SAE PAPER 901280] p 320 A91-50530
- KNEPTON, J. C.**  
The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array [AD-A238565] p 330 N91-29736
- KOCHETKOVA, A. N.**  
Feeding the Salyut-7 crews p 330 N91-30671  
Feeding the Salyut-7 crews p 330 N91-30685
- KONAKHEVICH, YU. G.**  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687
- KOVACH, ANDREW J.**  
Summary of static feed water electrolysis technology developments and applications for the Space Station and beyond [SAE PAPER 901293] p 321 A91-50535
- KOVAL', S. B.**  
Activity of acid phosphatase in the blood serum of rats with different types of hypoxia p 302 A91-49570
- KRAM, RODGER**  
Mechanics of running under simulated low gravity p 308 A91-51402
- KRANING, KENNETH K., II**  
Physiological responses to intermittent exercise as modified by heat stress and protective clothing [AD-A237447] p 309 N91-29716

## L

- KRAUZLIS, RICHARD J.**  
Visual motion commands for pursuit eye movements in the cerebellum p 301 A91-48450
- KUNDSIN, RUTH B.**  
Survival of Mycoplasmas and Ureaplasmas in water and at elevated temperatures [SAE PAPER 901422] p 328 A91-51363
- KURME, D. A.**  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687
- KVETNYANSKI, R.**  
Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 311 N91-30672  
Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686
- LAMBERTSEN, C. J.**  
Pulmonary function in men after oxygen breathing at 3.0 ATA for 3.5 h p 308 A91-51403
- LANDAU, FRANCINE**  
The effect on visual recognition performance of misregistration and overlap for a biocular helmet mounted display p 326 A91-51092
- LARUSSA, J.**  
A holographic helmet mounted display application for the Extravehicular Mobility Unit p 325 A91-51077
- LARUSSA, JOSEPH A.**  
A full-color wide-field-of-view holographic helmet-mounted display for pilot/vehicle interface development and human factors studies p 325 A91-51078
- LAWSON, B. MICHAEL**  
Investigation into venting and non-venting technologies for the Space Station Freedom extravehicular activity life support system [SAE PAPER 901319] p 323 A91-50546
- LAZIRI, FATIHA**  
Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401
- LE MOLI, S.**  
The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans p 302 A91-50633
- LE PAGE, CHRISTINE**  
Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401
- LEE, ALFRED**  
Analysis of routine pilot-controller communication [SAE PAPER 902352] p 315 A91-49861
- LEE, M. G.**  
Hybrid air revitalization system for a closed ecosystem [SAE PAPER 901311] p 322 A91-50539
- LEE, THOMAS S.**  
A modular telerobotic task execution system p 324 A91-51000
- LEPPALUOTO, J.**  
Passive heat exposure leads to delayed increase in plasma levels of atrial natriuretic peptide in humans p 306 A91-49207
- LEWANDOWSKI, RONALD J.**  
Helmet-mounted displays II; Proceedings of the Meeting, Orlando, FL, Apr. 19, 20, 1990 [SPIE-1290] p 325 A91-51076
- LEYTENE, L. YA.**  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687
- LIEBERMAN, HARRIS R.**  
Relationships between symptoms, moods, performance, and acute mountain sickness at 4,700 meters p 315 A91-50632
- LINTERN, GAVAN**  
Scene content and runway breadth effects on simulated landing approaches p 319 A91-48787  
An informational perspective on skill transfer in human-machine systems p 325 A91-51022
- LIPPERT, THOMAS M.**  
Fundamental monocular/binocular HMD human factors p 326 A91-51093
- LISBERGER, STEPHEN G.**  
Visual motion commands for pursuit eye movements in the cerebellum p 301 A91-48450
- LYONS, TERENCE J.**  
Medical causes of in-flight incapacitation - USAF experience 1978-1987 p 307 A91-50636

## M

- MACDOUGALL, J. D.**  
Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 2 [CTN-91-60128] p 331 N91-30704  
Evaluation of alternative methods for increasing tolerance to +Gz. A preliminary study of dynamic leg exercise [CTN-91-60213] p 332 N91-30707
- MACELROY, R. D.**  
The CELSS Test Facility - A foundation for crop research in space [SAE PAPER 901279] p 320 A91-50529  
Salad Machine - A vegetable production unit for long duration space missions [SAE PAPER 901280] p 320 A91-50530
- MAKSIMOV, A. L.**  
The characteristics of adaptive shifts in participants of the Soviet-American Bering-Bridge expedition. I - The energy aspects of adaptation p 308 A91-50855
- MARCUS, J. T.**  
Spatiotemporal edge perception [IZF-1990-B-15] p 318 N91-30698
- MARIANI, J.**  
An oral task-oriented dialogue for air-traffic controller training p 316 A91-51218
- MARKIN, A. A.**  
Status of lipid peroxidation system in rat tissues after 7-day flight on Kosmos-1667 p 305 N91-30673
- MATHIEU-COSTELLO, ODILE**  
COSMOS 2044: Lung morphology study, experiment K-7-28 [NASA-CR-187711] p 305 N91-30668
- MATRICARDI, P. M.**  
The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans p 302 A91-50633
- MATROUF, K.**  
An oral task-oriented dialogue for air-traffic controller training p 316 A91-51218
- MAZURIN, YU. V.**  
Predicting the effect of linear and angular impact acceleration on humans p 311 N91-30678  
Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688
- MAZZOCCA, AUGUSTUS D.**  
A comparison between computer-controlled and set work rate exercise based on target heart rate p 307 A91-50638
- MCBARRON, JAMES W., II**  
Shuttle extravehicular mobility unit (EMU) operational enhancements [SAE PAPER 901317] p 323 A91-50544
- MCCANN, C. A.**  
Human cognitive processes in command and control planning. 1: Identification of research issues [IZF-1990-B-18] p 318 N91-30699
- MCCORMICK, TIMOTHY J.**  
Medical causes of in-flight incapacitation - USAF experience 1978-1987 p 307 A91-50636
- MCCRAY, SCOTT B.**  
Preliminary evaluation of a membrane-based system for removing CO<sub>2</sub> from air [SAE PAPER 901295] p 322 A91-50537
- MCDANIEL, WILLIAM C.**  
Determining flight task proficiency of students - A mathematical decision aid p 315 A91-51023
- MCKENNA, FRANK P.**  
Predicting performance breakdown in pilots through objective measures of stress sensitivity [AD-A237540] p 316 N91-29725
- MCLIN, DAVID**  
Application of structured analysis to a telerobotic system p 324 A91-50988
- MCMAHON, THOMAS A.**  
Mechanics of running under simulated low gravity p 308 A91-51402
- METALIS, S. A.**  
Heart period as a useful index of pilot workload in commercial transport aircraft p 306 A91-48786
- MIERNIK, JANIE H.**  
Phase change water recovery for the Space Station Freedom and future exploration missions [SAE PAPER 901294] p 321 A91-50536
- MIKELL, A. T., JR.**  
Bacterial selectivity in the colonization of surface materials from groundwater and purified water systems [SAE PAPER 901423] p 328 A91-51364
- MILLER, JAMES C.**  
Performance testing as a determinant of fitness-for-duty [SAE PAPER 901870] p 305 A91-48574
- MITCHELL, J. H.**  
Effect of axillary blockade on regional cerebral blood flow during static handgrip p 306 A91-49206
- MITSUYA, AKIRA**  
An experimental system for free-flying space robots and its system identification [AIAA PAPER 91-2825] p 319 A91-49767
- MODELL, HAROLD I.**  
Influence of anticholinesterase on distribution of ventilation and gas exchange [AD-A229341] p 312 N91-30679
- MOLINA, E. A.**  
Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719
- MOREY, W. A.**  
Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719
- MORROW, DANIEL G.**  
Analysis of routine pilot-controller communication [SAE PAPER 902352] p 315 A91-49861
- MUELLE, E.-A.**  
Head tracking accuracy in view of boresighting and parallax compensation p 326 A91-51094
- MUELLER, PAUL**  
Hardware Implementation of Neuron Nets and Synapses Workshop [AD-A237704] p 310 N91-29718
- MUIR, HELEN**  
Human factors for pilots p 302 A91-50999
- MUIRA, R. M.**  
Perturbation techniques for models of bursting electrical activity in pancreatic (beta)-cells [DE91-013901] p 309 N91-29715
- MUNOZ, KATHRYN A.**  
The effect of a space food bar diet on body and muscle mass in normal and hind-limb suspended rats p 302 A91-50634
- MUROTSU, YOSHISADA**  
An experimental system for free-flying space robots and its system identification [AIAA PAPER 91-2825] p 319 A91-49767
- MURPHY, OLIVER J.**  
Electrooxidation of organics in waste water [SAE PAPER 901312] p 322 A91-50540

## N

- NAKAYAMA, KEN**  
Psychophysical studies of visual cortical function [AD-A238663] p 310 N91-29720
- NALETTE, TIMOTHY A.**  
Smoke and contaminant removal system for Space Station [SAE PAPER 901391] p 327 A91-51357
- NEEL, F.**  
An oral task-oriented dialogue for air-traffic controller training p 316 A91-51218
- NEWMAN, JAMES**  
Critique of a process proposed to determine CF aircrew/cockpit compatibility [DCIEM-R88-7C] p 331 N91-30705
- NISINI, R.**  
The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans p 302 A91-50633
- NIU, WILLIAM**  
Development of a water quality monitor for Space Station Freedom Life Support System [SAE PAPER 901426] p 328 A91-51366
- NOBLE, LARRY D.**  
Phase change water recovery for the Space Station Freedom and future exploration missions [SAE PAPER 901294] p 321 A91-50536
- NORTH, JEFFREY D.**  
The extended duration orbiter waste collection system [SAE PAPER 901291] p 321 A91-50533
- NOVIKOV, V. S.**  
Typological characteristics of defense reactions during chronophysiological stress p 308 A91-50854

## O

- O'BRYON, JAMES F.**  
Unlocking G-LOC p 329 A91-52837
- ODEN, ANDERS**  
White finger symptoms - A cross-sectional study p 307 A91-50635
- OEI, O.**  
Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405
- ORLANDO, SAMUEL P.**  
The extended duration orbiter waste collection system [SAE PAPER 901291] p 321 A91-50533

## OSMOND, C. B.

- Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of *Chlamydomonas* [DE91-015792] p 304 N91-29713
- OUELLETTE, FRED A.**  
The Extended Duration Orbiter Regenerable CO<sub>2</sub> Removal System [SAE PAPER 901292] p 321 A91-50534

## P

- PAIROT, J. M.**  
Intervention of human operators in automated spacecraft Rendezvous and Docking GNC [AIAA PAPER 91-2791] p 319 A91-49792
- PAOLI, F.**  
Intervention of human operators in automated spacecraft Rendezvous and Docking GNC [AIAA PAPER 91-2791] p 319 A91-49792
- PEDDER, JOCELYN**  
Critique of a process proposed to determine CF aircrew/cockpit compatibility [DCIEM-R88-7C] p 331 N91-30705
- PERKINS, ROBERT E.**  
Survival of Mycoplasmas and Ureaplasmas in water and at elevated temperatures [SAE PAPER 901422] p 328 A91-51363
- PERNAROWSKI, M.**  
Perturbation techniques for models of bursting electrical activity in pancreatic (beta)-cells [DE91-013901] p 309 N91-29715
- PETERSEN, GENE R.**  
The conversion of lignocellulosics to fermentable sugars - A survey of current research and applications to CELSS [SAE PAPER 901282] p 321 A91-50531
- PETROVA, T. V.**  
Effect of hyperthermia on some hormonal and immunogenic characteristics of humans p 307 A91-50851
- PEVNYI, S. A.**  
Differences in thermoregulation mechanisms of rats during separate and combined adaptation to cold and heat p 301 A91-49569
- PISHTEY, W.**  
A holographic helmet mounted display application for the Extravehicular Mobility Unit p 325 A91-51077
- PLOURDE, J. V.**  
Evaluation of night vision goggles for maritime search and rescue. Volume 2: Data appendix [AD-A229393] p 331 N91-30702
- POPE, S.**  
Bacterial selectivity in the colonization of surface materials from groundwater and purified water systems [SAE PAPER 901423] p 328 A91-51364
- POPOV, I. G.**  
Feeding the Salyut-7 crews p 330 N91-30671  
Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674  
Feeding the Salyut-7 crews p 330 N91-30685
- POPOVA, I. P.**  
Influence of long-term antithrostatic hypokinesia on activity of enzymes involved in energy and plastic metabolism p 311 N91-30675
- POPLOW, J. R.**  
Canadian Forces flight trial of individually molded fiberglass lumbar supports [DCIEM-88-RR-12] p 331 N91-30706
- POWELL, MICHAEL R.**  
Doppler indices of gas phase formation in hypobaric environments: Time-intensity analysis [NASA-TM-102176] p 313 N91-30692
- PRAKASH, OM, II**  
Multivariable control of the Space Shuttle Remote Manipulator System [AIAA PAPER 91-2828] p 319 A91-49770
- PRATT, WANDA M.**  
A comparison between computer-controlled and set work rate exercise based on target heart rate p 307 A91-50638
- PROTASOV, K. T.**  
Taxonomic analysis of individual reactions of an organism to hypoxia-related tests p 308 A91-50853
- PUDOKA, RICK J.**  
Phase change water recovery for the Space Station Freedom and future exploration missions [SAE PAPER 901294] p 321 A91-50536
- PURVIS, BRADLEY D.**  
Aim Sight p 327 A91-51100

## Q

## QING-FU, HU

Effects of invariant sympathetic activity on cutaneous circulatory responses to heat stress p 301 A91-49202

## R

## RAHMAN, Z.

Influences of chemical sympathectomy and simulated weightlessness on male and female rats p 302 A91-51406

## RANKIN, WILLIAM C.

Determining flight task proficiency of students - A mathematical decision aid p 315 A91-51023

## RASCH, W.

Heat loss from the human head during exercise p 306 A91-49204

## RASH, C. E.

Visual processing - Implications for helmet mounted displays p 326 A91-51091

## RASH, CLARENCE E.

Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090

## RAY, ROD J.

Preliminary evaluation of a membrane-based system for removing CO<sub>2</sub> from air [SAE PAPER 901295] p 322 A91-50537

## RAZINKIN, S. M.

Effect of hyperthermia on some hormonal and immunogenic characteristics of humans p 307 A91-50851

## REDDIX, M. D.

The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array [AD-A238565] p 330 N91-29736

## REED, CAROL J.

Water quality after electrodeionization [SAE PAPER 901421] p 328 A91-51362  
Evaluation of water treatment systems producing reagent grade water [SAE PAPER 901424] p 328 A91-51365

## REEVES, JOHN T.

Sleep disturbances at high altitude. Role of a PCO<sub>2</sub> apneic threshold [AD-A229426] p 312 N91-30680

## REICHARD, SHERWOOD M.

A review: The 13th Annual Conference on Shock [AD-A237300] p 313 N91-30690

## REINHART, W. H.

Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405

## REMIS, STEVEN J.

Design of an exoskeleton with kinesthetic feedback - Lessons learned p 324 A91-50983

## REPIN, A. A.

Ocular-vestibular-motor interactions in experimental labyrinth asymmetry p 311 N91-30676

## RETHKE, D. W.

Collection and containment of solid human waste for Space Station [SAE PAPER 901393] p 327 A91-51359

## REYNOLDS, W. H.

Evaluation of night vision goggles for maritime search and rescue. Volume 2: Data appendix [AD-A229393] p 331 N91-30702

## RICHARDS, WHITMAN

Representations in mental models [AD-A229401] p 317 N91-30696

## RICHARDSON, DANIEL

Effects of invariant sympathetic activity on cutaneous circulatory responses to heat stress p 301 A91-49202

## RICHARDSON, J. C.

Bacterial selectivity in the colonization of surface materials from groundwater and purified water systems [SAE PAPER 901423] p 328 A91-51364

## RIEU, MICHEL

Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401

## RIEU, PHILIPPE

Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401

## RIVAMONTE, ANDRE

Resolution and signal-to-noise measurement U.S. Army night vision goggles p 326 A91-51095

## ROBE, R. Q.

Evaluation of night vision goggles for maritime search and rescue. Volume 2: Data appendix [AD-A229393] p 331 N91-30702

## ROCKOFF, LISA M.

Telerobotics as an EVA tool [SAE PAPER 901397] p 323 A91-50547

## RODVOLD, MICHELLE

Analysis of routine pilot-controller communication [SAE PAPER 902352] p 315 A91-49861

## ROLIK, I. S.

Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674

## ROSSOMAKHIN, IU. I.

Differences in thermoregulation mechanisms of rats during separate and combined adaptation to cold and heat p 301 A91-49569

## ROSTAIN, JEAN-CLAUDE

Pressure-induced striatal dopamine release correlates hyperlocomotor activity in rats exposed to high pressure p 301 A91-49205

## ROTTERDAM, ERNEST

Physiological modelling using RL [ITLI-CT-90-08] p 314 N91-30695

## ROWE, JOSEPH

USSR Space Life Sciences Digest, issue 31 [NASA-CR-3922(37)] p 305 N91-30669

## RUMMEL, JOHN D.

Long term life support for space exploration [SAE PAPER 901277] p 320 A91-50528

## RUSKOAOH, H.

Passive heat exposure leads to delayed increase in plasma levels of atrial natriuretic peptide in humans p 306 A91-49207

## S

## SAMSON, P.

Heat loss from the human head during exercise p 306 A91-49204

## SARYCHEVA, N. N.

Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674

## SCHELEN, J. B. J.

Low light level television systems in helmet mounted displays p 326 A91-51083

## SCHLAPBACH, M. E.

A preliminary analysis of the passive thermal control system for Space Station Freedom [SAE PAPER 901403] p 327 A91-51361

## SCHNITZLER, BRUCE G.

Radiation dose estimates for typical piloted NTR lunar and Mars mission engine operations [AIAA PAPER 91-3407] p 309 A91-52331

## SCHRAAGEN, J. M. C.

An experimental comparison between different types of in-car navigation information [IZF-1991-B-1] p 332 N91-30709

## SCHRIJVERS, HOF, M.

Low light level television systems in helmet mounted displays p 326 A91-51083

## SCHROT, JOHN

Development and evaluation of a human performance assessment battery [AD-A237391] p 316 N91-29724

## SCHUBERT, FRANZ H.

Phase change water recovery for the Space Station Freedom and future exploration missions [SAE PAPER 901294] p 321 A91-50536

## SCHULTE, LEAH M.

Elevated interstitial fluid volume in rat soleus muscles by hindlimb unweighting p 302 A91-51404

## SCHWARTZKOPF, STEVEN H.

The Martian imperative - Innovative approaches to life support for advanced space missions p 324 A91-50975

## SCHWARZ, RAY P.

Horizontally rotated cell culture system with a coaxial tubular oxygenator [NASA-CASE-MSC-21294-1] p 305 N91-30667

## SCOTT, MICHAEL A.

Active vibration damping of the Space Shuttle Remote Manipulator System [AIAA PAPER 91-2621] p 319 A91-49597

## SEALS, DOUGLAS R.

Hypoxia potentiates exercise-induced sympathetic neural activation in humans p 309 A91-51407

## SEBASTIAN, LISA A.

Influences of chemical sympathectomy and simulated weightlessness on male and female rats p 302 A91-51406

## SECHER, N. H.

Effect of axillary blockade on regional cerebral blood flow during static handgrip p 306 A91-49206

## SEITZINGER, ALAN T.

Ventilation kinetics testing of a steel frame/rubber fabric underground shelter [AD-A237469] p 329 N91-29734

## SENDA, KEI

An experimental system for free-flying space robots and its system identification [AIAA PAPER 91-2825] p 319 A91-49767

## SEREDENKO, M. M.

Activity of acid phosphatase in the blood serum of rats with different types of hypoxia p 302 A91-49570

## SHAMMA, S.

Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719

## SHAN'GIN, O. G.

Effect of hyperthermia on some hormonal and immunogenic characteristics of humans p 307 A91-50851

## SHARMA, DINKBAR

Predicting performance breakdown in pilots through objective measures of stress sensitivity [AD-A237540] p 316 N91-29725

## SHARP, J. B.

A preliminary analysis of the passive thermal control system for Space Station Freedom [SAE PAPER 901403] p 327 A91-51361

## SHEPHERD, STEVEN

Effects of invariant sympathetic activity on cutaneous circulatory responses to heat stress p 301 A91-49202

## SHOCHAT, IGAL

Factors associated with leukocyturia in asymptomatic pilots p 307 A91-50637

## SHOLPO, L. N.

Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677  
Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687

## SHUKITT-HALE, BARBARA

Relationships between symptoms, moods, performance, and acute mountain sickness at 4,700 meters p 315 A91-50632

## SHULL, R. N.

Performance of Marine AV-8B (Harrier) pilots on a cognitive/psychomotor test battery: Comparison and prediction [AD-A238563] p 317 N91-29729  
Performance of several different Naval aviator communities on a cognitive/psychomotor test battery: Pipeline comparison and predictor [AD-A238564] p 317 N91-29730

## SICONOLFI, STEVEN F.

A comparison between computer-controlled and set work rate exercise based on target heart rate p 307 A91-50638

## SINGH, A.

Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405

## SIVAK, M.

Methods for evaluating discomfort glare [PB91-185132] p 310 N91-29722

## SIVE, WARRICK J.

The measurement of psychophysiological reactions of pilots to a stressor in a flight simulator p 306 A91-50629

## SMITH, BOB

Implementation of new technology - A United Airline's perspective [SAE PAPER 902342] p 314 A91-49859

## SMITH, GAIL S.

The Extended Duration Orbiter Regenerable CO<sub>2</sub> Removal System [SAE PAPER 901292] p 321 A91-50534

## SMITH, TERRANCE

Critique of a process proposed to determine CF aircrew/cockpit compatibility [DCIEM-R88-7C] p 331 N91-30705

## SMOORENBURG, G. F.

Damage risk for low-frequency impulse noise; the spectral factor in noise-induced hearing loss [IZF-1990-A-37] p 313 N91-30693

## SNYDER, GORDON

Development of a water quality monitor for Space Station Freedom Life Support System [SAE PAPER 901426] p 328 A91-51366

## SOKARI, ABIOTONA

Maximum oxygen uptake and arterial blood oxygenation during hypoxic exercise in rats p 303 A91-51408

## SOKOLOV, A. IA.

The characteristics of adaptive shifts in participants of the Soviet-American Bering-Bridge expedition. I - The energy aspects of adaptation p 308 A91-50855

## SOLOWAY, DONALD

Application of structured analysis to a telerobotic system p 324 A91-50988

## SPAMPINATO, PHILIP M.

Shuttle extravehicular mobility unit (EMU) operational enhancements [SAE PAPER 901317] p 323 A91-50544

## SPINNER, BARRY

Predicting success in primary flying school from the Canadian automated pilot selection system - Derivation and cross-validation p 314 A91-48790

**SPINONI, MAURIZIO**

Human engineering activity for the definition of visual avionic systems  
[ETN-91-99510] p 332 N91-30710

**SRIBNIK, FREDERICK**

Smoke and contaminant removal system for Space Station  
[SAE PAPER 901391] p 327 A91-51357

**ST. JOHN, RALPH J.**

Aim Sight p 327 A91-51100

**STANNY, R.**

Micro SAINT modeling of physiological and human performance in the heat  
[AD-A238659] p 310 N91-29719

**STAPP, H. P.**

Quantum measurement and the mind-brain connection  
[DE91-012343] p 316 N91-29723

**STEELE, J. W.**

Collection and containment of solid human waste for Space Station  
[SAE PAPER 901393] p 327 A91-51359

**STEIN, ANTHONY C.**

Performance testing as a determinant of fitness-for-duty  
[SAE PAPER 901870] p 305 A91-48574

**STEPHEN, K. W.**

Data acquisition system for collecting biophysical and physiological data  
[AD-A237654] p 304 N91-29710

**STEPHENS, R. L.**

Visual processing - Implications for helmet mounted displays p 326 A91-51091

**STEWART, DOUG**

The floating world at zero G p 319 A91-48938

**STILL, DAVID L.**

Prescriptive eyeglass use by U.S. Navy jet pilots - Effects on air-to-air target detection p 323 A91-50627

**STRAIGHT, C. L.**

The CELSS Test Facility - A foundation for crop research in space  
[SAE PAPER 901279] p 320 A91-50529

**STRAUCH, BARRY**

Factors affecting pilot decision-making in rejected takeoffs  
[SAE PAPER 902344] p 314 A91-49860

**STUMP, CRAIG S.**

Influences of chemical sympathectomy and simulated weightlessness on male and female rats p 302 A91-51406

**STUMP, JANE A.**

Influences of chemical sympathectomy and simulated weightlessness on male and female rats p 302 A91-51406

**STUPAKOV, G. P.**

Predicting the effect of linear and angular impact acceleration on humans p 311 N91-30678  
Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688

**SUKHANOV, S. G.**

The role of photoperiodism in the formation of adaptational changes in the human endocrine system in the north p 307 A91-50852

**SZETO, M. D.**

A preliminary analysis of the passive thermal control system for Space Station Freedom  
[SAE PAPER 901403] p 327 A91-51361

**T****TAITS, M. IU.**

Neuromediator interactions in specific and nonspecific structures of the central nervous system under the unloading of the locomotor apparatus and dosed visceral irritation p 303 A91-52602

**TARASIUK, ARIEL**

High pressure modifies respiratory activity in isolated rat brain stem-spinal cord p 301 A91-49203

**TEETER, RONALD**

USSR Space Life Sciences Digest, issue 31  
[NASA-CR-3922(37)] p 305 N91-30669

**TEMME, LEONARD A.**

Prescriptive eyeglass use by U.S. Navy jet pilots - Effects on air-to-air target detection p 323 A91-50627

**TENFORDE, T. S.**

Biological interactions of extremely-low-frequency electric and magnetic fields  
[DE90-011927] p 304 N91-29709

**TERELAK, JAN F.**

Current research and trends in aviation psychology in Poland p 315 A91-50639

**THAKOR, NITISH V.**

Applications of adaptive filtering to ECG analysis - Noise cancellation and arrhythmia detection p 329 A91-52128

**THOMAS, MELVIN L.**

Evaluation of eye tracking measurement systems for use with the fiber optic helmet mounted display p 320 A91-50473

**TIPTON, CHARLES M.**

Influences of chemical sympathectomy and simulated weightlessness on male and female rats p 302 A91-51406

**TISCHLER, MARC E.**

The effect of a space food bar diet on body and muscle mass in normal and hind-limb suspended rats p 302 A91-50634

**TOBIAS, A.**

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

**TOET, A.**

Spatiotemporal edge perception  
[IZF-1990-B-15] p 318 N91-30698

**TRAD, L. A.**

Hypobaric hypoxia (380 Torr) decreases intracellular and total body water in goats p 301 A91-49201

**TRINH, TINH T.**

Horizontally rotated cell culture system with a coaxial tubular oxygenator  
[NASA-CASE-MSC-21294-1] p 305 N91-30667

**TRITSCH, C. L.**

A holographic helmet mounted display application for the Extravehicular Mobility Unit p 325 A91-51077

**TSAI, PAI-FENG**

Gender-based differences in the cardiovascular response to standing p 306 A91-50631

**TSO, KAM S.**

A modular telerobotic task execution system p 324 A91-51000

**TSUJIO, SHOZO**

An experimental system for free-flying space robots and its system identification  
[AIAA PAPER 91-2825] p 319 A91-49767

**TURNER, JOHN W.**

The use and design of flightcrew checklists and manuals  
[AD-A237206] p 329 N91-29733

**U****UENO, HIROSHI**

On control and planning of a space station robot walker p 324 A91-50987

**UENO, MIYUKI**

On control and planning of a space station robot walker p 324 A91-50987

**UGLOVA, N. N.**

Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674

**UNGER, M.**

Pulmonary function in men after oxygen breathing at 3.0 ATA for 3.5 h p 308 A91-51403

**USHAKOV, A. S.**

Feeding the Salyut-7 crews p 330 N91-30671  
Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 311 N91-30672

**USHAKOV, A. S.**

Feeding the Salyut-7 crews p 330 N91-30685  
Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686

**V****VAN DEN BERG, J.**

Low light level television systems in helmet mounted displays p 326 A91-51083

**VANDENNEHEUVEL, SIEGER**

Physiological modelling using RL  
[ITLI-CT-90-08] p 314 N91-30695

**VANEMDEBOAS, PETER**

Physiological modelling using RL  
[ITLI-CT-90-08] p 314 N91-30695

**VARTBARONOV, R. A.**

Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674

**VASIN, M. V.**

Effect of hyperthermia on some hormonal and immunogenic characteristics of humans p 307 A91-50851

**VENKATASETTY, H. V.**

Electrochemical amperometric gas sensors for environmental monitoring and control  
[SAE PAPER 901296] p 322 A91-50538

**VERMAAS, W. F. J.**

Specific mutagenesis of a chlorophyll-binding protein  
[DE91-014813] p 304 N91-29711

**VERONA, ROBERT W.**

Human factors and safety considerations of night vision systems flight using thermal imaging systems p 326 A91-51090

**VEROSTKO, CHARLES E.**

Electrooxidation of organics in waste water  
[SAE PAPER 901312] p 322 A91-50540

**VETROVA, YE. G.**

Influence of long-term antiorthostatic hypokinesia on activity of enzymes involved in energy and plastic metabolism p 311 N91-30675

**VUOLTEENAHO, O.**

Passive heat exposure leads to delayed increase in plasma levels of atrial natriuretic peptide in humans p 306 A91-49207

**W****WABER, U.**

Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405

**WALKER, MICHAEL B.**

Scene content and runway breadth effects on simulated landing approaches p 319 A91-48787

**WANG, JIH-FANG**

Tracking a head-mounted display in a room-sized environment with head-mounted cameras p 325 A91-51082

**WANG, X.**

Preliminary investigations of tactile perception of graphical patterns  
[EUT-90-E-239] p 318 N91-30700

**WATSON, CHARLES S.**

Institute for the Study of Human Capabilities: Summary descriptions of research for the period December 1989 through September 1990  
[AD-A237767] p 316 N91-29726

**WEBSTER, LAURIE**

A comparison between computer-controlled and set work rate exercise based on target heart rate p 307 A91-50638

**WEIL, JOHN V.**

Sleep disturbances at high altitude. Role of a PCO2 apneic threshold  
[AD-A229426] p 312 N91-30680

**WEINSTOCK, M.**

A holographic helmet mounted display application for the Extravehicular Mobility Unit p 325 A91-51077

**WEINTRAUB, D. J.**

Methods for evaluating discomfort glare  
[PB91-185132] p 310 N91-29722

**WELLS, MAXWELL J.**

Head movements during simulated air-to-air engagements p 327 A91-51099

**WENZEL, ELIZABETH M.**

Three-dimensional virtual acoustic displays  
[NASA-TM-103835] p 318 N91-30697

**WEST, JOHN B.**

COSMOS 2044: Lung morphology study, experiment K-7-28  
[NASA-CR-187711] p 305 N91-30668

**WETZEL, PAUL A.**

Evaluation of eye tracking measurement systems for use with the fiber optic helmet mounted display p 320 A91-50473

**WIEGEL, J.**

Microbiology and physiology of anaerobic fermentations of cellulose  
[DE91-015239] p 304 N91-29712

**WILDE, D.**

Intervention of human operators in automated spacecraft Rendezvous and Docking GNC  
[AIAA PAPER 91-2791] p 319 A91-49792

**WILKINS, ROBERT R.**

Rotorcraft human factors  
Man...machine...environment  
[SAE PAPER 902001] p 319 A91-48658

**WILLIAMS, DAVID E.**

Expanded capabilities of the Extended Duration Orbiter  
[SAE PAPER 901290] p 321 A91-50532

**WILLIAMS, TERENCE T.**

Evaluation of eye tracking measurement systems for use with the fiber optic helmet mounted display p 320 A91-50473

**WILLIAMSON, SAMUEL J.**

Cognition and the brain  
[AD-A237846] p 316 N91-29727

**WILSON, JOHN L.**

Investigation into venting and non-venting technologies for the Space Station Freedom extravehicular activity life support system  
[SAE PAPER 901319] p 323 A91-50546

**WINKLER, H. E.**

The extended duration orbiter waste collection system  
[SAE PAPER 901291] p 321 A91-50533  
The Extended Duration Orbiter Regenerable CO2  
Removal System

[SAE PAPER 901292] p 321 A91-50534

**WITSIL, AMY K.**

Thermal design, analysis, and testing of the CETA Space  
Shuttle Flight Experiment

[SAE PAPER 901790] p 318 A91-48530

**WOLF, DAVID A.**

Horizontally rotated cell culture system with a coaxial  
tubular oxygenator

[NASA-CASE-MSC-21294-1] p 305 N91-30667

**WOODMAN, CHRISTOPHER R.**

Influences of chemical sympathectomy and simulated  
weightlessness on male and female rats

p 302 A91-51406

**WOODWARD, LORI**

Space Station Freedom predevelopment operational  
system test (POST) carbon dioxide removal assembly

[SAE PAPER 901392] p 327 A91-51358

**WYDEVEN, TED**

Physical/chemical closed-loop water-recycling for  
long-duration missions

[SAE PAPER 901446] p 323 A91-50542

**WYTCHERLEY, RANDI W.**

Preliminary evaluation of a membrane-based system for  
removing CO2 from air

[SAE PAPER 901295] p 322 A91-50537

**X****XU, YANGSHENG**

On control and planning of a space station robot  
walker

p 324 A91-50987

**Y****YOUNG, STEVEN**

Application of structured analysis to a telerobotic  
system

p 324 A91-50988

**Z****ZAMAGNI, MARCELO**

Effect of alkalosis on maximum oxygen uptake in rats  
acclimated to simulated altitude

p 303 A91-51409

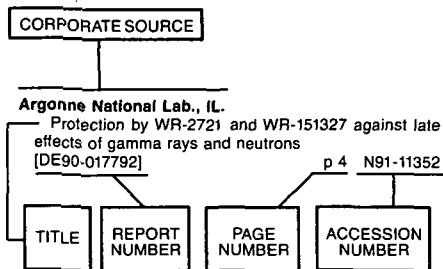
**ZHU, YI-SHENG**

Applications of adaptive filtering to ECG analysis - Noise  
cancellation and arrhythmia detection

p 329 A91-52128

# CORPORATE SOURCE INDEX

## Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

### A

- Aeritalia S.p.A., Turin (Italy).**  
Human engineering activity for the definition of visual avionic systems  
[ETN-91-99510] p 332 N91-30710
- Alabama Univ., Huntsville.**  
Chemical waste disposal in space by plasma discharge  
[NASA-CR-184169] p 330 N91-29737
- Amsterdam Univ. (Netherlands).**  
Physiological modelling using RL  
[ITLI-CT-90-08] p 314 N91-30695
- Anacapa Sciences, Inc., Fort Rucker, AL.**  
Task analysis and workload prediction model of the MH-60K mission and a comparison with UH-60A workload predictions. Volume 3: Appendixes H through N  
[AD-A229408] p 331 N91-30703
- Analysis and Technology, Inc., New London, CT.**  
Evaluation of night vision goggles for maritime search and rescue. Volume 2: Data appendix  
[AD-A229393] p 331 N91-30702
- Arizona State Univ., Tempe.**  
Specific mutagenesis of a chlorophyll-binding protein  
[DE91-014813] p 304 N91-29711
- Arizona Univ., Tucson.**  
The effect of a space food bar diet on body and muscle mass in normal and hind-limb suspended rats  
p 302 A91-50634  
Influences of chemical sympathectomy and simulated weightlessness on male and female rats  
p 302 A91-51406
- Army Aeromedical Research Lab., Fort Rucker, AL.**  
Human factors of night vision devices: Anecdotes from the field concerning visual illusions and other effects  
[AD-A237641] p 329 N91-29735
- Army Research Inst. of Environmental Medicine, Natick, MA.**  
Data acquisition system for collecting biophysical and physiological data  
[AD-A237654] p 304 N91-29710

- Physiological responses to intermittent exercise as modified by heat stress and protective clothing  
[AD-A237447] p 309 N91-29716

### B

- Bend Research, Inc., OR.**  
Preliminary evaluation of a membrane-based system for removing CO<sub>2</sub> from air  
[SAE PAPER 901295] p 322 A91-50537
- Biokinetics and Associates Ltd., Ottawa (Ontario).**  
Critique of a process proposed to determine CF aircrew/cockpit compatibility  
[DCIEM-R88-7C] p 331 N91-30705
- Bionetics Corp., Moffett Field, CA.**  
The CELSS Test Facility - A foundation for crop research in space  
[SAE PAPER 901279] p 320 A91-50529  
Physical/chemical closed-loop water-recycling for long-duration missions  
[SAE PAPER 901446] p 323 A91-50542

### C

- California Inst. of Tech., Pasadena.**  
Studies in neural networks  
[AD-A237452] p 310 N91-29717
- California Univ., Berkeley, Lawrence Berkeley Lab.**  
Quantum measurement and the mind-brain connection  
[DE91-012343] p 316 N91-29723
- California Univ., San Diego, La Jolla.**  
COSMOS 2044: Lung morphology study, experiment K-7-28  
[NASA-CR-187711] p 305 N91-30668
- Carnegie-Mellon Univ., Pittsburgh, PA.**  
The functional architecture of visual object recognition  
[AD-A238617] p 317 N91-29732
- Chemical Research and Development Center, Aberdeen Proving Ground, MD.**  
Ventilation kinetics testing of a steel frame/rubber fabric underground shelter  
[AD-A237469] p 329 N91-29734
- Colorado Univ., Denver.**  
Sleep disturbances at high altitude. Role of a PCO<sub>2</sub> apneic threshold  
[AD-A229426] p 312 N91-30680
- Cranfield Inst. of Tech., Bedford (England).**  
Preventing driver error and motorcycle accident causation: An empirical investigation  
[CRANFIELD-AERO-9106] p 332 N91-30711

### D

- Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).**  
Canadian Forces flight trial of individually molded fiberglass lumbar supports  
[DCIEM-88-RR-12] p 331 N91-30706
- Department of Transportation, Cambridge, MA.**  
The use and design of flightcrew checklists and manuals  
[AD-A237206] p 329 N91-29733
- Draper (Charles Stark) Lab., Inc., Cambridge, MA.**  
Active vibration damping of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2621] p 319 A91-49597  
Multivariable control of the Space Shuttle Remote Manipulator System  
[AIAA PAPER 91-2828] p 319 A91-49770
- Duke Univ., Durham, NC.**  
Stable isotope fractionation in photosynthesis: Analysis of autotrophic competence following transformation of the chloroplast genome of *Chlamydomonas*  
[DE91-015792] p 304 N91-29713

### E

- Educational Testing Service, Princeton, NJ.**  
Communication variations and aircrew performance  
p 314 A91-48789

### F

- Florida Univ., Saint Augustine.**  
Inhibition of olfactory receptor cells: An aquatic model  
[AD-A234437] p 312 N91-30681

### G

- Georgia Univ., Athens.**  
Microbiology and physiology of anaerobic fermentations of cellulose  
[DE91-015239] p 304 N91-29712

### H

- Hamilton Standard, Windsor Locks, CT.**  
Shuttle extravehicular mobility unit (EMU) operational enhancements  
[SAE PAPER 901317] p 323 A91-50544
- Honeywell, Inc., Bloomington, MN.**  
Electrochemical amperometric gas sensors for environmental monitoring and control  
[SAE PAPER 901296] p 322 A91-50538

### I

- Idaho National Engineering Lab., Idaho Falls.**  
Radiation dose estimates for typical piloted NTR lunar and Mars mission engine operations  
[AIAA PAPER 91-3407] p 309 A91-52331
- ILC Dover, Frederica, DE.**  
Shuttle extravehicular mobility unit (EMU) operational enhancements  
[SAE PAPER 901317] p 323 A91-50544
- Indiana Univ., Bloomington.**  
Institute for the Study of Human Capabilities: Summary descriptions of research for the period December 1989 through September 1990  
[AD-A237767] p 316 N91-29726

- Institute for Perception RVO-TNO, Soesterberg (Netherlands).**  
Damage risk for low-frequency impulse noise; the spectral factor in noise-induced hearing loss  
[IZF-1990-A-37] p 313 N91-30693  
Spatiotemporal edge perception  
[IZF-1990-B-15] p 318 N91-30698  
Human cognitive processes in command and control planning. 1: Identification of research issues  
[IZF-1990-B-18] p 318 N91-30699  
The use of an active gas-pedal as an element of an intelligent driver support system: Literature review and explorative study  
[IZF-1990-B-17] p 332 N91-30708  
An experimental comparison between different types of in-car navigation information  
[IZF-1991-B-1] p 332 N91-30709

### J

- Jet Propulsion Lab., California Inst. of Tech., Pasadena.**  
The conversion of lignocellulosics to fermentable sugars - A survey of current research and applications to CELSS  
[SAE PAPER 901282] p 321 A91-50531  
A modular telerobotic task execution system  
p 324 A91-51000  
Generalized compliant motion task description and execution within a complete telerobotic system  
p 324 A91-51001



**Joint Publications Research Service, Arlington, VA.**  
 JPRS report: Science and technology. USSR: Life sciences  
 [JPRS-ULS-90-018] p 311 N91-30670  
 Feeding the Salyut-7 crews p 330 N91-30671  
 Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 311 N91-30672  
 Status of lipid peroxidation system in rat tissues after 7-day flight on Kosmos-1667 p 305 N91-30673  
 Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674  
 Influence of long-term antiorthostatic hypokinesia on activity of enzymes involved in energy and plastic metabolism p 311 N91-30675  
 Ocular-vestibular-motor interactions in experimental labyrinth asymmetry p 311 N91-30676  
 Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677  
 Predicting the effect of linear and angular impact acceleration on humans p 311 N91-30678  
 JPRS report: Science and technology. USSR: Life sciences  
 [JPRS-ULS-91-005] p 312 N91-30683  
 Feeding the Salyut-7 crews p 330 N91-30685  
 Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686  
 Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687  
 Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688

**L**

**Life Systems, Inc., Cleveland, OH.**  
 Hybrid air revitalization system for a closed ecosystem [SAE PAPER 901311] p 322 A91-50539  
**Lockheed Engineering and Sciences Co., Houston, TX.**  
 CELSS simulations for a lunar outpost [SAE PAPER 901281] p 322 A91-50541  
 Investigation into venting and non-venting technologies for the Space Station Freedom extravehicular activity life support system [SAE PAPER 901319] p 323 A91-50546  
 Modular, thermal bus-to-radiator integral heat exchanger design for Space Station Freedom [SAE PAPER 901435] p 329 A91-51367  
**Lockheed Engineering and Sciences Co., Washington, DC.**  
 USSR Space Life Sciences Digest, issue 31 [NASA-CR-3922(37)] p 305 N91-30669

**M**

**Massachusetts Inst. of Tech., Cambridge.**  
 Representations in mental models [AD-A29401] p 317 N91-30696  
**McDonnell-Douglas Space Systems Co., Houston, TX.**  
 Expanded capabilities of the Extended Duration Orbiter [SAE PAPER 901290] p 321 A91-50532  
**McMaster Univ., Hamilton (Ontario).**  
 Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 2 [CTN-91-60128] p 331 N91-30704  
 Evaluation of alternative methods for increasing tolerance to +Gz. A preliminary study of dynamic leg exercise [CTN-91-60213] p 332 N91-30707  
**Medical Coll. of Georgia, Augusta.**  
 A review: The 13th Annual Conference on Shock [AD-A237300] p 313 N91-30690  
**Michigan Univ., Ann Arbor.**  
 Methods for evaluating discomfort glare [PB91-185132] p 310 N91-29722

**N**

**National Aeronautics and Space Administration, Washington, DC.**  
 Long term life support for space exploration [SAE PAPER 901277] p 320 A91-50528  
**National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.**  
 Communication variations and aircrew performance p 314 A91-48789  
 Pilot performance research for TCAS [SAE PAPER 902357] p 315 A91-49864  
 The CELSS Test Facility - A foundation for crop research in space [SAE PAPER 901279] p 320 A91-50529

Safad Machine - A vegetable production unit for long duration space missions [SAE PAPER 901280] p 320 A91-50530  
 Physical/chemical closed-loop water-recycling for long-duration missions [SAE PAPER 901446] p 323 A91-50542  
 Three-dimensional virtual acoustic displays [NASA-TM-103835] p 318 N91-30697  
**National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.**  
 Compliant walker [NASA-CASE-GSC-13348-2] p 309 N91-29714  
**National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.**  
 Expanded capabilities of the Extended Duration Orbiter [SAE PAPER 901290] p 321 A91-50532  
 The extended duration orbiter waste collection system [SAE PAPER 901291] p 321 A91-50533  
 The Extended Duration Orbiter Regenerable CO2 Removal System [SAE PAPER 901292] p 321 A91-50534  
 Hybrid air revitalization system for a closed ecosystem [SAE PAPER 901311] p 322 A91-50539  
 Electrooxidation of organics in waste water [SAE PAPER 901312] p 322 A91-50540  
 CELSS simulations for a lunar outpost [SAE PAPER 901281] p 322 A91-50541  
 Shuttle extravehicular mobility unit (EMU) operational enhancements [SAE PAPER 901317] p 323 A91-50544  
 Investigation into venting and non-venting technologies for the Space Station Freedom extravehicular activity life support system [SAE PAPER 901319] p 323 A91-50546  
 Gender-based differences in the cardiovascular response to standing p 306 A91-50631  
 A comparison between computer-controlled and set work rate exercise based on target heart rate p 307 A91-50638  
 Modular, thermal bus-to-radiator integral heat exchanger design for Space Station Freedom [SAE PAPER 901435] p 329 A91-51367  
 Horizontally rotated cell culture system with a coaxial tubular oxygenator [NASA-CASE-MS-C-21294-1] p 305 N91-30667  
 Doppler indices of gas phase formation in hypobaric environments: Time-intensity analysis [NASA-TM-102176] p 313 N91-30692  
**National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.**  
 Thermal design, analysis, and testing of the CETA Space Shuttle Flight Experiment p 318 A91-48530  
 Active vibration damping of the Space Shuttle Remote Manipulator System [AIAA PAPER 91-2621] p 319 A91-49597  
 Application of structured analysis to a telerobotic system p 324 A91-50988  
 A full-color wide-field-of-view holographic helmet-mounted display for pilot/vehicle interface development and human factors studies p 325 A91-51078  
**National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.**  
 Radiation dose estimates for typical piloted NTR lunar and Mars mission engine operations [AIAA PAPER 91-3407] p 309 A91-52331  
**National Oceanic and Atmospheric Administration, Boulder, CO.**  
 Irradiance distributions on the human retina from a laser observed through the turbulent atmosphere [PB91-196907] p 313 N91-30691  
**Naval Aerospace Medical Research Lab., Pensacola, FL.**  
 Micro SAINT modeling of physiological and human performance in the heat [AD-A238659] p 310 N91-29719  
 Analysis of Naval aviation selection test data with nonlinear models. Part 1: Parameter estimation [AD-A238244] p 317 N91-29728  
 Performance of Marine AV-8B (Harrier) pilots on a cognitive/psychomotor test battery: Comparison and prediction [AD-A238563] p 317 N91-29729  
 Performance of several different Naval aviator communities on a cognitive/psychomotor test battery: Pipeline comparison and prediction [AD-A238564] p 317 N91-29730  
 The effect of three levels of laser glare on the speed and accuracy of target location performance when viewing a briefly presented visual array p 330 N91-29736

**P**

**Naval Medical Research and Development Command, Bethesda, MD.**  
 Development and evaluation of a human performance assessment battery [AD-A237391] p 316 N91-29724  
**New York Univ., New York.**  
 Cognition and the brain [AD-A237846] p 316 N91-29727  
**Pacific Northwest Lab., Richland, WA.**  
 Biological interactions of extremely-low-frequency electric and magnetic fields [DE90-011927] p 304 N91-29709  
**Pennsylvania Univ., Philadelphia.**  
 Pulmonary function in men after oxygen breathing at 3.0 ATA for 3.5 h p 308 A91-51403  
 Hardware Implementation of Neuron Nets and Synapses Workshop [AD-A237704] p 310 N91-29718

**R**

**Reading Univ. (England).**  
 Predicting performance breakdown in pilots through objective measures of stress sensitivity [AD-A237540] p 316 N91-29725  
 Predicting performance breakdown in pilots through objective measures of stress sensitivity [AD-A238597] p 317 N91-29731  
**Research Triangle Inst., Research Triangle Park, NC.**  
 Application of structured analysis to a telerobotic system p 324 A91-50988  
**Retina Foundation, Boston, MA.**  
 Eye movements and spatial pattern vision [AD-A238664] p 310 N91-29721  
**Rockwell International Corp., Downey, CA.**  
 The extended duration orbiter waste collection system [SAE PAPER 901291] p 321 A91-50533  
**Royal Signals and Radar Establishment, Malvern (England).**  
 Information processing in the outer retina [RSRE-MEMO-4469] p 313 N91-30694

**S**

**Scotgen Ltd., Aberdeen (Scotland).**  
 Reshaped human monoclonal antibodies for therapy and passive immunization [AD-A234770] p 312 N91-30682  
**Smith-Kettlewell Inst. of Visual Sciences, San Francisco, CA.**  
 Psychophysical studies of visual cortical function [AD-A238663] p 310 N91-29720  
**Stanford Univ., CA.**  
 Analysis of routine pilot-controller communication [SAE PAPER 902352] p 315 A91-49861

**T**

**Technische Univ., Eindhoven (Netherlands).**  
 Preliminary investigations of tactile perception of graphical patterns [EUT-90-E-239] p 318 N91-30700  
 A membrane model for spatiotemporal coupling [EUT-90-E-241] p 318 N91-30701  
**Technology Innovation Group, Inc., Pleasantville, NY.**  
 A full-color wide-field-of-view holographic helmet-mounted display for pilot/vehicle interface development and human factors studies p 325 A91-51078  
**Texas A&M Univ., College Station.**  
 Electrooxidation of organics in waste water [SAE PAPER 901312] p 322 A91-50540  
**Texas Univ., Austin.**  
 Communication variations and aircrew performance p 314 A91-48789

**U**

**United Technologies Corp., Windsor Locks, CT.**  
 The extended duration orbiter waste collection system [SAE PAPER 901291] p 321 A91-50533  
 The Extended Duration Orbiter Regenerable CO2 Removal System [SAE PAPER 901292] p 321 A91-50534  
**Universities Space Research Association, Houston, TX.**  
 Gender-based differences in the cardiovascular response to standing p 306 A91-50631

V

Virginia Mason Research Center, Seattle, WA.  
Influence of anticholinesterase on distribution of  
ventilation and gas exchange  
[AD-A229341] p 312 N91-30679

W

Washington Univ., Seattle.  
Perturbation techniques for models of bursting electrical  
activity in pancreatic (beta)-cells  
[DE91-013901] p 309 N91-29715

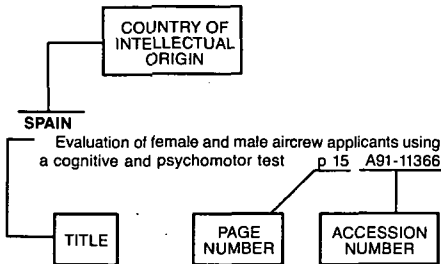
Wright State Univ., Dayton, OH.  
Gender-based differences in the cardiovascular  
response to standing p 306 A91-50631

# FOREIGN TECHNOLOGY INDEX

AEROSPACE MEDICINE AND BIOLOGY / A Continuing Bibliography (Supplement 356)

December 1991

## Typical Foreign Technology Index Listing



Listings in this index are arranged alphabetically by country of intellectual origin. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the citation in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

- C**
- CANADA**
- Predicting success in primary flying school from the Canadian automated pilot selection system - Derivation and cross-validation p 314 A91-48790
- Heat loss from the human head during exercise p 306 A91-49204
- Evaluation of alternative methods for increasing tolerance to +Gz acceleration, phase 2 [CTN-91-60128] p 331 N91-30704
- Critique of a process proposed to determine CF aircrew/cockpit compatibility [DCIEM-R88-7C] p 331 N91-30705
- Canadian Forces flight trial of individually molded fiberglass lumbar supports [DCIEM-88-RR-12] p 331 N91-30706
- Evaluation of alternative methods for increasing tolerance to +Gz. A preliminary study of dynamic leg exercise [CTN-91-60213] p 332 N91-30707
- D**
- DENMARK**
- Effect of axillary blockade on regional cerebral blood flow during static handgrip p 306 A91-49206
- F**
- FINLAND**
- Passive heat exposure leads to delayed increase in plasma levels of atrial natriuretic peptide in humans p 306 A91-49207
- FRANCE**
- Pressure-induced striatal dopamine release correlates hyperlocomotor activity in rats exposed to high pressure p 301 A91-49205

- An oral task-oriented dialogue for air-traffic controller training p 316 A91-51218
- Immunomodulations of thymocytes and splenocytes in trained rats p 302 A91-51401

## G

- GERMANY, FEDERAL REPUBLIC OF**
- Head tracking accuracy in view of boresighting and parallax compensation p 326 A91-51094

## I

- INTERNATIONAL ORGANIZATION**
- Intervention of human operators in automated spacecraft Rendezvous and Docking GNC [AIAA PAPER 91-2791] p 319 A91-49792

- ISRAEL**
- High pressure modifies respiratory activity in isolated rat brain stem-spinal cord p 301 A91-49203
- Factors associated with leukocyturia in asymptomatic pilots p 307 A91-50637

- ITALY**
- The effects of hypobaric hypoxia on specific B cell responses following immunization in mice and humans p 302 A91-50633
- Human engineering activity for the definition of visual avionic systems [ETN-91-99510] p 332 N91-30710

## J

- JAPAN**
- An experimental system for free-flying space robots and its system identification [AIAA PAPER 91-2825] p 319 A91-49767
- Perception of 3-D transparent illusory surface in binocular fusion p 316 A91-51550

## N

- NETHERLANDS**
- Low light level television systems in helmet mounted displays p 326 A91-51083
- Damage risk for low-frequency impulse noise; the spectral factor in noise-induced hearing loss [IZF-1990-A-37] p 313 N91-30693
- Physiological modelling using RL [ITLI-CT-90-08] p 314 N91-30695
- Spatiotemporal edge perception [IZF-1990-B-15] p 318 N91-30698
- Human cognitive processes in command and control planning. 1: Identification of research issues [IZF-1990-B-18] p 318 N91-30699
- Preliminary investigations of tactile perception of graphical patterns [EUT-90-E-239] p 318 N91-30700
- A membrane model for spatiotemporal coupling [EUT-90-E-241] p 318 N91-30701
- The use of an active gas-pedal as an element of an intelligent driver support system: Literature review and explorative study [IZF-1990-B-17] p 332 N91-30708
- An experimental comparison between different types of in-car navigation information [IZF-1991-B-1] p 332 N91-30709

## P

- POLAND**
- Current research and trends in aviation psychology in Poland p 315 A91-50639

## S

- SOUTH AFRICA, REPUBLIC OF**
- The measurement of psychophysiological reactions of pilots to a stressor in a flight simulator p 306 A91-50629

- SWEDEN**
- White finger symptoms - A cross-sectional study p 307 A91-50635

- SWITZERLAND**
- Blood rheology in acute mountain sickness and high-altitude pulmonary edema p 308 A91-51405

## U

- U.S.S.R.**
- Differences in thermoregulation mechanisms of rats during separate and combined adaptation to cold and heat p 301 A91-49569
- Activity of acid phosphatase in the blood serum of rats with different types of hypoxia p 302 A91-49570
- Effect of hyperthermia on some hormonal and immunogenic characteristics of humans p 307 A91-50851
- The role of photoperiodism in the formation of adaptational changes in the human endocrine system in the north p 307 A91-50852
- Taxonomic analysis of individual reactions of an organism to hypoxia-related tests p 308 A91-50853
- Typological characteristics of defense reactions during chronophysiological stress p 308 A91-50854
- The characteristics of adaptive shifts in participants of the Soviet-American Bering-Bridge expedition. I - The energy aspects of adaptation p 308 A91-50855
- Carnosine and its biological significance p 303 A91-52601

- Neuromediator interactions in specific and nonspecific structures of the central nervous system under the unloading of the locomotor apparatus and dosed visceral irritation p 303 A91-52602
- Physical work capacity of the organism in experiments with combined exposure to hypokinesia and radiation p 303 A91-52713
- Fundamentals of body energetics: Theoretical and practical aspects. I - The basic energetics, heat exchange, and thermoregulation p 304 A91-52726
- JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-90-018] p 311 N91-30670

- Feeding the Salyut-7 crews p 330 N91-30671
- Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 311 N91-30672
- Status of lipid peroxidation system in rat tissues after 7-day flight on Kosmos-1667 p 305 N91-30673
- Blood electrolyte balance in dogs repeatedly exposed to +G(subz) acceleration p 305 N91-30674
- Influence of long-term antithrostatic hypokinesia on activity of enzymes involved in energy and plastic metabolism p 311 N91-30675
- Ocular-vestibular-motor interactions in experimental labyrinth asymmetry p 311 N91-30676
- Differential criterion for tolerance of a blow to the head in certification of protective gear p 311 N91-30677
- Predicting the effect of linear and angular impact acceleration on humans p 311 N91-30678
- JPRS report: Science and technology. USSR: Life sciences [JPRS-ULS-91-005] p 312 N91-30683
- Feeding the Salyut-7 crews p 330 N91-30685
- Reaction of sympathoadrenal system of cosmonauts after long missions on Salyut-7 orbital spacecraft p 312 N91-30686
- Differential criterion for tolerance of a blow to the head in certification of protective gear p 330 N91-30687
- Predicting the effect of linear and angular impact acceleration on humans p 313 N91-30688

- UNITED KINGDOM**
- Human factors for pilots p 302 A91-50999
- The development of the combiner eyepiece night vision goggle p 325 A91-51079

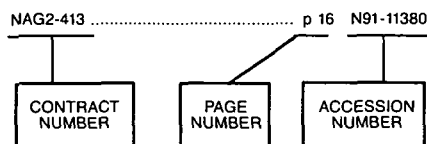
FOREIGN

**UNITED KINGDOM**

Predicting performance breakdown in pilots through objective measures of stress sensitivity  
[AD-A237540] p 316 N91-29725  
Predicting performance breakdown in pilots through objective measures of stress sensitivity  
[AD-A238597] p 317 N91-29731  
Reshaped human monoclonal antibodies for therapy and passive immunization  
[AD-A234770] p 312 N91-30682  
Information processing in the outer retina  
[RSRE-MEMO-4469] p 313 N91-30694  
Preventing driver error and motorcycle accident causation: An empirical investigation  
[CRANFIELD-AERO-9106] p 332 N91-30711

# CONTRACT NUMBER INDEX

## Typical Contract Number Index Listing



Listings in this index are arranged alphanumerically by contract number. Under each contract number, the accession numbers denoting documents that have been produced as a result of research done under the contract are shown. The accession number denotes the number by which the citation is identified in the abstract section. Preceding the accession number is the page number on which the citation may be found.

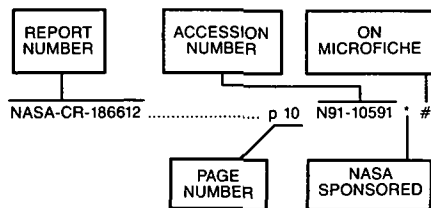
NAS9-18147	.....	p 319	A91-49770
NGT-70308	.....	p 302	A91-50634
NIH-AG-00423	.....	p 309	A91-51407
NIH-AG-06537	.....	p 309	A91-51407
NIH-AR-18140-13	.....	p 308	A91-51402
NIH-HL-01509	.....	p 329	A91-52128
NIH-HL-39443	.....	p 303	A91-51408
		p 303	A91-51409
NIH-HL-39966	.....	p 309	A91-51407
NIH-P01-HL-36552	.....	p 301	A91-49202
NIH-RR-02170-05	.....	p 325	A91-51082
NR PROJ. RR0-4108	.....	p 312	N91-30681
NR PROJ. RR0-4206	.....	p 317	N91-29732
NSF BNS-86-16509	.....	p 301	A91-48450
NSF ENG-84-51491	.....	p 329	A91-52128
N00014-81-C-0826	.....	p 308	A91-51403
N00014-86-K-0680	.....	p 325	A91-51082
N00014-87-K-0377	.....	p 310	N91-29717
N00014-88-J-1050	.....	p 310	N91-29718
N00014-89-J-3016	.....	p 317	N91-29732
N00014-90-J-1566	.....	p 312	N91-30681
SNSF-3200-0092,85	.....	p 308	A91-51405
505-67-01	.....	p 318	N91-30697

AF PROJ. 2313	.....	p 310	N91-29720
		p 310	N91-29721
		p 316	N91-29727
AF PROJ. 3484	.....	p 316	N91-29726
AF-AFOSR-0089-87	.....	p 316	N91-29726
AF-AFOSR-0177-90	.....	p 317	N91-30696
AF-AFOSR-0221-90	.....	p 316	N91-29727
AF-AFOSR-0326-88	.....	p 310	N91-29720
AF-AFOSR-0377-89	.....	p 310	N91-29721
A86/M/161	.....	p 313	N91-30693
DA PROJ. 2Q1-61102-B-74-F	.....	p 316	N91-29725
DA PROJ. 3E6-2777-A-879	.....	p 312	N91-30680
DA PROJ. 3M1-61102-BS-12	.....	p 312	N91-30682
DA PROJ. 3M1-62787-A-878	.....	p 304	N91-29710
DA PROJ. 3M4-637648995	.....	p 310	N91-29719
DA PROJ. 3M4-63807-D-993	.....	p 316	N91-29724
DAAG29-81-D-0100	.....	p 326	A91-51095
DAJA45-88-C-0024	.....	p 316	N91-29725
		p 317	N91-29731
DAMD17-85-C-5205	.....	p 312	N91-30680
DAMD17-89-C-9060	.....	p 312	N91-30682
DAMD17-90-Z-0028	.....	p 313	N91-30690
DCIEM-W-711-6-9281/01-SE	.....	p 332	N91-30707
DCIEM-W7711-8-7042/01-SE	.....	p 331	N91-30704
DE-AC03-76SF-00098	.....	p 316	N91-29723
DE-AC06-76RL-01830	.....	p 304	N91-29709
DE-AC07-7ID-01570	.....	p 309	A91-52331
DE-FG02-89ER-14031	.....	p 304	N91-29711
DE-FG05-89ER-14005	.....	p 304	N91-29713
DE-FG06-86ER-25019	.....	p 309	N91-29715
DE-FG09-86ER-13614	.....	p 304	N91-29712
DRET-87-168	.....	p 301	A91-49205
DTCG39-89-C-80671	.....	p 331	N91-30702
ESA-8369/89	.....	p 319	A91-49792
F33615-81-C-0012	.....	p 320	A91-50473
F33615-85-C-4512	.....	p 312	N91-30679
MDA903-86-C-0169	.....	p 319	A91-48787
		p 325	A91-51022
MDA903-87-C-0523	.....	p 331	N91-30703
NAG2-384	.....	p 302	A91-50634
NAG2-392	.....	p 302	A91-51406
NAG2-616	.....	p 305	N91-30668
NAG9-350	.....	p 322	A91-50540
NASW-4292	.....	p 305	N91-30669
NAS1-17964	.....	p 324	A91-50988
NAS8-37195	.....	p 330	N91-29737
NAS9-17238	.....	p 308	A91-51403
NAS9-17900	.....	p 322	A91-50541
		p 329	A91-51367
NAS9-17913	.....	p 322	A91-50539
NAS9-18085	.....	p 322	A91-50537

CONTRACT

# REPORT NUMBER INDEX

## Typical Report Number Index Listing



Listings in this index are arranged alphanumerically by report number. The page number indicates the page on which the citation is located. The accession number denotes the number by which the citation is identified. An asterisk (\*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

CRDEC-TR-278 .....	p 329	N91-29734	#	NASA-CR-187711 .....	p 305	N91-30668	* #
CTN-91-60128 .....	p 331	N91-30704		NASA-CR-3922(37) .....	p 305	N91-30669	*
CTN-91-60208 .....	p 331	N91-30705		NASA-TM-102176 .....	p 313	N91-30692	* #
CTN-91-60212 .....	p 331	N91-30706		NASA-TM-103835 .....	p 318	N91-30697	* #
CTN-91-60213 .....	p 332	N91-30707		NOAA-TM-ERL-WPL-196 .....	p 313	N91-30691	#
DCIEM-R88-7C .....	p 331	N91-30705		PB91-185132 .....	p 310	N91-29722	#
DCIEM-88-RR-12 .....	p 331	N91-30706		PB91-196907 .....	p 313	N91-30691	#
DE90-011927 .....	p 304	N91-29709	#	PNL-SA-17147 .....	p 304	N91-29709	#
DE91-012343 .....	p 316	N91-29723	#	RSRE-MEMO-4469 .....	p 313	N91-30694	#
DE91-013901 .....	p 309	N91-29715	#	S-626 .....	p 313	N91-30692	* #
DE91-014813 .....	p 304	N91-29711	#	SAE P-239 .....	p 314	A91-49857	
DE91-015239 .....	p 304	N91-29712	#	SAE PAPER 901277 .....	p 320	A91-50528	*
DE91-015792 .....	p 304	N91-29713	#	SAE PAPER 901279 .....	p 320	A91-50529	*
DOE/ER-13614/4 .....	p 304	N91-29712	#	SAE PAPER 901280 .....	p 320	A91-50530	*
DOE/ER-14005/T1 .....	p 304	N91-29713	#	SAE PAPER 901281 .....	p 320	A91-50541	*
DOE/ER-14031/3 .....	p 304	N91-29711	#	SAE PAPER 901282 .....	p 321	A91-50531	*
DOE/ER-25019/21 .....	p 309	N91-29715	#	SAE PAPER 901290 .....	p 321	A91-50532	*
DOT/FAA/AM-91/7 .....	p 329	N91-29733	#	SAE PAPER 901291 .....	p 321	A91-50533	*
ETN-91-99510 .....	p 332	N91-30710	#	SAE PAPER 901292 .....	p 321	A91-50534	*
ETN-91-99543 .....	p 332	N91-30711	#	SAE PAPER 901293 .....	p 321	A91-50535	*
ETN-91-99569 .....	p 314	N91-30695	#	SAE PAPER 901294 .....	p 321	A91-50536	*
ETN-91-99619 .....	p 318	N91-30700	#	SAE PAPER 901295 .....	p 322	A91-50537	*
ETN-91-99621 .....	p 318	N91-30701	#	SAE PAPER 901296 .....	p 322	A91-50538	*
ETN-91-99820 .....	p 313	N91-30693	#	SAE PAPER 901311 .....	p 322	A91-50539	*
ETN-91-99824 .....	p 318	N91-30698	#	SAE PAPER 901312 .....	p 322	A91-50540	*
ETN-91-99825 .....	p 332	N91-30708	#	SAE PAPER 901317 .....	p 323	A91-50544	*
ETN-91-99826 .....	p 318	N91-30699	#	SAE PAPER 901319 .....	p 323	A91-50546	*
ETN-91-99827 .....	p 332	N91-30709	#	SAE PAPER 901391 .....	p 327	A91-51357	*
ETN-91-99848 .....	p 313	N91-30694	#	SAE PAPER 901392 .....	p 327	A91-51358	*
EUT-90-E-239 .....	p 318	N91-30700	#	SAE PAPER 901393 .....	p 327	A91-51359	*
EUT-90-E-241 .....	p 318	N91-30701	#	SAE PAPER 901397 .....	p 323	A91-50547	*
INT-PATENT-CLASS-C12M-3/02 .....	p 305	N91-30667	*	SAE PAPER 901403 .....	p 327	A91-51361	*
ISBN-1-871564-14-X .....	p 332	N91-30711	#	SAE PAPER 901421 .....	p 328	A91-51362	*
ISBN-90-6144-239-7 .....	p 318	N91-30700	#	SAE PAPER 901422 .....	p 328	A91-51363	*
ISBN-90-6144-241-9 .....	p 318	N91-30701	#	SAE PAPER 901423 .....	p 328	A91-51364	*
ISSN-0167-9708 .....	p 318	N91-30700	#	SAE PAPER 901424 .....	p 328	A91-51365	*
ISSN-0167-9708 .....	p 318	N91-30701	#	SAE PAPER 901426 .....	p 328	A91-51366	*
ISSN-0924-8374 .....	p 314	N91-30695	#	SAE PAPER 901435 .....	p 329	A91-51367	*
ITLI-CT-90-08 .....	p 314	N91-30695	#	SAE PAPER 901446 .....	p 323	A91-50542	*
IZF-1990-A-37 .....	p 313	N91-30693	#	SAE PAPER 901790 .....	p 318	A91-48530	*
IZF-1990-B-15 .....	p 318	N91-30698	#	SAE PAPER 901870 .....	p 305	A91-48574	*
IZF-1990-B-17 .....	p 332	N91-30708	#	SAE PAPER 902001 .....	p 319	A91-48658	*
IZF-1990-B-18 .....	p 318	N91-30699	#	SAE PAPER 902342 .....	p 314	A91-49859	*
IZF-1991-B-1 .....	p 332	N91-30709	#	SAE PAPER 902344 .....	p 314	A91-49860	*
JPRS-ULS-90-018 .....	p 311	N91-30670	#	SAE PAPER 902352 .....	p 315	A91-49861	*
JPRS-ULS-91-005 .....	p 312	N91-30683	#	SAE PAPER 902353 .....	p 315	A91-49862	*
LBL-29594 .....	p 316	N91-29723	#	SAE PAPER 902357 .....	p 315	A91-49864	*
NAMRL-MONOGRAPH-42 .....	p 310	N91-29719	#	SAE SP-829 .....	p 327	A91-51356	*
NAMRL-TM-90-2 .....	p 317	N91-29728	#	SAE SP-830 .....	p 323	A91-50543	*
NAMRL-1359 .....	p 330	N91-29736	#	SAE SP-831 .....	p 320	A91-50527	*
NAMRL-1361 .....	p 317	N91-29730	#	SPIE-1290 .....	p 325	A91-51076	
NAMRL-1362 .....	p 317	N91-29729	#	TD-90-3405 .....	p 318	N91-30698	
NAS 1.15:102176 .....	p 313	N91-30692	* #	TD-90-3413 .....	p 313	N91-30693	
NAS 1.15:103835 .....	p 318	N91-30697	* #	TD-90-3415 .....	p 332	N91-30708	
NAS 1.26:184169 .....	p 330	N91-29737	* #	TD-90-3423 .....	p 318	N91-30699	
NAS 1.26:187711 .....	p 305	N91-30668	* #	TD-91-0034 .....	p 332	N91-30709	
NAS 1.26:3922(37) .....	p 305	N91-30669	* #	UMTRI-91-13 .....	p 310	N91-29722	#
NAS 1.71:GSC-13348-2 .....	p 309	N91-29714	* #	US-PATENT-APPL-SN-213558 .....	p 305	N91-30667	*
NASA-CASE-GSC-13348-2 .....	p 309	N91-29714	* #	US-PATENT-APPL-SN-725111 .....	p 309	N91-29714	* #
NASA-CASE-MSC-21294-1 .....	p 305	N91-30667	*	US-PATENT-CLASS-261-83 .....	p 305	N91-30667	*
NASA-CR-184169 .....	p 330	N91-29737	* #	US-PATENT-CLASS-435-285 .....	p 305	N91-30667	*
NASA-CR-186612 .....	p 10	N91-10591	* #	US-PATENT-CLASS-435-286 .....	p 305	N91-30667	*
AD-A229341 .....	p 312	N91-30679	#	US-PATENT-CLASS-435-312 .....	p 305	N91-30667	*
AD-A229393 .....	p 331	N91-30702	#	US-PATENT-CLASS-435-313 .....	p 305	N91-30667	*
AD-A229401 .....	p 331	N91-30696	#	US-PATENT-CLASS-435-818 .....	p 305	N91-30667	*
AD-A229408 .....	p 331	N91-30703	#	US-PATENT-5,026,650 .....	p 305	N91-30667	*
AD-A229426 .....	p 312	N91-30680	#	USAARL-91-15 .....	p 329	N91-29735	#
AD-A234437 .....	p 312	N91-30681	#				
AD-A234770 .....	p 312	N91-30682	#				
AD-A237206 .....	p 329	N91-29733	#				
AD-A237300 .....	p 313	N91-30690	#				
AD-A237391 .....	p 316	N91-29724	#				
AD-A237447 .....	p 309	N91-29716	#				
AD-A237452 .....	p 310	N91-29717	#				
AD-A237469 .....	p 329	N91-29734	#				
AD-A237540 .....	p 316	N91-29725	#				
AD-A237641 .....	p 329	N91-29735	#				
AD-A237654 .....	p 304	N91-29710	#				
AD-A237704 .....	p 310	N91-29718	#				
AD-A237767 .....	p 316	N91-29726	#				
AD-A237846 .....	p 316	N91-29727	#				
AD-A238244 .....	p 317	N91-29728	#				
AD-A238563 .....	p 317	N91-29729	#				
AD-A238564 .....	p 317	N91-29730	#				
AD-A238565 .....	p 330	N91-29736	#				
AD-A238597 .....	p 317	N91-29731	#				
AD-A238617 .....	p 317	N91-29732	#				
AD-A238659 .....	p 310	N91-29719	#				
AD-A238663 .....	p 310	N91-29720	#				
AD-A238664 .....	p 310	N91-29721	#				
AFOSR-90-1127TR .....	p 317	N91-30696	#				
AFOSR-91-0564TR .....	p 316	N91-29726	#				
AFOSR-91-0571TR .....	p 316	N91-29727	#				
AFOSR-91-0639TR .....	p 310	N91-29720	#				
AFOSR-91-0651TR .....	p 310	N91-29721	#				
AIAA PAPER 91-2621 .....	p 319	A91-49597	* #				
AIAA PAPER 91-2791 .....	p 319	A91-49792	#				
AIAA PAPER 91-2825 .....	p 319	A91-49767	#				
AIAA PAPER 91-2828 .....	p 319	A91-49770	* #				
AIAA PAPER 91-3407 .....	p 309	A91-52331	* #				
ARI-RN-91-02-VOL-3 .....	p 331	N91-30703	#				
ARI-RN-91-39 .....	p 317	N91-29731	#				
ARI-RN-91-40 .....	p 316	N91-29725	#				
ASI690-328-90-III-VOL-3 .....	p 331	N91-30703	#				
BR302008 .....	p 313	N91-30694	#				
CONF-8909334-1 .....	p 304	N91-29709	#				
CONF-900862-2 .....	p 316	N91-29723	#				
CRANFIELD-AERO-9106 .....	p 332	N91-30711	#				

**USAFSAM-TR-90-30**

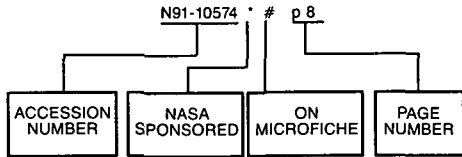
*REPORT NUMBER INDEX*

USAFSAM-TR-90-30 ..... p 312 N91-30679 #  
USARIEM-T9-91 ..... p 304 N91-29710 #  
USARIEM-12-91 ..... p 309 N91-29716 #  
USCG-D-14-90-VOL-2 ..... p 331 N91-30702 #



# ACCESSION NUMBER INDEX

## Typical Accession Number Index Listing



Listings in this index are arranged alphanumerically by accession number. The page number listed to the right indicates the page on which the citation is located. An asterisk (\*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

A91-48450	p 301	A91-50633	p 302
A91-48530 *	p 318	A91-50634	p 302
A91-48574	p 305	A91-50635	p 307
A91-48658	p 319	A91-50636	p 307
A91-48786	p 306	A91-50637	p 307
A91-48787	p 319	A91-50638 *	p 307
A91-48789 *	p 314	A91-50639	p 315
A91-48790	p 314	A91-50851	p 307
A91-48938	p 319	A91-50852	p 307
A91-49201	p 301	A91-50853	p 308
A91-49202	p 301	A91-50854	p 308
A91-49203	p 301	A91-50855	p 308
A91-49204	p 306	A91-50975	p 324
A91-49205	p 301	A91-50981	p 324
A91-49206	p 306	A91-50983	p 324
A91-49207	p 306	A91-50987	p 324
A91-49329	p 319	A91-50988 *	p 324
A91-49569	p 301	A91-50999	p 302
A91-49570	p 302	A91-51000 *	p 324
A91-49597 * #	p 319	A91-51001 *	p 324
A91-49767 #	p 319	A91-51022	p 325
A91-49770 * #	p 319	A91-51023	p 315
A91-49792 #	p 319	A91-51076	p 325
A91-49857	p 314	A91-51077	p 325
A91-49859	p 314	A91-51078 *	p 325
A91-49860	p 314	A91-51079	p 325
A91-49861 *	p 315	A91-51082	p 325
A91-49862	p 315	A91-51083	p 326
A91-49864 *	p 315	A91-51090	p 326
A91-50473	p 320	A91-51091	p 326
A91-50527	p 320	A91-51092	p 326
A91-50528 *	p 320	A91-51093	p 326
A91-50529 *	p 320	A91-51094	p 326
A91-50530 *	p 320	A91-51095	p 326
A91-50531 *	p 321	A91-51099	p 327
A91-50532 *	p 321	A91-51100	p 327
A91-50533 *	p 321	A91-51218	p 316
A91-50534 *	p 321	A91-51356	p 327
A91-50535	p 321	A91-51357	p 327
A91-50536	p 321	A91-51358	p 327
A91-50537 *	p 322	A91-51359	p 327
A91-50538 *	p 322	A91-51361	p 327
A91-50539 *	p 322	A91-51362	p 328
A91-50540 *	p 322	A91-51363	p 328
A91-50541 *	p 322	A91-51364	p 328
A91-50542 *	p 323	A91-51365	p 328
A91-50543 *	p 323	A91-51366	p 328
A91-50544 *	p 323	A91-51367 *	p 329
A91-50546 *	p 323	A91-51401	p 302
A91-50547	p 323	A91-51402	p 308
A91-50627	p 323	A91-51403 *	p 308
A91-50629	p 306	A91-51404	p 302
A91-50630	p 306	A91-51405	p 308
A91-50631 *	p 306	A91-51406 *	p 302
A91-50632	p 315	A91-51407	p 309

A91-51408	#	p 303
A91-51409	#	p 303
A91-51550	#	p 316
A91-52128	#	p 329
A91-52331 * #	#	p 309
A91-52601	#	p 303
A91-52602	#	p 303
A91-52713	#	p 303
A91-52726	#	p 304
A91-52837	#	p 329

N91-29709	#	p 304
N91-29710	#	p 304
N91-29711	#	p 304
N91-29712	#	p 304
N91-29713	#	p 304
N91-29714 *	#	p 309
N91-29715	#	p 309
N91-29716	#	p 309
N91-29717	#	p 310
N91-29718	#	p 310
N91-29719	#	p 310
N91-29720	#	p 310
N91-29721	#	p 310
N91-29722	#	p 310
N91-29723	#	p 316
N91-29724	#	p 316
N91-29725	#	p 316
N91-29726	#	p 316
N91-29727	#	p 316
N91-29728	#	p 317
N91-29729	#	p 317
N91-29730	#	p 317
N91-29731	#	p 317
N91-29732	#	p 317
N91-29733	#	p 329
N91-29734	#	p 329
N91-29735	#	p 329
N91-29736	#	p 330
N91-29737 * #	#	p 330
N91-30667 *	#	p 305
N91-30668 * #	#	p 305
N91-30669 *	#	p 305
N91-30670	#	p 311
N91-30671	#	p 330
N91-30672	#	p 311
N91-30673	#	p 305
N91-30674	#	p 305
N91-30675	#	p 311
N91-30676	#	p 311
N91-30677	#	p 311
N91-30678	#	p 311
N91-30679	#	p 312
N91-30680	#	p 312
N91-30681	#	p 312
N91-30682	#	p 312
N91-30683	#	p 312
N91-30685	#	p 330
N91-30686	#	p 312
N91-30687	#	p 330
N91-30688	#	p 313
N91-30690	#	p 313
N91-30691	#	p 313
N91-30692 * #	#	p 313
N91-30693	#	p 313
N91-30694	#	p 313
N91-30695	#	p 314
N91-30696	#	p 317
N91-30697 * #	#	p 318
N91-30698	#	p 318
N91-30699	#	p 318
N91-30700	#	p 318
N91-30701	#	p 318
N91-30702	#	p 331
N91-30703	#	p 331
N91-30704	#	p 331
N91-30705	#	p 331
N91-30706	#	p 331
N91-30707	#	p 332
N91-30708	#	p 332
N91-30709	#	p 332
N91-30710	#	p 332
N91-30711	#	p 332

# AVAILABILITY OF CITED PUBLICATIONS

## IAA ENTRIES (A91-10000 Series)

Publications announced in *IAA* are available from the AIAA Technical Information Service as follows: Paper copies of accessions are available at \$10.00 per document (up to 50 pages), additional pages \$0.25 each. Standing order microfiche are available at the rate of \$1.45 per microfiche for *IAA* source documents and \$1.75 per microfiche for AIAA meeting papers.

Minimum air-mail postage to foreign countries is \$2.50. All foreign orders are shipped on payment of pro-forma invoices.

All inquiries and requests should be addressed to: Technical Information Service, American Institute of Aeronautics and Astronautics, 555 West 57th Street, New York, NY 10019. Please refer to the accession number when requesting publications.

## STAR ENTRIES (N91-10000 Series)

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: NTIS. Sold by the National Technical Information Service. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code preceded by the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on NTIS PRICE SCHEDULES.

Documents on microfiche are designated by a pound sign (#) following the accession number. The pound sign is used without regard to the source or quality of the microfiche.

Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) is available at greatly reduced unit prices. For this service and for information concerning subscription to NASA printed reports, consult the NTIS Subscription Section, Springfield, VA 22161.

NOTE ON ORDERING DOCUMENTS: When ordering NASA publications (those followed by the \* symbol), use the N accession number. NASA patent applications (only the specifications are offered) should be ordered by the US-Patent-Appl-SN number. Non-NASA publications (no asterisk) should be ordered by the AD, PB, or other *report number* shown on the last line of the citation, not by the N accession number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy. The current price and order number are given following the availability line. (NTIS will fill microfiche requests, as indicated above, for those documents identified by a # symbol.)

- Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, inquiry should be addressed to the BLL.)
- Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts*. Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.
- Avail: ESDU. Pricing information on specific data, computer programs, and details on Engineering Sciences Data Unit (ESDU) topic categories can be obtained from ESDU International Ltd. Requesters in North America should use the Virginia address while all other requesters should use the London address, both of which are on the page titled ADDRESSES OF ORGANIZATIONS.
- Avail: Fachinformationszentrum, Karlsruhe. Sold by the Fachinformationszentrum Energie, Physik, Mathematik GMBH, Eggenstein Leopoldshafen, Federal Republic of Germany, at the price shown in deutschmarks (DM).
- Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.
- Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration, Public Documents Room (Room 126), 600 Independence Ave., S.W., Washington, DC 20546, or public document rooms located at each of the NASA research centers, the NASA Space Technology Laboratories, and the NASA Pasadena Office at the Jet Propulsion Laboratory.
- Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.
- Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of \$1.50 each, postage free.
- Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.
- Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed in this Introduction. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.
- Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

## **FEDERAL DEPOSITORY LIBRARY PROGRAM**

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 52 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 52 regional depositories. A list of the regional GPO libraries, arranged alphabetically by state, appears on the inside back cover. These libraries are *not* sales outlets. A local library can contact a Regional Depository to help locate specific reports, or direct contact may be made by an individual.

## **PUBLIC COLLECTION OF NASA DOCUMENTS**

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols # and \* from ESA – Information Retrieval Service European Space Agency, 8-10 rue Mario-Nikis, 75738 CEDEX 15, France.

## **STANDING ORDER SUBSCRIPTIONS**

NASA SP-7011 supplements and annual index are available from the National Technical Information Service (NTIS) on standing order subscription as PB91-912300, at price code A03. Current values for the price codes are listed on page APP-5. Standing order subscriptions do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber. Questions on the availability of the predecessor publications, *Aerospace Medicine and Biology* (Volumes I-XI), should be directed to NTIS.

## ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and Astronautics  
Technical Information Service  
555 West 57th Street, 12th Floor  
New York, New York 10019

British Library Lending Division,  
Boston Spa, Wetherby, Yorkshire,  
England

Commissioner of Patents and Trademarks  
U.S. Patent and Trademark Office  
Washington, DC 20231

Department of Energy  
Technical Information Center  
P.O. Box 62  
Oak Ridge, Tennessee 37830

European Space Agency-Information Retrieval Service  
ESRIN  
Via Galileo Galilei  
00044 Frascati (Rome) Italy

Engineering Sciences Data Unit International  
P.O. Box 1633  
Manassas, Virginia 22110

Engineering Sciences Data Unit International, Ltd.  
251-259 Regent Street  
London, W1R 7AD, England

Fachinformationszentrum Energie, Physik, Mathematik  
GMBH  
7514 Eggenstein Leopoldshafen  
Federal Republic of Germany

Her Majesty's Stationery Office  
P.O. Box 569, S.E. 1  
London, England

NASA Center for AeroSpace Information  
P.O. Box 8757  
Baltimore, MD 21240-0757

National Aeronautics and Space Administration  
Scientific and Technical Information Program (JTT)  
Washington, DC 20546

National Technical Information Service  
5285 Port Royal Road  
Springfield, Virginia 22161

Pendragon House, Inc.  
899 Broadway Avenue  
Redwood City, California 94063

Superintendent of Documents  
U.S. Government Printing Office  
Washington, DC 20402

University Microfilms  
A Xerox Company  
300 North Zeeb Road  
Ann Arbor, Michigan 48106

University Microfilms, Ltd.  
Tylers Green  
London, England

U.S. Geological Survey Library National Center  
MS 950  
12201 Sunrise Valley Drive  
Reston, Virginia 22092

U.S. Geological Survey Library  
2255 North Gemini Drive  
Flagstaff, Arizona 86001

U.S. Geological Survey  
345 Middlefield Road  
Menlo Park, California 94025

U.S. Geological Survey Library  
Box 25046  
Denver Federal Center, MS914  
Denver, Colorado 80225

# NTIS PRICE SCHEDULES

(Effective October 1, 1991)

## Schedule A STANDARD PRICE DOCUMENTS AND MICROFICHE\*\*

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	\$ 9.00	\$ 18.00
A02	12.50	25.00
A03	17.00	34.00
A04-A05	19.00	38.00
A06-A09	26.00	52.00
A10-A13	35.00	70.00
A14-A17	43.00	86.00
A18-A21	50.00	100.00
A22-A25	59.00	118.00
A99	*	*
N01	60.00	120.00
N02	59.00	118.00
N03	20.00	40.00

## Schedule E EXCEPTION PRICE DOCUMENTS AND MICROFICHE\*\*

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
E01	\$11.00	\$ 22.00
E02	14.00	28.00
E03	16.00	32.00
E04	19.00	38.00
E05	21.00	42.00
E06	24.00	48.00
E07	27.00	54.00
E08	30.00	60.00
E09	33.00	66.00
E10	36.00	72.00
E11	39.00	78.00
E12	43.00	86.00
E13	46.00	92.00
E14	50.00	100.00
E15	54.00	108.00
E16	59.00	118.00
E17	64.00	128.00
E18	69.00	138.00
E19	76.00	152.00
E20	88.00	176.00
E99	*	*

\* Contact NTIS for price quote.

\*\* Effective January 1, 1991, the microfiche copy of any new document entering the NTIS collection will be priced the same as the paper copy of the document.

### IMPORTANT NOTICE

NTIS Shipping and Handling Charges

U.S., Canada, Mexico — ADD \$3.00 per TOTAL ORDER

All Other Countries — ADD \$4.00 per TOTAL ORDER

Exceptions — Does NOT apply to:

ORDERS REQUESTING NTIS RUSH HANDLING  
ORDERS FOR SUBSCRIPTION OR STANDING ORDER PRODUCTS ONLY

NOTE: Each additional delivery address on an order requires a separate shipping and handling charge.

1. Report No. NASA SP-7011(356)	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Aerospace Medicine and Biology A Continuing Bibliography (Supplement 356)		5. Report Date December 1991	
		6. Performing Organization Code JTT	
7. Author(s)		8. Performing Organization Report No.	
		10. Work Unit No.	
9. Performing Organization Name and Address NASA Scientific and Technical Information Program		11. Contract or Grant No.	
		13. Type of Report and Period Covered Special Publication	
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, DC 20546		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract This bibliography lists 192 reports, articles and other documents introduced into the NASA scientific and technical information system in November 1991.			
17. Key Words (Suggested by Author(s)) Aerospace Medicine Bibliographies Biological Effects		18. Distribution Statement Unclassified - Unlimited Subject Category - 52	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 76	22. Price * A05/HC

\*For sale by the National Technical Information Service, Springfield, Virginia 22161



# FEDERAL REGIONAL DEPOSITORY LIBRARIES

## ALABAMA

**AUBURN UNIV. AT MONTGOMERY LIBRARY**  
Documents Dept.  
7300 University Drive  
Montgomery, AL 36117-3596  
(205) 244-3650 FAX: (205) 244-0678

## UNIV. OF ALABAMA

Amelia Gayle Gorgas Library  
Govt. Documents  
Box 870266  
Tuscaloosa, AL 35487-0266  
(205) 348-6046 FAX: (205) 348-8833

## ARIZONA

**DEPT. OF LIBRARY, ARCHIVES, AND PUBLIC RECORDS**  
Federal Documents  
Third Floor State Capitol  
1700 West Washington  
Phoenix, AZ 85007  
(602) 542-4121 FAX: (602) 542-4400;  
542-4500

## ARKANSAS

**ARKANSAS STATE LIBRARY**  
State Library Services  
One Capitol Mall  
Little Rock, AR 72201  
(501) 682-2869

## CALIFORNIA

**CALIFORNIA STATE LIBRARY**  
Govt. Publications Section  
914 Capitol Mall - P.O. Box 942837  
Sacramento, CA 94237-0001  
(916) 322-4572 FAX: (916) 324-8120

## COLORADO

**UNIV. OF COLORADO - BOULDER**  
Norlin Library  
Govt. Publications  
Campus Box 184  
Boulder, CO 80309-0184  
(303) 492-8834 FAX: (303) 492-2185

## DENVER PUBLIC LIBRARY

Govt. Publications Dept. BS/GPD  
1357 Broadway  
Denver, CO 80203  
(303) 571-2135

## CONNECTICUT

**CONNECTICUT STATE LIBRARY**  
231 Capitol Avenue  
Hartford, CT 06106  
(203) 566-4971 FAX: (203) 566-3322

## FLORIDA

**UNIV. OF FLORIDA LIBRARIES**  
Documents Dept.  
Library West  
Gainesville, FL 32611-2048  
(904) 392-0366 FAX: (904) 392-7251

## GEORGIA

**UNIV. OF GEORGIA LIBRARIES**  
Govt. Documents Dept.  
Jackson Street  
Athens, GA 30602  
(404) 542-8949 FAX: (404) 542-6522

## HAWAII

**UNIV. OF HAWAII**  
Hamilton Library  
Govt. Documents Collection  
2550 The Mall  
Honolulu, HI 96822  
(808) 948-8230 FAX: (808) 956-5968

## IDAHO

**UNIV. OF IDAHO LIBRARY**  
Documents Section  
Moscow, ID 83843  
(208) 885-6344 FAX: (208) 885-6817

## ILLINOIS

**ILLINOIS STATE LIBRARY**  
Reference Dept.  
300 South Second  
Springfield, IL 62701-1796  
(217) 782-7596 FAX: (217) 524-0041

## INDIANA

**INDIANA STATE LIBRARY**  
Serials/Documents Section  
140 North Senate Avenue  
Indianapolis, IN 46204  
(317) 232-3678 FAX: (317) 232-3728

## IOWA

**UNIV. OF IOWA LIBRARIES**  
Govt. Publications Dept.  
Washington & Madison Streets  
Iowa City, IA 52242  
(319) 335-5926 FAX: (319) 335-5830

## KANSAS

**UNIV. OF KANSAS**  
Govt. Documents & Map Library  
6001 Malatt Hall  
Lawrence, KS 66045-2800  
(913) 864-4660 FAX: (913) 864-5380

## KENTUCKY

**UNIV. OF KENTUCKY LIBRARIES**  
Govt. Publications/Maps Dept.  
Lexington, KY 40506-0039  
(606) 257-3139 FAX: (606) 257-1563;  
257-8379

## LOUISIANA

**LOUISIANA STATE UNIV.**  
Middleton Library  
Govt. Documents Dept.  
Baton Rouge, LA 70803  
(504) 388-2570 FAX: (504) 388-6992

## LOUISIANA TECHNICAL UNIV.

Prescott Memorial Library  
Govt. Documents Dept.  
305 Wisteria Street  
Ruston, LA 71270-9985  
(318) 257-4962 FAX: (318) 257-2447

## MAINE

**TRI-STATE DOCUMENTS DEPOSITORY**  
Raymond H. Fogler Library  
Govt. Documents & Microforms Dept.  
Univ. of Maine  
Orono, ME 04469  
(207) 581-1680

## MARYLAND

**UNIV. OF MARYLAND**  
Hornbake Library  
Govt. Documents/Maps Unit  
College Park, MD 20742  
(301) 454-3034 FAX: (301) 454-4985

## MASSACHUSETTS

**BOSTON PUBLIC LIBRARY**  
Govt. Documents Dept.  
666 Boylston Street  
Boston, MA 02117  
(617) 536-5400 ext. 226  
FAX: (617) 267-8273; 267-8248

## MICHIGAN

**DETROIT PUBLIC LIBRARY**  
5201 Woodward Avenue  
Detroit, MI 48202-4093  
(313) 833-1440; 833-1409  
FAX: (313) 833-5039

## LIBRARY OF MICHIGAN

Govt. Documents Unit  
P.O. Box 30007  
Lansing, MI 48909  
(517) 373-0640 FAX: (517) 373-3381

## MINNESOTA

**UNIV. OF MINNESOTA**  
Wilson Library  
Govt. Publications Library  
309 19th Avenue South  
Minneapolis, MN 55455  
(612) 624-5073 FAX: (612) 626-9353

## MISSISSIPPI

**UNIV. OF MISSISSIPPI**  
J.D. Williams Library  
Federal Documents Dept.  
106 Old Gym Bldg.  
University, MS 38677  
(601) 232-5857 FAX: (601) 232-5453

## MISSOURI

**UNIV. OF MISSOURI - COLUMBIA**  
Ellis Library  
Govt. Documents  
Columbia, MO 65201  
(314) 882-6733 FAX: (314) 882-8044

## MONTANA

**UNIV. OF MONTANA**  
Maureen & Mike Mansfield Library  
Documents Div.  
Missoula, MT 59812-1195  
(406) 243-6700 FAX: (406) 243-2060

## NEBRASKA

**UNIV. OF NEBRASKA - LINCOLN**  
D.L. Love Memorial Library  
Documents Dept.  
Lincoln, NE 68588  
(402) 472-2562

## NEVADA

**UNIV. OF NEVADA**  
Reno Library  
Govt. Publications Dept.  
Reno, NV 89557  
(702) 784-6579 FAX: (702) 784-1751

## NEW JERSEY

**NEWARK PUBLIC LIBRARY**  
U.S. Documents Div.  
5 Washington Street -  
P.O. Box 630  
Newark, NJ 07101-0630  
(201) 733-7812 FAX: (201) 733-5648

## NEW MEXICO

**UNIV. OF NEW MEXICO**  
General Library  
Govt. Publications Dept.  
Albuquerque, NM 87131-1466  
(505) 277-5441 FAX: (505) 277-6019

## NEW MEXICO STATE LIBRARY

325 Don Gaspar Avenue  
Santa Fe, NM 87503  
(505) 827-3826 FAX: (505) 827-3820

## NEW YORK

**NEW YORK STATE LIBRARY**  
Documents/Gift & Exchange Section  
Federal Depository Program  
Cultural Education Center  
Albany, NY 12230  
(518) 474-5563 FAX: (518) 474-5786

## NORTH CAROLINA

**UNIV. OF NORTH CAROLINA - CHAPEL HILL**  
CB#3912, Davis Library  
BA/SS Dept. - Documents  
Chapel Hill, NC 27599  
(919) 962-1151 FAX: (919) 962-0484

## NORTH DAKOTA

**NORTH DAKOTA STATE UNIV. LIBRARY**  
Documents Office  
Fargo, ND 58105  
(701) 237-8886 FAX: (701) 237-7138  
In cooperation with Univ. of North  
Dakota, Chester Fritz Library  
Grand Forks

## OHIO

**STATE LIBRARY OF OHIO**  
Documents Dept.  
65 South Front Street  
Columbus, OH 43266  
(614) 644-7051 FAX: (614) 752-9178

## OKLAHOMA

**OKLAHOMA DEPT. OF LIBRARIES**  
U.S. Govt. Information Div.  
200 NE 18th Street  
Oklahoma City, OK 73105-3298  
(405) 521-2502, ext. 252, 253  
FAX: (405) 525-7804

## OKLAHOMA STATE UNIV.

Edmon Low Library  
Documents Dept.  
Stillwater, OK 74078  
(405) 744-6546 FAX: (405) 744-5183

## OREGON

**PORTLAND STATE UNIV.**  
Millar Library  
934 SW Harrison - P.O. Box 1151  
Portland, OR 97207  
(503) 725-3673 FAX: (503) 725-4527

## PENNSYLVANIA

**STATE LIBRARY OF PENN.**  
Govt. Publications Section  
Walnut St. & Commonwealth Ave. -  
P.O. Box 1601  
Harrisburg, PA 17105  
(717) 787-3752

## SOUTH CAROLINA

**CLEMSON UNIV.**  
Cooper Library  
Public Documents Unit  
Clemson, SC 29634-3001  
(803) 656-5174 FAX: (803) 656-3025  
In cooperation with Univ. of South  
Carolina, Thomas Cooper Library,  
Columbia

## TENNESSEE

**MEMPHIS STATE UNIV. LIBRARIES**  
Govt. Documents  
Memphis, TN 38152  
(901) 678-2586 FAX: (901) 678-2511

## TEXAS

**TEXAS STATE LIBRARY**  
United States Documents  
P.O. Box 12927 - 1201 Brazos  
Austin, TX 78711  
(512) 463-5455 FAX: (512) 463-5436

## TEXAS TECH. UNIV. LIBRARY

Documents Dept.  
Lubbock, TX 79409  
(806) 742-2268 FAX: (806) 742-1920

## UTAH

**UTAH STATE UNIV.**  
Merrill Library & Learning Resources  
Center, UMC-3000  
Documents Dept.  
Logan, UT 84322-3000  
(801) 750-2684 FAX: (801) 750-2677

## VIRGINIA

**UNIV. OF VIRGINIA**  
Alderman Library  
Govt. Documents  
Charlottesville, VA 22903-2498  
(804) 924-3133 FAX: (804) 924-4337

## WASHINGTON

**WASHINGTON STATE LIBRARY**  
Document Section  
MS AJ-11  
Olympia, WA 98504-0111  
(206) 753-4027 FAX: (206) 753-3546

## WEST VIRGINIA

**WEST VIRGINIA UNIV. LIBRARY**  
Govt. Documents Section  
P.O. Box 6069  
Morgantown, WV 26506  
(304) 293-3640

## WISCONSIN

**ST. HIST. SOC. OF WISCONSIN LIBRARY**  
Govt. Publications Section  
816 State Street  
Madison, WI 53706  
(608) 262-2781 FAX: (608) 262-4711  
In cooperation with Univ. of Wisconsin-  
Madison, Memorial Library

## MILWAUKEE PUBLIC LIBRARY

Documents Div.  
814 West Wisconsin Avenue  
Milwaukee, WI 53233  
(414) 278-2167 FAX: (414) 278-2137

## WYOMING

**WYOMING STATE LIBRARY**  
Supreme Court & Library Bldg.  
Govt. Publications  
Cheyenne, WY 82002  
(307) 777-5920 FAX: (307) 777-6289

**National Aeronautics and  
Space Administration  
Code NTT-4**

**Washington, D.C.  
20546-0001**

Official Business  
Penalty for Private Use, \$300

**BULK RATE  
POSTAGE & FEES PAID  
NASA  
Permit No. G-27**

**NASA**

**POSTMASTER: If Undeliverable (Section 158  
Postal Manual) Do Not Return**

---