NASA SP-7011 (380)
October 1993

P-72

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

NASA STI PROGRAM
SCIENTIFIC & TECHNICAL INFORMATION

The NASA STI Program ... in Profile

Since its founding, NASA has been dedicated to the advancement of aeronautics and space science. The NASA Scientific and Technical Information (STI) Program plays a key part in helping NASA maintain this important role.

The NASA STI Program provides access to the NASA STI Database, the largest collection of aeronautical and space science STI in the world. The Program is also NASA's institutional mechanism for disseminating the results of its research and development activities.

Specialized services that help round out the Program's diverse offerings include creating custom thesauri, translating material to or from 34 foreign languages, building customized databases, organizing and publishing research results ... even providing videos.

For more information about the NASA STI Program, you can:

- **Phone** the NASA Access Help Desk at (301) 621-0390
- **Fax** your question to the NASA Access Help Desk at (301) 621-0134
- **E-mail** your question via the **Internet** to help@sti.nasa.gov
- **Write** to:

  NASA Access Help Desk
  NASA Center for AeroSpace Information
  800 Elkridge Landing Road
  Linthicum Heights, MD 21090-2934

NASA SP-7011 (380)
October 1993

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

National Aeronautics and Space Administration
Scientific and Technical Information Program
Washington, DC 1993

This publication was prepared by the NASA Center for AeroSpace Information,
800 Elkridge Landing Road, Linthicum Heights, MD 21090-2934, (301) 621-0390.

INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 192 reports, articles, and other documents recently announced in the NASA STI Database. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue include:

Scientific and Technical Aerospace Reports (STAR) (N-10000 Series)	N93-29392 — N93-31325
International Aerospace Abstracts (IAA) (A-10000 Series)	A93-41656 — A93-45450

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 number, report number, and accession number—are included.

A cumulative index for 1993 will be published in early 1994.

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

TABLE OF CONTENTS

PAGE iv INTENTIONALLY BLANK

TYPICAL REPORT CITATION AND ABSTRACT

NASA SPONSORED
ON MICROFICHE

ACCESSION NUMBER → **N93-12195 * #** Lockheed Engineering and Sciences, Co., Houston, TX. ← **CORPORATE SOURCE**

TITLE → **ASTRONAUT CANDIDATE STRENGTH MEASUREMENT USING THE CYBEX 2 AND THE LIDO MULTI-JOINT 2 DYNAMOMETERS Final Report**

AUTHORS → AMY E. CARROLL and ROBERT P. WILMINGTON May 1992 ← **PUBLICATION DATE**

CONTRACT NUMBER → (Contract NAS9-17900)

REPORT NUMBERS → (NASA-CR-185679; NAS 1.26:185679; LESC-30277) Avail: CASI HC ← **AVAILABILITY**

PRICE CODE → A03/MF A01

The Anthropometry and Biomechanics Laboratory in the man-Systems division at NASA's Johnson Space Center has as one of its responsibilities the anthropometry and strength measurement data collection of astronaut candidates. The anthropometry data is used to ensure that the astronaut candidates are within the height restrictions for space vehicle and space suit design requirments, for example. The strength data is used to help detect abnormalities or isolate injuries to muscle groups that could jeopardize the astronauts' safety. The Cybex II Dynamometer has been used for strength measurements from 1985 through 1991. The Cybex II was one of the first instruments of its kind to measure strength and similarity of muscle groups by isolating the specific joint of interest. In November 1991, a LIDO Multi-Joint II Dynamometer was purchased to upgrade the strength measurement data collection capability of the Anthropometry and Biomechanics Laboratory. The LIDO Multi-Joint II Dynamometer design offers several advantages over the Cybex II Dynamometer including a more sophisticated method of joint isolation and a more accurate and efficient computer based data collection system. Author

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

ACCESSION NUMBER → **A93-11150**

TITLE → **STUDIES TOWARDS THE CRYSTALLIZATION OF THE ROD VISUAL PIGMENT RHODOPSIN**

AUTHORS → W. J. DE GRIP, J. VAN OOSTRUM, and G. L. J. DE CALUWE

AUTHORS' AFFILIATION → (Nigmegen Catholic Univ., Netherlands) Journal of Crystal Growth (ISSN 0022-0248) vol. 122, no. 1-4 Aug. 1992 ← **JOURNAL TITLE** ← **PUBLICATION DATE**
p. 375-384. Research supported by SRON refs

CONTRACT NUMBER → (Contract NWO-SON-328-050)

Copyright

Results are presented of crystallization experiments on bovine rhodopsin, which established a restricted range of conditions which reproducibly yield rhodopsin crystals. Several parameters were optimized, including the detergent, the precipitant, additives, and pH. The crystals obtained so far are too small (less than 50 microns in any direction) or of insufficient order to allow high-resolution diffraction analysis. Several approaches are proposed for improving the average size, stability, and order of the rhodopsin crystals. I. S.

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 380)

October 1993

51

LIFE SCIENCES (GENERAL)

A93-42186
ENDOTOXIN PRIMING FOLLOWED BY HIGH-ALTITUDE CAUSES PULMONARY EDEMA IN RATS
S. ONO, J. Y. WESTCOTT, S.-W. CHANG, and N. F. VOELKEL (Colorado Univ., Denver) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 4 April 1993 p. 1534-1542. refs
Copyright

The hypothesis that lung injury and inflammation contribute to the pathogenesis of some forms of high-altitude pulmonary edema was tested by inducing pulmonary lung injury and inflammation in rats by priming the animals with *Salmonella enteritidis endotoxin* (ETX, 0.1 or 0.5 mg/kg body wt, ip) and examining the effect of added exposure to simulated hypobaric hypoxia (24 h, 4300 m). It was found that vascular damage was developed in animals which were both primed with ETX and exposed to hypoxia, but not in rats which received either ETX or hypoxia alone. Hearts of ETX + hypoxia-treated rats showed an increased ratio of right ventricular weight (RV) divided by body weight. Pretreatment of ETX + hypoxia rats with a Ca(2+) entry blocker inhibited lung injury and the right ventricular hypertrophy, indicating that ETX priming causes pulmonary edema at high altitude and suggesting a role for neutrophils and Ca(2+) in the rat model of lung injury. AIAA

A93-42187
EFFECT OF CHRONIC HYPOXIA ON HYPOXIC VENTILATORY RESPONSE IN AWAKE RATS
ELIZABETH A. AARON and FRANK L. POWELL (California Univ., La Jolla) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 4 April 1993 p. 1635-1640. refs
(Contract NIH-HL-17731; NIH-HL-07212)
Copyright

The effect of chronic hypoxia on hypoxic ventilatory response (HVR) was investigated in rats fitted with chronic catheters in the iliac artery and vein, by comparing the HVR of rats acclimatized to hypoxia for more than 7 wks at simulated altitude of 380 Torr to that of sea-level controls. To measure arterial P(O2) and P(CO2), arterial blood was drawn via a roller pump past O2 and CO2 electrodes and returned to the vein; batch samples were taken before and after HVR measurements for calibrating and determining arterial pH and hematocrit. Results of measurements showed that isocapnic HVR values were significantly greater in hypoxia-acclimatized rats than in sea-level control rats, mainly due to a significant increase in tidal volume. AIAA

A93-42190
VARIABILITY OVER TIME OF COMPLEMENT ACTIVATION INDUCED BY AIR BUBBLES IN HUMAN AND RABBIT SERA
KARE BERGH, ASTRID HJELDE, OLE-JAN IVERSEN, and ALF O. BRUBAKK (Foundation for Scientific and Industrial Research; Trondheim Univ., Norway) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 4 April 1993 p. 1811-1815. refs
Copyright

The large variability in susceptibility of humans to decompression sickness both between individuals and in an individual undergoing repetitive diving has not been plausibly explained. This paper presents results of experiments investigating whether the activation of complement by air bubbles is an inherent and static feature of the complement system of an individual by measuring complement activation induced by continuously introduced air bubbles in rabbit and human sera. This was done by periodically measuring the generation of anaphylatoxin des-Arg-C5a over time during 66- and 196 time periods, using the ELISA technique. Results disclosed a pronounced intraindividual variability over time, indicating that the sensitivity of complement to activation by air bubbles is not an inherent, static feature of the complement system of an individual. The reason for the large variability is not known. AIAA

A93-42192* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
INFLUENCE OF SIMULATED MICROGRAVITY ON THE MAXIMAL OXYGEN CONSUMPTION OF NONTRAINED AND TRAINED RATS
CHRISTOPHER R. WOODMAN, KIMBERLY A. MONNIN, LISA A. SEBASTIAN, and CHARLES M. TIPTON (Arizona Univ., Tucson) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 4 April 1993 p. 1941-1947. refs
(Contract NAG2-362; NIH-HL-33782)
Copyright

The effects of microgravity and endurance training (TR) on maximal O2 consumption was investigated in trained and nontrained (NT) rats subjected to head-down suspension (HDS) by comparing maximal O2 consumption, treadmill run time (RT), and mechanical efficiency (ME) of treadmill running in HDS rats, both NT and TR, and in respective cage controls. It was found that HDS for 28 days was associated with significant reduction in absolute maximal O2 consumption in both TR and NT rats. Relative maximal O2 consumption, however, was significantly reduced in TR but not NT rats. Reductions in RT and ME occurring in both TR and NT rats after 28 days of HDS were similar. The TR rats exhibited greater diuretic, natriuretic, and kaliuretic responses to HDS than the NT rats. AIAA

A93-42193
TISSUE-SPECIFIC NORADRENERGIC ACTIVITY DURING ACUTE HEAT STRESS IN RATS
KEVIN C. KREGEL, DAVID G. JOHNSON, and DOUGLAS R. SEALS (Arizona Univ., Tucson) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 4 April 1993 p. 1988-1993. Research supported by American Heart Association and Univ. of Arizona Foundation refs
(Contract NIH-HL-39966; NIH-HL-07249; NIH-GM-08400; NIH-AG-06537)
Copyright

The effect of nonexertional acute heat stress on the sympathetic nervous system (SNS) activity of mammals was investigated in unrestrained rats exposed to 24, 38, 39.5, and 41 C temperatures, in which norepinephrine (NE) synthesis was blocked with alpha-methyl-p-tyrosine. The rate of decrine in tissue NE concentration after synthesis blockade was used to estimate the

SNS activity in the left ventricle, kidney, liver, adrenal gland, and soleus and extensor digitorum longus muscles of the hindlimb. Measurements of the tissue NE turnover rates indicate that hyperthermia can be a potent stimulus for increasing SNS activity. The neural activation is region specific and is dependent on the degree of hyperthermia. AIAA

A93-42450* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
XYLAZINE EMESIS, YOHIMBINE AND MOTION SICKNESS SUSCEPTIBILITY IN THE CAT
JAMES B. LUCOT and GEORGE H. CRAMPTON (Wright State Univ., Dayton, OH) Journal of Pharmacology and Experimental Therapeutics (ISSN 0022-3565) vol. 237, no. 2 1986 p. 450-455. refs
(Contract NCC2-220)
Copyright

The possible role of the alpha-2 adrenoceptors in xylazine-induced vomiting and in motion sickness was investigated. Cats were divided into two groups according to motion sickness susceptibility and were observed after s.c. injections of xylazine. The incidence of vomiting increased with the dose, and at each dose the high susceptibility group had a greater emetic incidence than the low susceptibility group. In another experiment with cats divided into two groups according to motion sickness susceptibility, s.c. administration of yohimbine effectively antagonized the xylazine-induced emesis in both susceptibility groups. The cats in the latter experiment were then challenged with a motion sickness stimulus after s.c. pretreatment with yohimbine. Yohimbine failed to prevent motion sickness but did occasion an unexplained variability in the incidence of vomiting. These findings suggest that the emetic effect of xylazine results from stimulation of alpha-2 adrenoceptors but that these receptors are not fundamental to feline motion sickness. The fact that susceptibilities to xylazine-induced emesis and to motion sickness are correlated suggests a point of interaction other than the area postrema, which is known to be essential for xylazine-induced vomiting but not for motion sickness in the cat. Author (revised)

A93-42668
BUSPIRONE BLOCKS CISPLATIN-INDUCED EMESIS IN CATS
JAMES B. LUCOT and GEORGE H. CRAMPTON (Wright State Univ., Dayton, OH) Journal of Clinical Pharmacology (ISSN 0091-2700) vol. 27, no. 10 Oct. 1987 p. 817, 818. Research supported by Ohio Research Challenge Grant refs
Copyright

A test for evaluating the efficacy of buspirone in blocking the retching and vomiting elicited by cisplatin is decribed. Six cats received four infusions of 7.5 mg/kg cisplatin over a period of four to five minutes. It is concluded that buspirone was effective in preventing cisplatine-induced emesis. AIAA

A93-42915
PYROLYSIS OF VEGETATION BY BRIEF INTENSE IRRADIATION
F. E. FENDELL and E. Y. KUNG (TRW Space and Electronics Group, Redondo Beach, CA) Journal of Thermophysics and Heat Transfer (ISSN 0887-8722) vol. 7, no. 3 July-Sept. 1993 p. 510-516. refs
Copyright

When nonreflected intense visible radiation of about 4 x 10 exp 6 J/(sq m-sec) is incident on a dense vegetative layer (about 3-kg/sq m loading, 0.3-m height) for even a second or two, the absorbing leafy matter can be desiccated and gasified. Simple unsteady 1D models are formulated and solved to characterize the rate of propagation earthward of the pyrolysis front, at which the vegetative population under consideration totally disappears. Distinct treatments are undertaken for temperate-cereal-like layers which contain only 'foliage' (hay, wheat, grass) and brush-like layers, in which not only effectively pyrolyzable leafy matter but also partially pyrolyzable woody-stem matter exist. Qualitative remarks consider soot formation in the pyrolyzate and/or combustion of the hydrocarbon-vapor pyrolyzate with interstitial air. Author (revised)

A93-43025
POSSIBLE BIOLOGICAL SIGNIFICANCE OF THE CURVATURE OF EQUIPOTENTIAL SURFACES OF GRAVITY-FORCE TIDAL VARIATIONS [O VOZMOZHNOJ BIOLOGICHESKOJ ZNACHIMOSTI KRIVIZNY EHKVIPOTENTSIAL'NYKH POVERKHNOSTEJ PRILIVNYKH IZMENENIJ SILY TYAZHESTI]
G. I. BORTNIKOVA (Pervyj Meditsinskij Inst., Tashkent, Uzbekistan) Kibernetika i Vychislitel'naya Tekhnika (ISSN 0454-9910) no. 94 1992 p. 87-93. In RUSSIAN refs
Copyright

The effect of tidal variations in the force of gravity on the functioning of a biological organism, Paramecium caudatum, is investigated using measurements of the motility rhythm of P. caudatum cells grown in culture. It is shown that tidal variations in the gravity force significantly affected the geometrical parameters of P. caudatum motility, which depended on local time and the space coordinates. AIAA

A93-43034
THE ROLE OF SEROTONIN AND HISTAMINE IN INCREASING THE RESISTANCE OF THE ORGANISM TO CERTAIN EXTREME CONDITIONS [ROL' SEROTONINA I GISTAMINA V POVYSHENII USTOJCHIVOSTI ORGANIZMA K NEKOTORYM EHKSTREMAL'NYM VOZDEJSTVIYAM]
V. A. PEREVERZEV, A. I. KUBARKO, A. I. BALAKLEEVSKIJ, and N. I. GUBKINA (Gosudarstvennyj Meditsinskij Inst., Minsk, Byelarus) Fiziologicheskij Zhurnal (ISSN 0015-329X) vol. 78, no. 6 June 1992 p. 48-53. In RUSSIAN refs
Copyright

The feasibility of increasing the organism's resistance to the effects of hyperthermia, hypoxia, and ionizing radiation by administering, separately or in combination, small doses of serotonin and histamine was investigated in mice and rats injected with these drugs in doses of 10 ng/kg body weight, prior to exposures. It was found that combined, but not separate, administration of 10 ng/kg doses of serotonin and histamine improves the resistance of both rats and mice to short-term hyperthermia, hypercapnic and tissue hypoxia, and ionizing radiation. AIAA

A93-43035
EFFECT OF ADAPTATION TO HYPOXIA ON THE CONTRACTILE ACTIVITY OF FAST AND SLOW MUSCLES IN THE RAT [VLIYANIE ADAPTATSII K GIPOKSII NA SOKRATITEL'NUYU AKTIVNOST' BYSTROJ I MEDLENNOJ MYSHTS KRYSY]
O. V. ZOROVA (Petrozavodskij Gosudarstvennyj Univ., Petrozavodsk, Russia) Fiziologicheskij Zhurnal (ISSN 0015-329X) vol. 78, no. 6 June 1992 p. 59-63. In RUSSIAN refs
Copyright

The effect of chronic hypoxia on the contractile activity of rat musculature was investigated by analyzing the mechanical parameters of single contractions and denticulate tetanus for m. gastrocnemius and m. soleus of rats adapted to hypoxia. It was found that chronic hypoxia affects the contractile characteristics in the m. gastrocnemius but not in of m. soleus of the rat. AIAA

A93-43036
ADJUSTABLE TEMPERATURE LEVEL OF A PHYSIOLOGICAL THERMOSTAT AND THE FEASIBILITY OF ITS PRECISE MAINTENANCE [USTANOVOCHNYJ TEMPERATURNYJ UROVEN' FIZIOLOGICHESKOGO TERMOSTATA I VOZMOZHNOSTI EGO TOCHNOGO PODDERZHANIYA]
G. V. RUMYANTSEV (RAN, Inst. Fiziologii, St. Petersburg, Russia) Fiziologicheskij Zhurnal (ISSN 0015-329X) vol. 78, no. 6 June 1992 p. 115-118. In RUSSIAN refs
Copyright

The limits of changes in the environmental temperature within which the temperature of the rabbit body can be maintained at 37

C were investigated using the rabbit body model of Gekhman and Morozov (1975). Measurements of the model temperature at different environmental temperatures indicated that, rather than striving to maintain an exact temperature level of a certain body region, the heat-regulation system of the rabbit maintains the average temperature of the body within rather wide limits (+/- 0.5 C or +/- 200 cal/kg). AIAA

A93-43070
CORRELATION BETWEEN THE LYMPH DYNAMICS AND VENOUS PRESSURE DURING SHORT-TERM ANTIORTHOSTATIC EFFECTS [VZAIMOOTNOSHENIYA LIMFODINAMIKI I VENOZNOGO DAVLENIYA PRI KRATKOVREMENNYKH ANTIORTOSTATICHESKIKH VOZDEJSTVIYAKH]
L. EH. BULEKBAEVA, T. A. DEMCHENKO, and E. V. VOVK (ANK, Inst. Fiziologii, Alma-Ata, Kazakhstan) Fiziologicheskij Zhurnal (ISSN 0015-329X) vol. 78, no. 9 Sept. 1992 p. 137-140. In RUSSIAN refs
Copyright

The effect of reduced gravity (30 deg-head-down tilt for 30 min) on the relationships between the lymph- and venous-blood flow and pressure was investigated by measuring the values of the venous and lymph pressure in the neck region of dogs in down-head tilt and comparing the data with the relationships found in controls. It is found that, in the orthostatic position, the levels of venous pressure in the jugular vein and in the thoracic lymph duct increase simultaneously, but the venous pressure reaches values higher than those of the lymph pressure. This pressure gradient leads to a decreased lymph drainage into the vein, causing a reflexive constriction of the thoracic duct. AIAA

A93-43073
MECHANISMS OF THE ANTIHYPOXIC EFFECT OF TAURINE [DEYAKYI MEKHANYIZMI ANTIGYIPOKSICHNOYI DYIYI TAURYINU]
YI. M. MAN'KOVS'KA, V. YI. NOSAR, A. YI. NAZARENKO, T. M. GOVORUKHA, and L. V. BRATUS' (ANU, Inst. Fiziologii and Inst. Eksperimental'noj Patologii, Onkologii i Radiobiologii, Kiev, Ukraine) Fiziologicheskij Zhurnal (Kiev) (ISSN 0201-8489) vol. 38, no. 5 Sept.-Oct. 1992 p. 81-88. In UKRAINIAN refs
Copyright

The effect of pretreatment of rats with taurine (200 mg/kg body weight, administered following the Van Galder (1972) scheme) before exposure to acute hypoxic hypoxia (30 min at normobaric 7 pct O2/93 pct N2) was investigated. It was found that taurine treatment alleviates metabolic disturbances caused by acute hypoxic hypoxia in the brain, heart, and liver tissues of the rats and decreased the rate of lipid oxidation in various rat tissues. AIAA

A93-43074
EFFECT OF HYPOXIC HYPOXIA ON THE IMMUNE RESPONSE AND SOME FACTORS OF NONSPECIFIC RESISTANCE OF HUMAN AND ANIMAL ORGANISMS [VLIYANIE GIPOKSICHESKOJ GIPOKSII NA IMMUNOLOGICHESKUYU REAKTIVNOST' I NEKOTORYE FAKTORY NESPETSIFICHESKOJ REZISTENTNOSTI ORGANIZMA CHELOVEKA I ZHIVOTNYKH]
O. K. REDZHEBOVA (Tsentr Profilakticheskoj Gipoksii, Moscow, Russia) Fiziologicheskij Zhurnal (Kiev) (ISSN 0201-8489) vol. 38, no. 5 Sept.-Oct. 1992 p. 98-111. In RUSSIAN refs
Copyright

Literature data concerning the effects of the normobaric hypoxia, adaptation to mountain conditions, and training in a pressure chamber on the cellular and humoral indices of immune response are critically evaluated. Also studied were data on the effect of permanent residence at elevated altitudes on the level of morbidity in a population and bioenergetic indices. The results of these evaluations indicate the validity of data on the effect of normobaric hypoxic hypoxia on the state of the immune system. AIAA

A93-43078
ROENTGENOPHOSPHENE AS AN INDICATOR OF THE RADIATION EXCITABILITY OF THE CENTRAL NERVOUS SYSTEM [RENTGENOFOSFEN - INDIKATOR RADIATSIONNOJ VOZBUDIMOSTI TSNS]
A. D. NOZDRACHEV and B. N. SAVCHENKO (Sankt-Peterburgskij Gosudarstvennyj Univ., St.-Petersburg, Russia) Rossijskaya Akademiya Nauk, Doklady (ISSN 0869-5652) vol. 329, no. 1 March 1993 p. 106-109. In RUSSIAN refs
Copyright

The response of neurons to X-ray irradiation was investigated experimentally using the spontaneously discharging abdominal neurons of the crayfish as response indicators. The experiments indicate that changes in the excitability of the neurons are produced as a direct result of radioactive irradiation of the membrane structures of the neural cells in the range of doses used to produce radiation-induced electroretinograms. The implications of the results for the development of fast and safe methods for determining the individual radiation sensitivity of human subjects are discussed. AIAA

A93-43136
THE EFFICIENCY OF THERMOREGULATORY RESPONSES IN THE COOLING OF THE ORGANISM [OB EHFFEKTIVNOSTI TERMOREGULYATORNYKH REAKTSIJ PRI OKHLAZHDENII ORGANIZMA]
K. P. IVANOV, G. V. RUMYANTSEV, and G. B. MOROZOV (RAN, Inst. Fiziologii, St. Petersburg, Russia) Fiziologicheskij Zhurnal (ISSN 0015-329X) vol. 78, no. 10 Oct. 1992 p. 120-125. In RUSSIAN refs
Copyright

Using a rabbit-body model described by Rumiantsev and Morozov (1989), the rate of cooling of the model during immersion into 4C water and the efficiency of thermoregulation were investigated. It was found that immersion induces fast cooling of the model even though the rate of heating of the model was three times higher than that of the heat-producing mechanism in live rabbits. A 10-11-times more powerful heat production was needed to keep the model temperature at about 37 C. AIAA

A93-43794
NUCLEOTIDE ANALOGS BASED ON PENTAERYTHRITOL - AN HYPOTHESIS
ALAN W. SCHWARTZ (Nijmegen Catholic Univ.,. Netherlands) Origins of Life and Evolution of the Biosphere (ISSN 0169-6149) vol. 23, no. 3 June 1993 p. 185-194. refs
Copyright

The synthesis of ribose and ribose-based nucleotides under reasonable prebiotic conditions has not been achieved. Glycerol has been suggested as a structural unit that might have preceded ribose in the evolutionary emergence of RNA. Template-directed oligomerizations of nucleotide analogs based on glycerol, however, have been only partially successful. Recent studies on the effect of ultraviolet irradiation of formaldehyde solutions have shown that the reduced sugar pentaerythritol is formed with great specificity. I argue that pentaerythritol is potentially capable of being converted by simple chemistry into a series of nucleoside analogs related to barbituric acid. These analogs may be able to take part in nucleic acid-like interactions and could therefore be of potential interest as a new class of candidates as RNA precursors. Author

A93-43795
THE BINDING AND REACTIONS OF NUCLEOTIDES AND POLYNUCLEOTIDES ON IRON OXIDE HYDROXIDE POLYMORPHS
NILS G. HOLM (Stockholm Univ., Sweden), GOZEN ERTEM, and JAMES P. FERRIS (Rensselaer Polytechnic Inst., Troy, NY) Origins of Life and Evolution of the Biosphere (ISSN 0169-6149) vol. 23, no. 3 June 1993 p. 195-215. refs
(Contract NSF INT-87-12007; NSF CHE-90-00187; NFR-G-GU-3865)
Copyright

The binding to iron oxide hydroxide minerals goethite and

akaganeite, and reactions with these minerals of adenosine, several nucleotides (including 5-prime-AMP, 3-prime-AMP, 5-prime-UMP, and 5-prime-CMP) and oligonucleotides was investigated. It was found that adenosine does not bind to goethite and akaganeite, while all the nucleotides had very similar affinity for minerals when tested under the same pH. Abinding decreased with increasing pH, and binding to goethite was about 4 times stronger than to akaganeite. Two times as many moles of polynucleotides were bound to either of these minerals as compared to the mononucleotides. Template-directed synthesis of oligomers of 5-prime-GMP on poly(C) bound to goethite was observed. AIAA

A93-44176
QUANTITATIVE EMG ANALYSIS IN SOLEUS AND PLANTARIS DURING HINDLIMB SUSPENSION AND RECOVERY
CAMERON BLEWETT and GEOFFREY C. B. ELDER (Dalhousie Univ., Halifax, Canada) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 5 May 1993 p. 2057-2066. Research supported by NSERC refs
Copyright

An electromyographic quantification has been made in rat soleus and plantaris during 6-day control, 28-day hind-limb suspension (HS), and 6-day recovery. The number and amplitude of 'turns' were determined in each muscle ever 2 min of the total of 40 days. The number of turns was significantly reduced during HS, to 39 percent in soleus and 35 percent in plantaris, relative to the control period, as of day 28. The large differences between dark and light cycles in control muscles were absent during HS and recovery. AIAA

A93-44177
EFFECTS OF ACUTE HYPOXIA ON INTRACRANIAL DYNAMICS IN UNANESTHETIZED GOATS
YING-BO YANG, BINGYONG SUN, ZHONGQIANG YANG, JUNYUAN WANG, and YING PONG (Third Military Medical College, Chongqing, China) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 5 May 1993 p. 2067-2071. refs
Copyright

In the unanesthetized goats presently subjected to acute hypoxia, there occurs significant disturbance of intracranial dynamics. While cerebral blood flow, intracranial pressure, and cerebral water content increased, intracranial compliance decreased. These results suggest that the imbalance of the relationship between total brain volume, cerebral blood flow, cerebrospinal fluid, and the craniospinal cavity, may be an important mechanism of acute mountain sickness. AIAA

A93-44178 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
MUSCLE GLUCOSE UPTAKE IN THE RAT AFTER SUSPENSION WITH SINGLE HINDLIMB WEIGHT BEARING
CRAIG S. STUMP, CHRISTOPHER R. WOODMAN, RALPH F. FREGOSI, and CHARLES M. TIPTON (Arizona Univ., Tucson) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 5 May 1993 p. 2072-2078. refs
(Contract NAG2-392; NGT-50493)
Copyright

An examination is conducted of the effect of nonweight-bearing conditions, and the systemic influences of simulated microgravity on rat hindlimb muscles. The results obtained suggest that the increases in hindlimb muscle glucose uptake and extracellular space associated with simulated microgravity persist with hindlimb weightbearing, despite the prevention of muscle atrophy. The mechanism (or mechanisms) responsible for these effects are currently unknown. AIAA

A93-44179* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
SPACEFLIGHT ON STS-48 AND EARTH-BASED UNWEIGHTING PRODUCE SIMILAR EFFECTS ON SKELETAL MUSCLE OF YOUNG RATS
MARC E. TISCHLER, ERIK J. HENRIKSEN, KATHRYN A. MUNOZ, CRAIG S. STUMP, CHRISTOPHER R. WOODMAN, and CHRISTOPHER R. KIRBY (Arizona Univ., Tucson) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 5 May 1993 p. 2161-2165. refs
(Contract NAG2-384)
Copyright

Eight female albino rats were exposed to 5.4 days of weightlessness aboard the Space Shuttle mission STS-48 in 1991. An asynchronous ground control experiment mimicked the flight cage conditions and mission duration of the STS-48 rats, and a third group of animals underwent limb suspension for 5.4 days. The flight animals gained a greater percentage of body mass per day despite similar rates of food consumption in the three groups. The results obtained on insulin response and muscle size show that a tail-cast hindlimb-suspension model is suitable for mimicking the effects of weightlessness on rapidly growing juvenile rat muscles. AIAA

A93-44181
FUNCTIONAL AND STRUCTURAL ADAPTATION OF THE YAK PULMONARY CIRCULATION TO RESIDENCE AT HIGH ALTITUDE
ANTHONY G. DURMOWICZ, STEPHEN HOFMEISTER, T. K. KADYRALIEV, ALMAS A. ALDASHEV, and KURT R. STENMARK (Colorado Univ.; Children's Hospital, Denver; Kyrgyz Inst. of Cardiology, Bishkek, Kyrgyzstan) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 5 May 1993 p. 2276-2285. Research supported by U.S./USSR International Exchange Program and American Lung Association refs
(Contract NIH-HL-14985; NIH-HL-46481)
Copyright

In order to determine possible mechanisms by which pulmonary circulation may adapt to chronic hypoxia, yak pulmonary vascular reactivity to both vasoconstrictor and vasodilator stimuli and pulmonary artery structure were evaluated. The yak is found to have adapted to high altitude conditions by maintaining both a blunted hypoxic pulmonary vasoconstrictor response and thin-walled pulmonary vessels. AIAA

A93-44183* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
ACTIVITY-INDUCED REGULATION OF MYOSIN ISOFORM DISTRIBUTION - COMPARISON OF TWO CONTRACTILE ACTIVITY PROGRAMS
GARY M. DIFFEE, VINCE J. CAIOZZO, SAMUEL A. MCCUE, ROBERT E. HERRICK, and KENNETH M. BALDWIN (California Univ., Irvine) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 5 May 1993 p. 2509-2516. refs
(Contract NIH-AR-30346; NAG2-555)
Copyright

This study examined the role of specific types of contractile activity in regulating myosin heavy chain (MHC) isoform expression in rodent soleus. A combination of hindlimb suspension (SN) and two programmed contractile training activity paradigms, either isometric contractile activity (ST-IM) or high-load slowly shortening isovelocity activity, were utilized. Both training paradigms increased muscle mass compared with SN alone. However, only ST-IM resulted in a partial prevention of the suspension-induced decrease in type I MHC. With the use of a fluorescently labeled antibody to type IIa MHC, the distribution of MHCs among fibers was examined immunohistochemically. In SN, the percentage of cells staining positive for type IIa MHC was increased but the staining intensity of the positively staining cells was unchanged compared with control cells. In the ST-IM soleus, the percentage of positively staining fibers was unchanged but the intensity of the positively staining cells was decreased compared with SN values. These results suggest that 1) isometric contractile activity is more effective than isovelocity activity in preventing suspension-induced shifts in soleus MHC distribution and 2) changes associated with both suspension and training occur in only a small number of fibers, with the majority of fibers apparently unresponsive to these interventions. Author

A93-44184* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
INTERACTION OF VARIOUS MECHANICAL ACTIVITY MODELS IN REGULATION OF MYOSIN HEAVY CHAIN ISOFORM EXPRESSION
GARY M. DIFFEE, SAMUEL MCCUE, ANGELA LAROSA, ROBERT E. HERRICK, and KENNETH M. BALDWIN (California Univ., Irvine) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 5 May 1993 p. 2517-2522. refs
(Contract NIH-AR-30346; NAG2-555)
Copyright

The purpose of this study was to determine the effects of a novel combination of mechanical activity paradigms on the isomyosin distribution in rat hindlimb muscles. Thirty female Sprague-Dawley rats were divided into five experimental groups as follows: normal control, functional overload (OV) of the plantaris, OV in conjunction with hindlimb suspension (OV-S), and a combination of OV-S and either static standing weight-bearing activity (OV-SS) or high-incline treadmill exercise (OV-SE). OV of the plantaris resulted in significant hypertrophy and significant fast-to-slow isomyosin shifts. These changes were completely inhibited by the addition of hindlimb suspension (OV-S). Also, neither of the two weight-bearing regimes (OV-SS and OV-SE) was able to attenuate the suspension-induced atrophy. In the vastus intermedius and vastus lateralis, however, OV-SS was able to partially retard the atrophy associated with suspension. In both the plantaris and vastus intermedius, only OV-SS was able to partially reverse the slow-to-fast isomyosin transitions associated with suspension. These results suggest that the type of mechanical activity is important in determining adaptation to altered loading conditions, with OV-SS appearing more effective than OV-SE in reversing the effects of unweighting. Author

A93-44842
EFFECTS OF TWO KINDS OF CHINESE HERB MEDICINE ON RABBIT'S EAR MICROCIRCULATION UNDER SIMULATED WEIGHTLESSNESS
XIANYUN SHEN, QIULU XIANG, and JINGRUI MENG (Inst. of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837) vol. 6, no. 1 1993 p. 1-5. refs

The effects of two herb-medicine preparations, Chuan Qiong (CQ) and Dan Sun + Huang Qi (DH) on the rabbit-ear microcirculation under simulated wightlessness (head-down tilt for three days) were investigated by comparing the volume and rate of the ear blood flow in the experimental rabbits with those in free-moving controls receiving water. Experimental (head-down tilt) rabbits received pretreatments for 3 days of either 5 ml/kg body weight per day of water or of suspensions containing either CQ (2 g/ml) or DH (3 g/ml). The results of measurements of changes in the volume and rate of the blood flow in rabbit ear at the end of the experiment showed that both the Chinese-medicine extracts were effective in improving microcirculation of head-down tilt rabbits, with the DH extracts exhibiting greater effect. AIAA

A93-44843
PROTECTIVE EFFECTS OF RHODIOLA CRENULATA ON RATS UNDER ANTIORTHOSTATIC POSITION AND PROFESSIONAL ATHLETES
JINKANG QIAN, HONGZHI ZHANG, GUANGHUA YANG, BAOZHEN WANG, and XIULAN WEN (Inst. of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837) vol. 6, no. 1 1993 p. 6-11. refs

The effect of Rodiola crenulata preparations (tablets containing 0.5 g crude herb in each tablet or extracts containing 2.0 g/ml) as a protective agent against physical stress in athletes and 30-deg head-down tilt in rats was investigated. In experiments, the athletes received the drug in dosages of 3 tablets/day for 75 days during training on a motor-driven treadmill, rats were given 0.25 ml extract/day for seven days of head-down tilt. It was found that athletes who received R. crenulata exhibited greater Ve and V(O sub 2 max) and greater work capacity than the controls who did not take the drug. Rats given R. crenulata exhibited significantly lesser degree of atrophy of m. soleus and loss of myoprotein in this muscle, body weight loss, and thymus atrophy. AIAA

A93-44844
PROTECTION OF CHINESE MEDICINE AND LOW FREQUENCY MAGNETIC FIELD AGAINST SUSPENSION INDUCED BONE LOSS IN RAT
ZHIZHEN SHI, SHILIANG SHEN, and WEI CUI (Inst. of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837) vol. 6, no. 1 1993 p. 12-18. refs

The protective effects of Chinese herb medicine and extremely low frequency magnetic field (LMF) stimulation on bone loss were studied in 100 S.D. male rats during 21-day suspension. The main results showed that, compared with suspension control group, the bone formation rate of tibia, the mechanical strength of femura, the mean density of mineral contents of weight-bearing bone, and the BGP contents in serum and OS calcium were all increased by Chinese medicine or LMF. In addition, the condition of periosteum was significantly improved by LMF. The results also indicated that much better protection against suspension induced bone loss could be obtained by the use of both the herb medicine and LMF. Author (revised)

A93-44845
RADIATION DOSE MEASUREMENT AND BIOSTACK EXPERIMENT IN BIOCABIN ON BOARD SATELLITE
MEI CHEN, ZHANGNIAN QI, XIANGGAO LI (Inst. of Space Medico-Engineering, Beijing, China), and DAHENG ZHUANG (Inst. of Sericulture, Zhenjiang, China) Space Medicine & Medical Engineering (ISSN 1002-0837) vol. 6, no. 1 1993 p. 19-23. refs

Radiation doses outside and inside the biochamber on board the Chinese recoverable satellite were measured with LiF thermoluminescent dosimeters. The dose level was 0.53 +/- 0.04 mGy accumulated in an eight-day flight period, which corresponds to 0.07 mGy/d, and is about 28 times as high as the ground control value. A biostack made of sandwiched silkworm eggs and CR-39 plastic nuclear track detectors, was designed for recording the high atomic number and high energy particles from the cosmic ray and their biological effect. Author (revised)

A93-44878
IDAVERINE, AN M2- VS. M3-SELECTIVE MUSCARINIC ANTAGONIST, DOES NOT PREVENT MOTION SICKNESS IN CATS
JAMES B. LUCOT (Wright State Univ., Dayton, OH), KARIN J. VAN CHARLDORP, and MARTIN TH. M. TULP (Duphar, Dept. of Pharmacology, Weesp, Netherlands) Pharmacology, Biochemistry and Behavior (ISSN 0091-3057) vol. 40 1991 p. 345-349. Research supported by Duphar refs
Copyright

The affinity of idaverine to muscarinic receptor subtypes was investigated using results of radioligand binding and in vitro organ bath experiments obtained for the M1- (neuronal tissue), M2- (heart), and M3- (glandular tissue/nonvascular smooth muscle) binding sites and for the atrial, ileal, and tracheal muscarinic receptors. The idaverine results were compared with those of muscarinic antagonists atropine, pirenzepine, AF-DX 116, and 4-DAMP. The results were interpreted to implicate M3 receptors in the motion sickness suppressant effect of antimuscarinic drugs. AIAA

A93-44879* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
STIMULATION OF LETTUCE PRODUCTIVITY BY MANIPULATION OF DIURNAL TEMPERATURE AND LIGHT
SHARON L. KNIGHT and CARY A. MITCHELL (Purdue Univ., West Lafayette, IN) HortScience (ISSN 0018-5345) vol. 18, no. 4 Aug. 1983 p. 462, 463. refs
(Contract NCC2-100)
Copyright

Salad Bowl and Waldmann's Green leaf lettuce (Lactuca sativa L.) were exposed to photosynthetic photon flux densities (PPFDs) of 444 or 889 micromol/s per sq m for 20 hrs/day under a diurnal temperature regime of 25-C days/15-C nights or 20-C days/15-C nights. Leaf dry weight of both cultivars was highest under the high PPFD/warm temperature regime and lowest under the low PPFD/cool temperature regime. Waldmann's Green yielded more than did Salad Bowl at 889 micromol/s per sq m and 25-C days/20-C nights. Under high PPFD, both cultivars yielded better with 25-C days/25-C nights than with 25-C days/20-C nights, although relative growth rates were the same under both temperature regimes. Author (revised)

A93-44880* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
MODIFICATION OF YIELD AND CHLOROPHYLL CONTENT IN LEAF LETTUCE BY HPS RADIATION AND NITROGEN TREATMENTS
CARY A. MITCHELL, TINA LEAKAKOS, and TAMERIA L. FORD (Purdue Univ., West Lafayette, IN) HortScience (ISSN 0018-5345) vol. 26, no. 11 Nov. 1991 p. 1371-1374. refs
(Contract NCC2-100)
Copyright

The potential of realizing high photosynthetic photon flux from radiation by high-pressure sodium (HPS) lamp, alone or in combination with metal halide (MH) plus quartz iodide (QI) incandescent lamps, to support lettuce grow, with or without nitrogen supplement, was investigated. It was found that varying exposures to radiation from combined HPS, MH, and QI lamps influenced dry weight gain and photosynthetic pigment content of hydroponically grown lettuce (Lactuca sativa L.) seedlings. AIAA

A93-44900
HABITUATION TO FELINE MOTION SICKNESS
JAMES B. LUCOT (Wright State Univ., Dayton, OH) *In* Workshop on Nervous System Plasticity in Relation to Long-Term Exposure to Microgravity Environment, Houston, TX, Oct. 13, 14, 1987, Proceedings Houston, TX NASA, Space Biomedical Research Institut 1987 p. 101-106; Commentary, p. 106.
Copyright

Results of a study of habituation to motion sickness in cats are presented. The motion sickness stimulus is described, habituation data is presented, and the neurochemical analyses performed are reviewed. Results indicate that animals with different susceptibility levels show different baseline levels of several neurotransmitters. High susceptibility was observed with low baseline levels of serotonin metabolites, two dopamine metabolites, and low vasopressin in CSF. It is concluded that the cat is a suitable model for the study of motion sickness and adaptation processes and that the neurochemical data obtained rules out a number of global changes in the brain that may have occurred during habituation. AIAA

A93-44903* National Aeronautics and Space Administration, Washington, DC.
REVISION OF THE WIND RIVER FAUNAS, EARLY EOCENE OF CENTRAL WYOMING. IX - THE OLDEST KNOWN HYSTRICOMORPHOUS RODENT (MAMMALIA: RODENTIA)
MARY R. DAWSON, LEONARD KRISHTALKA, and RICHARD K. STUCKY (Denver Museum of Natural History, CO) Carnegie Museum of Natural History, Annals (ISSN 0097-4463) vol. 59, no. 2 June 8, 1990 p. 135-147. Research supported by Carnegie Museum of Natural History refs
(Contract NSF BSR-84-02051; NSF BSR-87-09242; NAGW-949)
Copyright

The rostral portion of the skull of a new genus and species of rodent, Armintomys tullbergi, from the earliest middle Eocene of the Wind River Basin (Wyoming) provides the geologically oldest known record of the hystricomorphous zygomasseteric structure. Armintomys also preserves the oldest known occurrence of incisor enamel that is transitional from pauciserial to uniserial. Other dental characters include: anteriorly grooved incisor, small premolars, and relatively primitive sciuravidlike molars. Analysis of this unique combination of characters implies that Armintomys is the oldest known myomorph rodent and the only known representative of a new family. Armintomyidae, which is referred, with question, to the myomorph superfamily Dipodoidea. Armintomys is more primitive, especially in premolar retention and structure, than the Bridgerian zapodid Elymys from Nevada, but adds to evidence from the latter for an early origin and radiation of dipodoid rodents. Author (revised)

A93-44928* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
RESPONSE OF A MOUSE HYBRIDOMA CELL LINE TO HEAT SHOCK, AGITATION, AND SPARGING
CHERYL A. PASSINI (Houston Univ., TX) and CHARLES F. GOOCHEE (Stanford Univ., CA) Biotechnology Progress (ISSN 8756-7938) vol. 5, no. 4 Dec. 1989 p. 175-188. Research supported by Texas Advanced Technology Program and Merck Faculty Development Award refs
(Contract NAS9-17403)
Copyright

A mouse hybridoma cell line is used as a model system for studying the effect of environmental stress on attachment-independent mammalian cells. The full time course of recovery for a mouse hybridoma cell line from both a mild and intermediate heat shock is examined. The pattern of intracellular synthesis is compared for actively growing, log phase cells and nondividing, stationary phase cells. AIAA

A93-44929* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
INTRACELLULAR PROTEINS PRODUCED BY MAMMALIAN CELLS IN RESPONSE TO ENVIRONMENTAL STRESS
CHARLES F. GOOCHEE and CHERYL A. PASSINI (Houston Univ., TX) Biotechnology Progress (ISSN 8756-7938) vol. 4, no. 4 Dec. 1988 p. 189-201. refs
(Contract NAS9-17403)
Copyright

The nature of the response of mammalian cells to environmental stress is examined by reviewing results of studies where cultured mouse L cells and baby hamster kidney cells were exposed to heat shock and the synthesis of heat-shock proteins and stress-response proteins (including HSP70, HSC70, HSP90, ubiquitin, and GRP70) in stressed and unstressed cells was evaluated using 2D-PAGE. The intracellular roles of the individual stress response proteins are discussed together with the regulation of the stress response system. AIAA

A93-44930* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
VESTIBULAR AFFERENT RESPONSES TO MICROROTATIONAL STIMULI
STEVEN F. MYERS (Wayne State Univ., Detroit, MI) and EDWIN R. LEWIS (California Univ., Berkeley) Brain Research (ISSN 0006-8993) vol. 543 1991 p. 36-44. refs
(Contract NAG2-448)
Copyright

Intracellular microelectrode recording/labeling techniques were used to investigate vestibular afferent responses in the bullfrog, to very small amplitude (less than 5 deg p-p) sinusoidal rotations in the vertical plane over the frequency range of 0.063-4 Hz. Robust responses to peak accelerations as low as 0.031 deg/sec per sec were obtained from units subsequently traced to either the central portion of the anterior canal crista or the striolar region of the utricle. All of these microrotationally sensitive afferent neurons had irregular resting discharge rates, and the majority had transfer ratios (relative to rotational velocity) of 1-40 spikes/sec per deg/sec. Individual utricular afferent velocity transfer ratios were nearly constant over the frequency range of 0.125-4 Hz. Canal units displayed decreasing response transfer ratios as stimulus frequencies increased. These findings indicate that, although utricular striolar and central crista afferent velocity transfer ratios to microrotations were very similar, utricular striolar afferent

neurons were more faithful sensors of very small amplitude rotational velocity in the vertical plane. Author (revised)

A93-44931* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
HAIR CELL TUFTS AND AFFERENT INNERVATION OF THE BULLFROG CRISTA AMPULLARIS
STEVEN F. MYERS (Wayne State Univ., Detroit, MI) and EDWIN R. LEWIS (California Univ., Berkeley) Brain Research (ISSN 0006-8993) vol. 534 1990 p. 15-24. refs
(Contract NAG2-448)
Copyright

Within the bullfrog semicircular canal crista, hair cell tuft types were defined and mapped with the aid of scanning electron microscopy. Dye-filled planar afferent axons had mean distal axonal diameters of 1.6-4.9 microns, highly branched arbors, and contacted 11-24 hair cells. Dye-filled isthmus afferent axons had mean distal axonal diameters of 1.8-7.9 microns, with either small or large field arbors contacting 4-9 or 25-31 hair cells. The estimated mean number of contacts per innervated hair cell was 2.2 for planar and 1.3 for isthmus afferent neurons. Data on evoked afferent responses were available only for isthmus units that were observed to respond to our microrotational stimuli. Of 21 such afferent neurons, eight were successfully dye-filled. Within this sample, high-gain units had large field arbors and lower-gain units had small field arbors. The sensitivity of each afferent neuron was analyzed in terms of noise equivalent input (NEI), the stimulus amplitude for which the afferent response amplitude is just equivalent to the rms deviation of the instantaneous spike rate. NEI for isthmus units varied from 0.63 to 8.2 deg/s; the mean was 3.2 deg/s. Author (revised)

A93-44933 National Aeronautics and Space Administration, Washington, DC.
SEPARATION OF RAT PITUITARY SECRETORY GRANULES BY CONTINUOUS FLOW ELECTROPHORESIS
DANIEL HAYES, CARRIE EXTON, THOMAS SALADA, KATHY SHELLENBERGER, JENNY WADDLE, and W. C. HYMER (Pennsylvania State Univ., University Park) Electrophoresis (ISSN 0173-0835) vol. 11 1990 p. 976-978. refs
(Contract NAGW-1196; NAG8-807)
Copyright

The separation of growth hormone-containing cytoplasmic secretory granules from the rat pituitary gland by continuous flow electrophoresis is described. The results are consistent with the hypothesis that granule subpopulations can be separated due to differences in surface charge; these, in turn, may be related to the oligomeric state of the hormone. Author

A93-44934
PROLACTIN-INDUCED MITOGENESIS OF LYMPHOCYTES FROM OVARIECTOMIZED RATS
SUSAN M. VISELLI, ELAINE M. STANEK, PINKU MUKHERJEE, W. C. HYMER, and ANDREA M. MASTRO (Pennsylvania State Univ., University Park) Endocrinology (ISSN 0013-7227) vol. 129, no. 2 1991 p. 983-990. Research supported by Sigma Xi - Scientific Research Society refs
(Contract NIH-CA-24385; NIH-CA-23248)
Copyright

The effect of prolactin on lymphocytes in cultured splenocytes and thymocytes from male rats and ovariectomized female rats was investigated in an experiment where lymphocytes were first freed from adherent cells on a column and by incubation in culture and then were incubated with prolactin, Con-A, or medium alone. It was found that prolactin induced the IL-2 receptor expression, IL-2 production, and proliferation of splenocytes and thymocytes from ovariectomized female (but not in male) rats. AIAA

A93-44935* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
EFFECTS OF SPACEFLIGHT ON THE SPERMATOGONIAL POPULATION OF RAT SEMINIFEROUS EPITHELIUM
WALTER J. SAPP (Tuskegee Univ., AL), DELBERT E. PHILPOTT (NASA, Ames Research Center, Moffett Field, CA), CAROL S. WILLIAMS (Tuskegee Univ., AL), KATHARINE KATO, JOANN STEVENSON, M. VASQUEZ (NASA, Ames Research Center, Moffett Field, CA), and L. V. SEROVA (Inst. for Biomedical Problems, Moscow, Russia) FASEB Journal (ISSN 0892-6638) vol. 4, no. 1 Jan. 1990 p. 101-104. refs
(Contract NCC2-12; NCC2-455; NIH-G12-RR-03059-01A1)
Copyright

Testes from rats flown on Cosmos 1887 were compared with vivarium control and synchronous control samples. The mean weights of flight testes, normalized for weight per 100 g, were 6.4 percent less when compared with the vivarium controls. Counts of spermatogonia from tissue sections (seminiferous tubules in maturation stage 6) from five animals in each group revealed 4 percent fewer spermatogonia in flight testes compared with synchronous controls and 11 percent fewer spermatogonia in flight samples compared with vivarium controls. Author (revised)

A93-44939* National Aeronautics and Space Administration, Washington, DC.
IN VITRO SELECTION OF OPTIMAL DNA SUBSTRATES FOR T4 RNA LIGASE
KAZUO HARADA and LESLIE E. ORGEL (Salk Inst. for Biological Studies, San Diego, CA) National Academy of Sciences, Proceedings (ISSN 0027-8424) vol. 90 Feb. 1993 p. 1576-1579. refs
(Contract NAGW-1660)
Copyright

We have used in vitro selection techniques to characterize DNA sequences that are ligated efficiently by T4 RNA ligase. We find that the ensemble of selected sequences ligated about 10 times as efficiently as the random mixture of sequences used as the input for selection. Surprisingly, the majority of the selected sequences approximated a well-defined consensus sequence. Author

A93-44941* National Aeronautics and Space Administration, Washington, DC.
CELL WALL AND ENZYME CHANGES DURING THE GRAVIRESPONSE OF THE LEAF-SHEATH PULVINUS OF OAT (AVENA SATIVA)
DAVID M. GIBEAUT (Purdue Univ., West Lafayette, IN), NADARAJAH KARUPPIAH, S.-R. CHANG, THOMAS G. BROCK, BABU VADLAMUDI, DONGHERN KIM (Michigan Univ., Ann Arbor), NAJATI S. GHOSHEH (Eastern Michigan Univ., Ypsilanti, MI), DAVID L. RAYLE (San Diego State Univ., CA), NICHOLAS C. CARPITA (Purdue Univ., West Lafayette, IN), and PETER B. KAUFMAN (Michigan Univ., Ann Arbor) Plant Physiology (ISSN 0032-0889) vol. 94 1990 p. 411-416. refs
(Contract NAGW-1849; NAGW-1600; DE-FG02-88ER-13903)
Copyright

The graviresponse of the leaf-sheath pulvinus of oat (Avena sativa) involves an asymmetric growth response and asymmetric processes involving degradation of starch and cell wall synthesis. Cellular and biochemical events were studied by investigation of the activities of related enzymes and changes in cell walls and their constituents. It is suggested that an osmotic potential gradient acts as the driving factor for growth, while wall extensibility is a limiting factor in pulvinus growth. AIAA

N93-29702*# Oklahoma State Univ., Stillwater.
FINAL RESULTS OF SPACE EXPOSED EXPERIMENT DEVELOPED FOR STUDENTS
DORIS K. GRIGSBY *In* NASA. Langley Research Center, LDEF: 69 Months in Space. Part 4: Second Post-Retrieval Symposium p 1479-1492 Apr. 1993
Avail: CASI HC A03/MF A03; 2 functional color pages

SEEDS was a cooperative endeavor of NASA Headquarters, the NASA Langley Research Center, and the George W. Park Seed Company. Approximately 132,000 SEEDS kits containing Rutger's tomato seeds that had flown on LDEF, as well as similar seeds that had been stored in a climate-controlled warehouse for the same time period, were sent to schools in every state and 30

foreign countries. Student researchers from kindergarten through university compared germination and growth characteristics of the space-exposed and Earth-based seeds and returned data to NASA for analysis. Important scientific information was gained as students reported very little difference between the two seed groups.
Author (revised)

N93-29703*# Park Seed Co., Inc., Greenwood, SC.
CONTINUED RESULTS OF THE SEEDS IN SPACE EXPERIMENT
JIM A. ALSTON *In* NASA. Langley Research Center, LDEF: 69 Months in Space. Part 4: Second Post-Retrieval Symposium p 1493-1497 Apr. 1993
Avail: CASI HC A01/MF A03; 2 functional color pages

Two million seeds of 120 different varieties representing 106 species, 97 genera, and 55 plant families were flown aboard the Long Duration Exposure Facility (LDEF). The seed were housed on the Space Exposed Experiment Developed for Students (SEEDS) tray in the sealed canister number 6 and in two small vented canisters. The tray was in the F-2 position. The seed were germinated and the germination rates and the development of the resulting plants were compared to the performance of the control seed that stayed in Park Seed's seed storage facility. The initial results were presented in a paper at the First LDEF Post-Retrieval Symposium. There was a better survival rate of the seed in the sealed canister in space than in the storage facility at Park Seed. At least some of the seed in each of the vented canisters survived the exposure to vacuum for almost six years. The number of observed apparent mutations was very low. In the initial testing, the small seeded crops were not grown to maturity to check for mutations and obtain second generation seed. These small seeded crops have now been grown for evaluation and second generation seed collected. Author

N93-29915# Cornell Univ., Ithaca, NY.
CENTER OF EXCELLENCE IN BIOTECHNOLOGY (RESEARCH) Final Report, 22 Dec. 1986 - 21 Dec. 1992
L. JELINSKI and MILTON ZAITLIN Mar. 1993 32 p
(Contract DAAL03-87-K-0004)
(AD-A263598; ARO-24629.68-LS-UIR) Avail: CASI HC A03/MF A01

The ARO Center of Excellence in Biotechnology was established within the Cornell University Biotechnology Program in 1986. The research focus of the Center was protein structure and function, with special emphasis on enzymes and receptors. Research projects funded through the Center represented a multidisciplinary attack on the molecular basis of how proteins and enzymes work, how energy and enzymic processes are coupled through cell membranes, how membrane receptors are used to transmit signals to the cell, and how signals are transmitted in the nervous system. The final report summarizes the results of the research. DTIC

N93-30483# Sandia National Labs., Albuquerque, NM.
A ROBUST MODEL FOR FINDING OPTIMAL EVOLUTIONARY TREES
M. FARACH (Rutgers - The State Univ., Piscataway, NJ.), S. KANNAN (Arizona Univ., Tucson.), and T. WARNOW 1993 13 p Presented at the Association for Computing Machinery Symposium on the Theory of Computing, San Diego, CA, May 1993
(Contract DE-AC04-76DP-00789)
(DE93-010682; SAND-93-0361C; CONF-9305153-2) Avail: CASI HC A03/MF A01

Constructing evolutionary trees for species sets is a fundamental problem in biology. One of the standard models assumes the ability to compute distances between every pair of species and seeks to find an edge-weighted tree T in which the distance d(sub ij)(exp T) in the tree between the leaves of T corresponding to the species i and j exactly equals the observed distance, d(exp ij). When such a tree exists, this is expressed in the biological literature by saying that the distance function or matrix is additive, and trees can be constructed from additive distance matrices in O(n(exp 2)) time. Real distance data is hardly ever additive, and we therefore need methods (such as approximation algorithms with guaranteed error bounds) for handling such data. In this paper, we present several natural and realistic ways of modeling the inaccuracies in the distance data. In one model, we assume that we have upper and lower bounds for the distances between pairs of species and try to find an additive distance matrix between these bounds. In a second model, we are given a partial matrix and asked to find if we can fill in the unspecified entries in order to make the entire matrix additive. For both of these models, we also consider a more restrictive problem of finding a matrix that fits a tree which is not only additive but also ultrametric. Ultrametric matrices correspond to trees which can be rooted so that the distance from the root to any leaf is the same. Ultrametric matrices are desirable in biology since the trees then indicate evolutionary time. We give polynomial time algorithms for some of the problems while showing others to be NP-Complete. We also consider various ways of 'fitting' a given distance matrix to a tree in order to minimize various criteria of error in the fit. For most criteria this optimization problem turns out to be NP-Hard, while we do get polynomial time algorithms for some. DOE

N93-30594# Wake Forest Univ., Winston-Salem, NC. Bowman Gray School of Medicine.
MULTIPLE NEURON RECORDING IN THE HIPPOCAMPUS OF FREELY MOVING ANIMALS Annual Report, 1 Dec. 1991 - 30 Nov. 1992
SAM A. DEADWYLER 30 Mar. 1993 6 p
(Contract AF-AFOSR-0092-90)
(AD-A264807; BGSM-PP-92-001; AFOSR-93-0285TR) Avail: CASI HC A02/MF A01

Progress has been significant over the previous year on the development of multineuronal recording and systems for analysis of the multineuronal data. This was a primary objective of the three laboratory consortium, and it has been a principle focus of the research efforts. The multitasking computer system has been in operation in all three laboratories this past year, as well as the DSP-based multineuron spike-sorter and the associated software interface for neural spike discrimination. Much of the research effort in the past year has been directed toward implementing the spike-sorter system, collecting multineuron data, and developing the analysis strategies. In addition, studies using the multineuron data acquisition have revealed new relationships between the behavioral events in the DMTS and patterns of simultaneously active neurons in the hippocampus. The following report will summarize these and other accomplishments in the third year of the award. DTIC

N93-30665*# Woods Hole Oceanographic Inst., MA.
MARINE MICROBIAL PRODUCTION OF DIMETHYLSULFIDE FROM DISSOLVED DIMETHYLSULFONIOPROPIONATE Ph.D. Thesis
KATHLEEN M. LEDYARD Feb. 1993 228 p
(Contract NAGW-606; NSF OCE-90-2532)
(NASA-CR-193278; NAS 1.26:193278; AD-A264794; WHOI-93-07)
Avail: CASI HC A11/MF A03

Dimethylsulfide (DMS) plays a central role in the transfer of sulfur from the ocean to the atmosphere and ultimately to land. The most abundant volatile organosulfur compound in seawater, DMS is believed to account for the bulk of the sea-to-air biogenic sulfur flux. DMS has also been implicated as the major precursor of submicron-sized sulfate aerosol over the ocean. This aerosol acts as an effective site for cloud droplet condensation suggesting a possibly important role for DMS in marine cloud formation. In the ocean, the precursor of DMS is presumed to be the zwitterionic sulfonium compound dimethylsulfoniopropionate (DMSP), a common osmoticum in certain classes of marine algae. While some algae can cleave DMSP intracellularly to form DMS, correlation of DMS concentrations with indicators of algal productivity on a local scale is poor. This thesis focuses on an alternative pathway of DMS formation: microbial cleavage of dissolved (extracellular) DMSP. In laboratory studies, bacteria able to cleave DMSP to form DMS were isolated from seawater by a DMSP enrichment

technique, and the kinetics of DMSP uptake and DMS production were examined closely in pure cultures of a bacterial isolate from the Sargasso Sea. The isolate could grow with both DMSP and acrylic acid, one of the products of DMSP cleavage, as the sole source of carbon and energy, and the enzyme catalyzing DMSP cleavage appeared to be induced by both of these compounds. Kinetic parameters were estimated for DMSP uptake and cleavage by whole cells. Comparison of the 16S rRNA sequence of this isolate with that of known eubacteria showed that it was most closely related to Erythrobacter longus, an aerobic, bacteriochlorophyll-containing member of the alpha proteobacteria. DTIC

N93-30818# Naval Medical Research Inst., Bethesda, MD.
AN ASSESSMENT OF PERIPHERAL NERVE DAMAGE IN THE RAT FOLLOWING NON-FREEZING COLD EXPOSURE: AN ELECTROPHYSIOLOGICAL AND HISTOPATHOLOGICAL EXAMINATION Technical Report, Jan. 1991 - Jan. 1992
DAVID SHURTLEFF, ROGER W. GILLIATT, JOHN R. THOMAS, and G. H. PEZESHKPOUR 20 Jan. 1993 19 p
(AD-A264293; NMRI-93-1) Avail: CASI HC A03/MF A01

The effect of exposure to non-freezing cold temperature on peripheral nerve was studied in vivo. Rats' tails and a portion of their lower backs were submerged in 1 C water for either 10 or 12 hours. Changes in evoked ascending nerve action potentials, and muscle action potentials in the rat tail and lumbar spine, were studied periodically over a three week period following cold exposure. In addition, ventral caudal nerves were excised 27 days following cold exposure and histopathology was performed. Electrophysiological analysis indicated initial nerve damage appeared to be just below the surface of the water, and later, in the first week after exposure, Wallerian degeneration occurred. Histopathological analysis revealed damage to the large myelinated fibers and capillaries within the fascicle following cold exposure. These results further validate the use of the rat tail as a model for non-freezing cold injury (NFCI) and suggest that the injury's etiology is multifaceted, which may require a variety of strategies and interventions to prevent its occurrence. DTIC

N93-31161# International Centre for Theoretical Physics, Trieste (Italy).
SPONTANEOUS REGULATING MECHANISMS THAT MAY HAVE LED TO THE ORIGIN OF LIFE
J. CHELAFLORES Jul. 1992 13 p
(DE93-603677; IC-92/170) Avail: CASI HC A03/MF A01 (US Sales Only)

According to Salam condensation may be relevant in biochemistry as a factor contributing to the homochirality of amino acids. An attempt was made to show that DNA packaging may be modeled, by interpreting chromatin as a form of soft matter, in which a phase transition has induced chromatin into a condensed mode. In the context of the origin of life, it is shown the relevance of simultaneous discussion of DNA packaging, transcription, and DNA replication. Beyond a certain critical length of the protogenome (RNA), physical properties of inert condensed matter may have given rise to a spontaneous regulating mechanism of certain significance for the evolution of life on Earth. DOE

52

AEROSPACE MEDICINE

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

A93-42126
MEDICAL CARE ON THE MOON
RON SCHAEFER (Critical Care Medicine and Medical Computer Informatics, Pasadena, CA) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1728-1737. refs
Copyright

The establishment of a health maintenance facility at a lunar base to assure the health and productivity of the crew is discussed. In particular, attention is given to the principal characteristics of the lunar environment, the main goals and the equipment of a lunar health maintenance facility, communications, robotics, and logistics. The discussion also covers surgery on the moon, decompression sickness, effects of reduced gravity, radiation, environmental contamination, life pods, and disaster planning. AIAA

A93-42188
MECHANISMS OF IMPROVED ARTERIAL OXYGENATION AFTER PERIPHERAL CHEMORECEPTOR STIMULATION DURING HYPOXIC EXERCISE
ROBERT NAEIJE, CHRISTIAN MELOT, GEORGES NISET, MARION DELACROIX, and PETER D. WAGNER (Erasme Univ. Hospital, Brussels, Belgium; California Univ., La Jolla) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 4 April 1993 p. 1666-1671. Research supported by PK Morgan, Ltd., Inst. de Recherches Internationales Servier, and Fondation pour la Recherche Scientifique Medicale refs
(Contract NIH-HL-17731)
Copyright

To verify the report of Giesbrecht et al. (1991) on the effect of almitrine on arterial oxygenation and to investigate its mechanism of action, the perimeters of pulmonary hemodynamics (right heart catheterization) and gas exchange were studied in humans at rest and during exercise in normobaric normoxia or in hypoxia, before and after intakes of 75 mg of almitrine. The results indicate that almitrine during hypoxia does not affect cardiac output or O2 diffusion capacity, but does increase the slope of the minute ventilation/mean O2 uptake relationship. It is concluded that, during hypoxic exercise, a pharmacological stimulation of the peripheral chemoreceptors improves arterial O2 saturation, but not arterial O2 pressure, by means of increased ventilation and an associated leftward shift of the oxyhemoglobin dissociation curve. AIAA

A93-42189
COGNITIVE PERFORMANCE AND EVENT-RELATED BRAIN POTENTIALS UNDER SIMULATED HIGH ALTITUDES
MITSURO KIDA and AKIRA IMAI (Nagoya Univ., Japan) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 4 April 1993 p. 1735-1741. refs
Copyright

The effects of hypobaric hypoxia on cognitive processing in humans were studied by recording event-related potentials (ERPs) from the scalp in a go/no-go reaction time (RT) paradigm under various simulated high altitudes. Most subjects indicated abrupt impairment of RT at high altitudes. RTs lengthened in association with changes in latency and amplitude of the N2-P3 components, reflecting sensory discrimination and evaluation processes. Some subjects did not suffer any changes in RT up to an extremely high altitude of 6,000 m. In the latter case, although the N2-P3 components did not undergo any changes, the P3 component was followed by a sequence of negative on-going (frontal maximum) and positive on-going (parietal maximum) slow waves. The amplitudes of these slow waves increased as altitude increased. Although these same waves appeared in the ERPs of subjects who demonstrated the increase in RTs at high altitudes, when the subjects failed in the RT task, both of the slow waves either disappeared or diminished. Such slow waves may be associated with attempts to maintain RTs against the deteriorative effects of hypobaric hypoxia. Author

A93-42191
EFFECTS OF CHRONIC HYPOXIA AND EXERCISE ON PLASMA ERYTHROPOIETIN IN HIGH-ALTITUDE RESIDENTS
W. SCHMIDT, H. SPIELVOGEL, K. U. ECKARDT, A. QUINTELA, and R. PENALOZA (Hannover, Medizinische Hochschule, Hanover;

Regensburg Univ., Germany; Inst. Boliviano de Biologia de Altura, La Paz, Bolivia) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 4 April 1993 p. 1874-1878. refs
(Contract DFG-716/1-2)

The present study was performed to evaluate the effects of chronic inspiratory hypoxia and its combination with physical exercise on plasma erythropoietin concentration (PEC). Eight natives from the Bolivian Plateau were investigated at 3600 m above sea level at rest as well as during and up to 48 h after exhaustive exercise (EE) and 60 min of submaximal (60 percent) cycle ergometer exercise (SE). Ten sea-level subjects were used as a control group for resting values. The mean resting plasma PEC of the high-altitude group (19.5 +/- 0.7 mU/ml) did not differ from that of the sea-level group (18.1 +/- 0.4 mU/ml) but was higher than would be expected from the relationship between PEC and hematocrit at sea level. Five hours after both types of exercise, PEC decreased by 2.1 +/- 0.8 (EE, P less than 0.01) and 1.6 +/- 0.8 mU/ml (SE, P less than 0.05); 48 h after SE, PEC increased by 2.6 +/- 0.9 mU/ml (P less than 0.05). It is concluded that (1) high-altitude natives need relatively high PEC to maintain their high hematocrit and (2) exercise at low basal arterial P O2 does not directly increase plasma PEC in high-altitude residents but seems to exert suppressive effects.
Author (revised)

A93-44180
RENAL HEMODYNAMICS, TUBULAR FUNCTION, AND RESPONSE TO LOW-DOSE DOPAMINE DURING ACUTE HYPOXIA IN HUMANS

NIELS V. OLSEN, JESPER M. HANSEN, INGE-LIS KANSTRUP, JEAN-PAUL RICHALET, and PAUL P. LEYSSAC (Herlev Hospital; Copenhagen Univ., Denmark; Association pour la Recherche en Physiologie de l'Environnement, Bobigny, France) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 5 May 1993 p. 2166-2173. Research supported by Lab. Sandoz, MEDA, Director Jacob Madsen and Wife Olga Madsen Foundation, et al refs

Acute hypobaric hypoxia has been found to decrease effective renal plasma flow. The concomitant increase in mean systemic arterial pressure suggests an enhanced renal vascular resistance secondary to increased adrenergic nervous activity. While the renal vasolidating effect of exoneous dopamine was significantly attenuated in hypoxia, dopamine-induced increases in Li and Na clearance were maintained at high altitude; this suggests that natriuresis in both environments was secondary to an increased outflow of Na from the proximal tubules.
AIAA

A93-44182
BAROREFLEX FUNCTION AND CARDIAC STRUCTURE WITH MODERATE ENDURANCE TRAINING IN NORMOTENSIVE MEN

M. P. MCDONALD, ANTHONY J. SANFILIPPO, and GABRIELLE K. SAVARD (Queen's Univ.; Hotel Dieu Hospital, Kingston, Canada) Journal of Applied Physiology (ISSN 8750-7587) vol. 74, no. 5 May 1993 p. 2469-2477. Research supported by NSERC refs

A 10-week exercise training period of moderate intensity induces a persistent lowering of resting arterial pressure and heart rate. There is an increase in the reflex control of the heart within the normal ranges of arterial pressure; these changes appear to occur independently of changes in cardiac structure, in carotid-cardiac baroreflex function, or in plasma volume. The enhancement of baroreflex response may permit a more efficient regulation of transient fluctuations in arterial pressure.
AIAA

A93-44847
INVESTIGATION ON REQUIREMENTS FOR EJECTION ACCELERATION MEASURING SYSTEM

FANGZI WANG, YUXIA XUAN, ZHI WANG, and XIANGCHANG ZHUANG (Inst. of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837) vol. 6, no. 1 1993 p. 57-63. refs

The requirements of an ejection-acceleration measuring system are investigated together with the issues of transducer calibration and the location of transducers, in experiments in which ejection acceleration data were obtained using an instrument with the frequency response over 250 Hz in several groups of ejection tests with different positions of the ejection seat. All data were forced to pass different band-pass filters; power spectra were calculated using an FFT method, and human responses were computed. It was found that the frequency response range, which is the key characteristic of an ejection-acceleration measuring system, should not be less than 0 to 160 Hz for engineering applications, and 0-180 Hz for human ergonomics. Acceleration transducers should be fixed on the frame of the seat to avoid loss or distortion of information. It is also important to calibrate the measuring system using a dynamic method, and to precondition the recorded data.
AIAA

A93-44848
ANALYSIS OF FACTORS INFLUENCING CONTRAST VISION IN NORMAL EYES

WENCAN WU and YAFU XU (Inst. of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837) vol. 6, no. 1 1993 p. 64-68. refs

Physiological factors influencing contrast vision in normal eyes were investigated in 254 subjects aged 10 to 59, with clinical vision 1.0, 1.2, and 1.5, using a low-contrast letter vision chart made by ESSILOR. The chart was printed on a white opal glass background and consisted of three rows of letters and figures, indicating visual acuities of 0.4, 0.6, and 0.8, with each row having three different contrast values, 0.6, 0.4, and 0.25. Results showed that the degree of contrast vision of the subjects declined with age and was higher in subjects who rated higher in clinical vision.
AIAA

A93-44849
PROBLEMS OF RESPIRATORY PHYSIOLOGY DURING SPACE FLIGHT

RUGUO ZHANG (Inst. of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837) vol. 6, no. 1 1993 p. 73-77. In CHINESE refs

A review of literature data on the effect of a prolonged space flight on the respiratory system's vital capacity and the parameters of respiratory biomechanics led to several suggestions for further studies. These are: (1) the necessity of standardizing experimental models for simulated weightlessness, (2) the necessity of studies of the mechanism of changes in the respiratory system during the spaceflight, for understanding the physiological effects of weightlessness, (3) the necessity of developing more sensitive tests (than presently available) for assessing the condition of pulmonary function in astronaut candidates, and (4) efficient methods for training respiratory musculature.
AIAA

A93-45320
RESPIRATION CURVES AS AN INDEX OF PILOT WORKLOAD

YOSHINORI TEKEUCHI Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858) vol. 33, no. 1-2 June 1992 p. 1-11. In JAPANESE refs

The feasibility of using results of respiration curve analyses as an index of the pilot's mental work load was investigated in an experiment where a trained 24-yr-old male subject was asked to execute a set of maneuvers on a flight simulator or the T-2 Japanese jet trainer. Respiration data were sampled for one minute of each maneuver and of the rest period. The calculated maximum differential coefficients of inspiration for each maneuver were divided by the one for the rest period. It was found that the coefficients correlated positively with the subjective work-load estimates. No correlation was found with the inspiration time, respiration rate, or amplitude.
AIAA

A93-45321
RELATIONSHIP BETWEEN ALCOHOL DRINKING HABIT AND BLOOD PRESSURE CHANGES DURING THE PERIOD OF 25 YEARS ON JASDF AGED PILOTS
YOSHINORI KURIHARA, MASASHI KATO, AZUSA KIKUKAWA, HIROHISA TAMURA, and AKIO NAKAMURA Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858) vol. 33, no. 3 Sept. 1992 p. 51-65. In JAPANESE refs

The effects of the food preference, alcohol consumption, smoking, and exercising on the long-term changes of blood pressure (BP) of JASDF aircraft pilots was investigated using a questionnaire which included minute questions concerning daily life habits of the subjects. It was found that, among the daily habits analyzed, only alcohol consumption was significantly correlated with both systolic and diastolic BP changes. When pilots were divided into groups of nondrinkers, moderate drinkers, and heavy drinkers in year 1965, they exhibited no significant difference in the BP levels. Twenty five years later (in 1990), pilots who were heavy drinkers (i.e., who have been drinking almost every day from young adulthood) had the highest mean levels of systolic and diastolic BPs. Nondrinkers or only occasional drinkers exhibited normal BP levels for the entire 25 years. AIAA

A93-45322
THE EFFECT OF G-EXPERIENCE ON HEART RATE DURING +GZ LOADING
CHIEKO MIZUMOTO, TADAO YANAKA, and HIDEO TARUI Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858) vol. 33, no. 3 Sept. 1992 p. 67-74. In JAPANESE refs

The effects of the subject's age and experience to +Gz loading on the heart rate (HR) and the saliva cortisol concentration as well as on the subjective feeling of discomfort of humans subjected to +G loading were investigated in subjects of one of three groups of subjects: (1) nonexperienced, (2) those who have experienced +Gz loading 3 to 20 times in the past, and (3) those who have experienced +Gz more than 100 times. The G profile in the experiments was as follows: Max +5 Gz, head movement at +2 Gz, on-off set rate 0.1 G/sec. The results of measurements and the surveys of discomfort complaints showed that, at a given +Gz, HR and the HR increase due to G loading were lower in the most experienced subjects and that the HR of older subjects was lower than HR in young ones. The saliva cortosol concentration rose markedly after +Gz loading in all subjects, with no statistically significant difference between the groups, and the amount of subjective complaints was lowest among most experienced subjects. AIAA

N93-29400# Air Force Systems Command, Wright-Patterson AFB, OH. Armstrong Lab.
A TUTORIAL ON EXIT PUPILS AND EYE ROTATION WITH VIRTUAL IMAGE OPTICAL DISPLAYS Interim Report, Aug. 1991 - Sep. 1992
HERSCHEL C. SELF Dec. 1992 37 p
(AD-A262399; AL-TR-1993-0010) Avail: CASI HC A03/MF A01

Exit pupils of virtual image optical displays and eye entrance pupils and how their sizes and relative positions influence light input to the eye are discussed. Equations based on simplifying assumptions about the eye and its rotational behavior are derived and graphed to describe the position of the center and edge of the eye entrance pupil after eye rotation and for the rotation angles at which exit pupil vignetting begins and at which vignetting is total. The graphs and equations are useful for descriptive purposes and for practical application in choosing, specifying or designing virtual image optical display devices. Worked out numerical examples are supplied to further aid in understanding pupils and eye rotation and how they interact. The reader is not required to have a background in optics or in college mathematics. DTIC

N93-29421# Massachusetts Inst. of Tech., Cambridge.
PROGRAMMABLE INTERACTIVE SYSTEM FOR COCHLEAR IMPLANT ELECTRODE STIMULATION Technical Report
JOSEPH TIERNEY, MARC A. ZISSMAN, DONALD K. EDDINGTON, and WILLIAM M. RABINOWITZ 12 Jan. 1993 51 p
(Contract F19628-90-C-0002)
(AD-A262558; TR-970; ESC-TR-92-139) Avail: CASI HC A04/MF A01

The aim of this research, which was performed as a Lincoln Laboratory Innovative Research Program (IRP) project, was to apply advanced digital speech and signal-processing techniques toward improving cochlear implant electrode simulators. By providing a flexible stimulator whose function could be tuned depending on the subject's residual auditory nerves and the efficiency of the implant's coupling to those nerves, it was hypothesized that the subject's speech reception could be improved. The approach to providing these new and improved electrode stimulators included the design of a laboratory signal processor used for interactive testing of new algorithms with implant subjects. This Programmable Interactive System for Cochlear Implant Electrode Stimulation (PISCES) was designed, built, and tested at Lincoln Laboratory and then delivered to the Massachusetts Eye and Ear Infirmary (MEEI) Cochlear Implant Research Laboratory (CIRL). In collaboration with researchers at MEEI CIRL and MIT Research Laboratory of Electronics (RLE), new algorithms run on PISCES resulted in substantial improvements in subject speech reception relative to that with their current implant stimulators. These results were obtained as a result of interactive algorithm adjuctment at the clinic, which demonstrated the importance of a flexible signal processor. DTIC

N93-29502*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
PHARMACOKINETICS AND PHARMACODYNAMICS IN SPACE
LAKSHMI PUTCHA and NITZA M. CINTRON Apr. 1990 31 p Workshop held in Houston, TX, 29-30 Aug. 1988
(NASA-CP-10048; NAS 1.55:10048) Avail: CASI HC A03/MF A01

The Pharmacokinetics and Pharmacodynamics Panel met on 29-30 Aug. 1988 at the Lunar and Planetary Institute in Houston, Texas to discuss pharmacokinetic and pharmacodynamic implications of space flight and make recommendations for operational and research strategies. Based on the knowledge available on the physiological changes that occur during space flight, the dependence of pharmacokinetics on physiological factors, and the therapeutic requirements for future space missions, the panel made several recommendations for research. It was suggested that using medications available with a large (wide) therapeutic window will avoid unforeseen therapeutic consequences during flight. The sequence for conducting research was outlined as follows: (1) identify ground-based simulation models (e.g., antiorthostatic bed rest) for conducting pharmacokinetic and pharmacodynamic research; (2) estimate parametric changes in these models using pharmacologic agents that have different pharmacokinetic characteristics and a narrow therapeutic index; (3) verify these findings during flight; and (4) develop and identify appropriate and effective drug delivery systems, dosage forms, and regimens. The panel recommended gaining a thorough understanding of the pharmacokinetic deviations of medications that have a narrow therapeutic index (e.g. cardiovascular drugs and sedative hypnotics) in order to ensure safe and effective treatment during flight with these agents. It was also suggested that basic information on physiological factors such as organ blood flow, protein composition and binding, tissue distribution, and metabolism by hepatic enzymes must be accumulated by conducting ground-based animal and human studies using models of weightlessness. This information will be useful to construct and identify physiologically based pharmacokinetic models that can provide valuable information on the pharmacodynamic consequences of space flight and aid in identifying appropriate therapeutic regimens. Author (revised)

N93-29509# Biotronics Technologies, Inc., Waukesha, WI.
TRANSCUTANEOUS ANALYTE MEASURING METHODS Quarterly Progress Report No. 6, Jan. - Mar. 1993

KENNETH J. SCHLAGER 2 Apr. 1993 15 p
(Contract N00014-91-C-0190)
(AD-A262861) Avail: CASI HC A03/MF A01

The major objective of this quarter was to complete all patient data collection at Froedtert Lutheran Memorial Hospital (Medical College of Wisconsin), finalize all TAMM algorithms, integrate the new diagnostic software into the NIR-800 Array Analyzer and deliver the instrument to the Naval Health Research Center (NHRC) in San Diego, California. All of the above work activities were completed, and the NIR-800 was shipped to NHRC on March 9, 1993. Prior to shipment, test set runs on all 9 of the analytes were completed with the results shown in Table 1. All of the electrolytes recorded average errors of less than 6% of mean value with all except bicarbonate less than 4%. The reliable operating range of the system for each analyte is also indicated in Table 1. This limited range results from the lack of sufficient extreme values for all analytes except glucose. Even glucose by these standards is marginal because only a few values over 150 mg/dl were obtained during preclinical testing. Extension of this range to include abnormal values for each analyte will require additional data collection in an Intensive Care Unit (ICU) where extreme analyte concentration values are common. Data on 531 patients have been collected of which 514 were acceptable. Best results were obtained using the final 73 patients for whom data collection instrumentation and procedures were optimized. A description of the preliminary field instrument design is included in this report. DTIC

N93-29546*# Guelph Univ. (Ontario). Dept. of Computing and Information Science.
FUZZY NEURAL NETWORK METHODOLOGY APPLIED TO MEDICAL DIAGNOSIS
MARIAN B. GORZALCZANY (Technical Univ. of Kielce, Poland.) and MARY DEUTSCH-MCLEISH *In* NASA. Johnson Space Center, North American Fuzzy Logic Processing Society (NAFIPS 1992), Volume 1 p 266-275 Dec. 1992
Avail: CASI HC A02/MF A03

This paper presents a technique for building expert systems that combines the fuzzy-set approach with artificial neural network structures. This technique can effectively deal with two types of medical knowledge: a nonfuzzy one and a fuzzy one which usually contributes to the process of medical diagnosis. Nonfuzzy numerical data is obtained from medical tests. Fuzzy linguistic rules describing the diagnosis process are provided by a human expert. The proposed method has been successfully applied in veterinary medicine as a support system in the diagnosis of canine liver diseases. Author (revised)

N93-29620# East Carolina Univ., Greenville, NC. School of Medicine.
EVALUATION OF DRIED STORAGE OF PLATELETS FOR TRANSFUSION: PHYSIOLOGIC INTEGRITY AND HEMOSTATIC FUNCTIONALITY Annual Report No. 1, 1 Feb. 1992 - 31 Jan. 1993
ARTHUR P. BODE, MAJORIE S. READ, and ROBERT L. REDDICK 31 Jan. 1993 9 p
(Contract N00014-92-J-1244)
(AD-A263240) Avail: CASI HC A02/MF A01

The intramural collaboration at East Carolina University to study metabolic activity of lyophilized platelets was cancelled after six months due to departure of the investigator. This study will now be carried out by colleagues at the American Red Cross Research Laboratory in Norfolk, VA. Samples of various platelet preparations were sent and analysis is underway. The major objectives achieved at ECU in the first year were initiation of long-term storage studies of the standard lyophilized platelet preparation, set-up of Baumgartner chamber methodology for assessment of platelet adhesiveness, and further development of permanganate-based stabilization protocols before platelet lyophilization. A long-term study of the stability of surface receptors on lyophilized platelets stored under various conditions (desiccated, at room temperature or 4 deg C, or frozen at -70 deg C) was initiated in June 1992, with a single large batch of paraformaldehyde-treated dried human platelets. At one month intervals, sample vials from each storage environment were reconstituted and assayed by flow cytometry with monoclonal antibody probes to the major surface glycoproteins. The only signigicant finding thus far is a decrease in binding of MoAb SZ-1 to the dried platelets stored at room temperature. DTIC

N93-29651*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ISSUES ON HUMAN ACCELERATION TOLERANCE AFTER LONG-DURATION SPACE FLIGHTS
K. VASANTHA KUMAR (Krug Life Sciences, Inc., Houston, TX.) and WILLIAM T. NORFLEET Oct. 1992 55 p
(Contract NAS9-18492)
(NASA-TM-104753; S-686; NAS 1.15:104753) Avail: CASI HC A04/MF A01

This report reviewed the literature on human tolerance to acceleration at 1 G and changes in tolerance after exposure to hypogravic fields. It was found that human tolerance decreased after exposure to hypokinetic and hypogravic fields, but the magnitude of such reduction ranged from 0 to 30 percent for plateau G forces and 30 to 70 percent for time tolerance on sustained G forces. A logistic regression model of the probability of individuals with 25 percent reduction in +Gz tolerance after 1 to 41 days of hypogravic exposures was constructed. The estimated values from the model showed a good correlation with the observed data. A brief review of the need for in-flight centrifuge during long-duration missions was also presented. Review of the available data showed that the use of countermeasures (such as anti-G suits, periodic acceleration, and exercise) reduced the decrement in acceleration tolerance after long-duration space flights. Areas of further research include quantification of the effect of countermeasures on tolerance, and methods to augment tolerance during and after exposures to hypogravic fields. Such data are essential for planning long-duration human missions.
Author (revised)

N93-29820# Colorado Univ., Denver. School of Medicine.
BETA-ADRENERGIC BLOCKADE AND LACTATE METABOLISM DURING EXERCISE AT HIGH ALTITUDE Final Report, 10 Jun. 1991 - 9 Dec. 1992
JOHN T. REEVES 28 Jan. 1993 6 p
(Contract DAMD17-91-C-1112; DA PROJ. 3M1-61102-BS-15)
(AD-A263544) Avail: CASI HC A02/MF A01

The primary thrust of this contract was to perform high altitude research on Pikes Peak Colorado (with the sea level phase to be done in Palo Alto) in the summer of 1991. The work was to test the hypothesis that the adreno-sympathetic system mediated many of the adaptations to high altitude, particularly the metabolic changes. DTIC

N93-30153# Arizona Univ., Tucson.
THE CHRONIC EFFECTS OF JP-8 JET FUEL EXPOSURE ON THE LUNGS Annual Technical Report, 1 Apr. 1992 - 1 Apr. 1993
MARK L. WITTEN 13 Apr. 1993 12 p
(Contract AF-AFOSR-0199-91)
(AD-A264162; AFOSR-93-0302TR) Avail: CASI HC A03/MF A01

The second year of this project concentrated on using a 'high' dose of JP-8 jet fuel in our exposure regimen. We selected a target dose of approximately 1,000 mg/cu m based on a published epidemiological study conducted at NATO Air Force Bases that demonstrated jet fuel concentrations as high as 1,020 mg/cu m during refueling operations. The rats in the 'high' dose studies were exposed to an average of 813.8 Mg/cu m for one hour/day for 7 and 28 days. In our previous work, a 'low' dose concentration of JP-8 jet fuel (500 mg/cu m) for one hour/day for 7 and 28 days did not show any significant changes in lung structures by light microscopy. However, when light microscopy was performed on lung sections from rats exposed to JP-8 jet fuel for 7 and 28 days at the 'high' dose concentration, the evidence for injury to the alveolar-capillary barrier was overwhelming. In these rats, we observed red blood cells in the alveolar air spaces, distortion of

the bronchial airways, and loss of epithelial cells in the alveoli. These findings were substantiated by electron microscopy which showed epithelial cells missing their basement membrane, airways devoid of cilia, and alterations of type 2 alveolar epithelial cells. DTIC

N93-30160# Vanderbilt Univ., Nashville, TN. Dept. of Physics and Astronomy.
THE AFOSR WORKSHOP ON THE FUTURE OF EEG AND MEG Final Report, 1 Apr. 1992 - 30 Sep. 1992
JOHN WIKSWO, JR., ALAN GEVINS, and SAMUEL J. WILLIAMSON 2 Feb. 1993 41 p Workshop held in Virginia Beach, VA, 17-22 May 1992 Prepared in cooperation with EEG Systems Lab, San Francisco, CA
(Contract F49620-92-J-0214)
(AD-A264338; AFOSR-93-0256TR) Avail: CASI HC A03/MF A01

A workshop on the prospects of the electroencephalogram (EEG) and the magnetoencephalogram (MEG) for elucidating human brain function was held at Virginia Beach, Virginia from 17-22 May 1992. The purpose of the workshop was to discuss the EEG and the MEG in relation to other rapidly advancing imaging modalities such as PET, SPECT, and functional MRI (MRI), and in terms of the recognized research, medical, and personnel evaluation needs for advanced brain imaging. Medical areas where these and other advanced technologies will undoubtedly be utilized include the diagnosis and treatment of diseases of the brain such as epilepsy, Alzheimer's, and schizophrenia; the monitoring and facilitation of recovery of function from head trauma and stroke; and the quantitative assessment of the effect on the brain of toxins and other bioenvironmental hazards. Non-medical applications of these techniques include a furthering of our understanding of the factors that are limiting the development and full utilization of human intelligence, particularly in recognition of increasing demands that are being placed on the mental capacities of people who live and work in our modern, post-industrial society. DTIC

N93-30192# Harvard Univ., Cambridge, MA.
INTERMEDIATE LEVELS OF VISUAL PROCESSING Annual Report, 1 Oct. 1991 - 30 Sep. 1992
KEN NAKUYAMA 30 Sep. 1992 4 p
(Contract F49620-92-J-0016)
(AD-A264117; AFOSR-93-0308TR) Avail: CASI HC A01/MF A01

The following topics were discussed: (1) Developed a theory to explain perceived depth in untextured stereograms which relies on the principle of generic image sampling. (2) Conducted experiments on visual search and visual texture segregation which show that early filter outputs are not accessible to either of these two operations. (3) Discovered a new form of implicit memory which is uniquely shortlasting (approx 30 seconds) and which assists in enabling more speedy popout with repeated trials. (4) Developed a new theory of binocular vision which relies heavily on the importance identification of half-occlusions. DTIC

N93-30196# Army Natick Research and Development Command, MA.
THE ENVIRONMENTAL SYMPTOMS QUESTIONNAIRE (ESQ): DEVELOPMENT AND APPLICATION Final Report, Sep. 1990 - Jun. 1992
JAMES B. SAMPSON, JOHN L. KOBRICK, and RICHARD F. JOHNSON Mar. 1993 27 p
(Contract DA PROJ. 1L1-62786-AH-98)
(AD-A264127; NATICK/TR-93/026) Avail: CASI HC A03/MF A01

The Environmental Symptoms Questionnaire (ESQ) was developed to help researchers quantify symptoms experienced by individuals exposed to extreme conditions. The ESQ has evolved into a general symptom questionnaire from earlier designs for capturing the symptoms of acute mountain sickness. Item have been added, removed and revised, and scale changes were made for greater reliability and ease of administration and completion. Factor analysis revealed significant symptom clusters and weights for scoring the ESQ. Discussion is given to these developments and to the application to a number of environmental studies. Recommendations are offered for its administration and scoring using either factor weights or nonfactored clusters. DTIC

N93-30269 Simon Fraser Univ., Burnaby (British Columbia).
MODELLING AND SIMULATION OF HUMAN RETINAL VISION PROCESSING
PHILIP J. SCHELTENS, ANDREW H. RAWICZ, and MAREK J. SYRZYCKI *In* Engineering Inst. of Canada, Canadian Conference on Electrical and Computer Engineering, Volumes 1 and 2 4 p 1990
Avail: Engineering Inst. of Canada, 2050 rue Mansfield, Suite 700, Montreal, Quebec H3A 1Z2 Canada

Examination of biological vision processing systems has been used to develop a model of retinal vision processing. The model features differently sized photoreceptors with programmable light adaptation and lateral interaction mechanisms. Each specific effect can be invoked by a proper choice of model parameters responsible for static and temporal rod response, lateral inhibition, scaling of bipolar summation, and filter kernel size. This model has been simulated in various illumination conditions, producing outputs that resemble psychophysical results with human vision such as Mach bands. The model and its algorithms were found useful for performing such image processing tasks as image deblurring, edge enhancement, and edge extraction. Author (CISTI)

N93-30382# Virginia Univ., Charlottesville. Dept. of Biology.
CONTROL AND CIRCADIAN BEHAVIOR BY TRANSPLANTED SUPRACHIASMATIC NUCLEI Final Report, 15 Nov. 1989 - 14 Nov. 1992
MICHAEL MENAKER 14 Nov. 1992 10 p
(Contract AF-AFOSR-0098-90)
(AD-A264553; AFOSR-93-0337TR) Avail: CASI HC A02/MF A01

Fetal SCN tissue transplanted into the third ventricle of hamsters bearing complete SCN lesions restores the circadian locomotor rhythm with a period that depends exclusively on the genetically determined period of the tissue donor. If the host is only partially lesioned and thus retains rhythmicity with its own genetically determined period, an implant from an animal of a different genotype can induce a second rhythm with a period determined by the donor genotype. Both rhythms can be present simultaneously in the record of such a temporal chimera, interacting only superficially (i.e., not at the level of the pacemaker). Our data support the interpretation that under such circumstances the graft is able to capture part of the locomotor output of the circadian system but does not make functional connections with the host SCN pacemaking system. DTIC

N93-30400# Krug Life Sciences, Inc., San Antonio, TX.
ACQUISITION OF PHYSIOLOGICAL DATA DURING G-INDUCED LOSS OF CONSCIOUSNESS (G-LOC) Final Report, Apr. 1991 - 1992
PAUL M. WERCHAN, SHARON K. GARCIA, JEMETT L. DESMOND, SAMUAL GALINDO, JR., and JUDY A. BARBER Apr. 1993 9 p
(Contract F33615-89-C-0603)
(AD-A264492; AL-TP-1992-0053) Avail: CASI HC A02/MF A01

The objective of this study was to develop a data acquisition system for the small animal centrifuge (SAC) and the transcranial Doppler (TCD) and to perform required research into the hemodynamic/biochemical alterations during G-induced loss of consciousness (G-LOC). This effort was to include the daily operation and maintenance of the SAC and Waters High Performance Liquid Chromatography units. The original data were turned over to the Flight Motion Effects Branch. The results of this effort were published as the article and abstracts included in this technical paper. DTIC

N93-30421# Scripps Clinic and Research Foundation, La Jolla, CA.
MOLECULAR APPROACH TO HYPOTHALAMIC RHYTHMS Annual Report, 15 Mar. 1992 - 14 Mar. 1993

J. G. SUTCLIFFE 14 Mar. 1993 25 p
(Contract F49620-92-J-0188)
(AD-A264438; AFOSR-93-0280TR) Avail: CASI HC A03/MF A01

We have utilized polymerase chain reaction with primers corresponding to conserved amino acid sequences within membrane-spanning regions of known serotonin receptors to identify clones of 4 putative new indoleamine receptors. We have determined complete amino acid sequences of these 4 receptors which fall into 3 subfamilies; two of these subfamilies are novel. The sites of expression within the brain have been determined for each of the genes. Expression in mammalian cells demonstrates that each new protein is a receptor for serotonin and each has a distinct pharmacology when compared to known receptors. Two of the new receptors are coupled to CAMP, one negatively (G) and one positively (Gs). The latter is a candidate for the serotonin receptor that mediates phase advances in circadian rhythms of the SCN. DTIC

N93-30422# Drexel Univ., Philadelphia, PA. Environmental Studies Inst.
DEVELOPMENT OF NOVEL MODELS FOR DESCRIBING MULTIPLE TOXICITY EFFECTS Annual Report, 20 Sep. 1991 - 19 Sep. 1993
CHARLES N. HAAS 19 Sep. 1992 3 p
(Contract AF-AFOSR-0428-91)
(AD-A264439; AFOSR-93-0242TR) Avail: CASI HC A01/MF A01

The project was initiated October 1, 1991. Major accomplishments during the first year of the project were: (1) refinement of data analysis software; (2) conduct of a literature review of binary and multicomponent toxic response data; (3) analysis of a sample of data sets using the developed software; and (4) refinement of the theory of copulas with respect to multicomponent dose-response relationships. Papers relating to the work have been submitted and/or presented in the following locations: International Association on Water Pollution Research and Control, Water Science and Technology, Eastern North American Regional Meeting of the Biometric Society, Environmental Toxicology and Chemistry. DTIC

N93-30494# Texas Univ., San Antonio. Nonlinear Signal Processing Lab.
ANALYSIS OF VISUAL LOSS FROM RETINAL LESIONS Final Report, 1 Sep. 1989 - 31 Oct. 1992
HAROLD LONGBOTHAM 31 Oct. 1992 5 p
(Contract AF-AFOSR-0490-89)
(AD-A264692; AFOSR-93-0270TR) Avail: CASI HC A01/MF A01

Progress was made during the course of the grant on the application of Order Statistics and Neural Network modeling to analysis of the onset of retinal lesions. Several medical applications of WMMR filters were initiated, leading to a number of publications and conference presentations by the PI and his co-workers. DTIC

N93-30515# Naval Command, Control and Ocean Surveillance Center, San Diego, CA.
A SIMPLE COMPUTATIONAL MODEL OF CENTER-SURROUND RECEPTIVE FIELDS IN THE RETINA
M. R. BLACKBURN Feb. 1993 17 p
(AD-A264723; NRAD-TD-2454) Avail: CASI HC A03/MF A01

This report discloses a simple computational model of the outer retinal layers. The algorithm incorporates both rectified on-center/off-surround and off-center/on-surround bipolar elements, and an increase in the convergence of receptors to output elements that accounts for resolution differences between central and peripheral vision. The phenomenon of even and odd symmetry observed in biological receptive fields can be reproduced by the response of the model system to a moving line. DTIC

N93-30588# Army Research Inst. of Environmental Medicine, Natick, MA.
MEDICAL ASPECTS OF COLD WEATHER OPERATIONS: A HANDBOOK FOR MEDICAL OFFICERS
ROBERT E. BURR Apr. 1993 66 p
(AD-A263559; TN-93-4) Avail: CASI HC A04/MF A01

Soldiers engaged in military operations in cold weather are at risk of cold weather injuries and illnesses. The physiology of cold exposure, the prevention of cold injuries, and the medical management of cold injuries are reviewed and briefing points for medical personnel to use in training are provided. Author (revised)

N93-30613# New York Medical Coll., NY. Dept. of Physiology.
BIOPHYSICAL AND BIOCHEMICAL MECHANISMS IN SYNAPTIC TRANSMITTER RELEASE Annual Technical Report, 1 Jun. 1992 - 31 May 1993
RODOLFO R. LLINAS 2 Apr. 1992 4 p
(Contract F49620-92-J-0363)
(AD-A264829; AFOSR-93-0281TR) Avail: CASI HC A01/MF A01

Three areas of research were implemented experimentally in the summer of 1992. The areas are as follows: (1) further description of calcium microdomains and their role in synaptic transmission; (2) a morphological analysis of rat synaptic vesicles injected into presynaptic terminal of the squid; and (3) the effect of Brefilden A (BFA) on the distribution and size of synaptic vesicles. DTIC

N93-30659# Michigan Univ., Ann Arbor. Transportation Research Inst.
DISCOMFORT GLARE FROM HIGH-INTENSITY DISCHARGE HEADLAMPS: EFFECTS OF CONTEXT AND EXPERIENCE
M. J. FLANNAGAN, M. SIVAK, D. S. BATTLE, T. SATO, and E. C. TRAUBE Mar. 1993 31 p Sponsored by Industry Affiliation Program for Human Factors in Transportation Safety, Ann Arbor, MI
(PB93-174720; UMTRI-93-10) Avail: CASI HC A03/MF A01

The study was designed to investigate a difference in the discomfort glare produced by tungsten-halogen (TH) and high-intensity discharge (HID) headlamps. In a static field setup, 36 subjects, 24 in a younger group and 12 in an older group, made de Boer ratings of discomfort glare for TH and HID lamps. The lighting conditions were similar to those seen while driving on a dark, two-lane road when glare from an oncoming car is encountered. The results replicated the difference between TH and HID lamps that the authors observed in the earlier study, and indicated that the difference is not reduced by several manipulations of context and experience that the authors introduced in the present study. Analysis of subjects' discomfort ratings indicated that when TH and HID lamps produce equal discomfort glare, the tungsten-halogen lamps produce more photooptic lux at the eye of the observer. The magnitude of the difference was not affected by the type of headlamp (TH or HID) used on the car in which observers sat while viewing the glare stimuli, nor by whether the TH and HID lamps were presented in the context of headlamps that had been filtered to produce strongly saturated colors. NTIS

N93-30882# Naval Medical Research Inst., Bethesda, MD.
HYDROGEN-RATED SYSTEM FOR IN VITRO STUDIES AT PRESSURE: OPERATING PROCEDURES AND EMERGENCY PROCEDURES Technical Report, Jan. 1989 - Jun. 1992
HOMER J. MOORE, JOEL S. COLTON, WALT LONG, KAREN MILLER, and GUY IMBERT Mar. 1993 60 p
(Contract NR PROJ. MR0-4101)
(AD-A264179; NMRI-93-14) Avail: CASI HC A04/MF A01

A special apparatus was constructed to study the neurophysiologic effect of high pressure and the pharmacology of various gaseous agents using the isolated nerve terminal (synaptosome) tissue preparation. Design features were incorporated to permit investigations using H2, among other gases. Detailed operating procedures and emergency procedures for the use of H2 were established. These procedures are memorialized by this report. The theory of operation of the device and a pertinent overview of safety considerations are covered. DTIC

N93-30890# Saint Louis Univ., MO. School of Medicine.
CARBON MONOXIDE EXPOSURE OF SUBJECTS WITH DOCUMENTED CARDIAC ARRHYTHMIAS Research Report, Aug. 1987 - Jul. 1991
B. R. CHAITMAN, T. E. DAHMS, S. BYERS, L. W. CARROLL, and L. T. YOUNIS Sep. 1992 48 p Sponsored by Health Effects Inst.
(PB93-179943; HEI/RR-92/52) Copyright Avail: CASI HC A03/MF A01

The authors studied 30 subjects with well-documented coronary artery disease who had an average of at least 30 ventricular ectopic beats per hour over a 20-hour monitoring interval. Subjects were selected and enrolled in a randomized double-blind study; the carbon monoxide exposure was designed to result in 3% or 5% carboxyhemoglobin levels, as measured by gas chromatography. Total and repetitive ventricular arrhythmias were measured for four specific time intervals: (1) two hours before carbon monoxide exposure; (2) during the two-hour carbon monoxide exposure; (3) six hours after carbon monoxide exposure; and (4) approximately 10 hours after exposure, or the remaining recording interval on the Holter monitor. There was no increase in ventricular arrhythmia frequency after carbon monoxide exposure, regardless of the level of carboxyhemoglobin or the type of activity. During steady-state conditions at rest, the number of ventricular ectopic beats per hour was 115 +/- 153 (SD) for room air exposure (0.7% carboxyhemoglobin), 121 +/- 171 for the lower carbon monoxide exposure (3.2% carboxyhemoglobin), and 94 +/- 129 for the higher carbon monoxide exposure (5.1% carboxyhemoglobin). The frequency of complex ventricular ectopy was not altered at the levels of carbon monoxide studied. Secondary analysis of the impact of carbon monoxide on ventricular ectopic beat frequency stratified by baseline ejection fraction, baseline ventricular ectopic beat frequency, and exercise-induced ST-segment changes did not indicate an effect of carbon monoxide on ventricular arrhythmias. However, patients with symptomatic ventricular arrhythmias and symptomatic myocardial ischemia were excluded from the present study. NTIS

N93-30894# Army Research Inst. of Environmental Medicine, Natick, MA.
FIELD TRIAL OF CAFFEINE ON PHYSICAL PERFORMANCE AT ALTITUDE: AN ATTEMPT TO OVERCOME THE CHALLENGE
NANCY KING, CHARLES S. FULCO, CAROL J. BAKER-FULCO, STEPHEN MUZA, and TIMOTHY LYONS May 1993 52 p
(AD-A264260) Avail: CASI HC A04/MF A01

This study was designed to determine if caffeine would enhance the physical performance of soldiers at altitude (Pikes Peak, Colo.). Eight male soldiers from the Special Forces (ages 22 to 35 years old) completed two ascents of a 22 km, mountain trail (hiking from 1800 m to 4300 m above sea level) after having resided for 8 and 17 days at the summit (4300 m). Soldiers were asked to refrain from caffeinated foods and beverages for two days prior to each ascent. The composition and timing of the pre-ascent breakfasts were controlled. Ninety minutes after breakfast (one hour prior to ascent) each soldier received either caffeine (4 mg/kg body weight) or placebo in a double-blind, cross-over design. Urine samples were collected prior to each ascent for 1-methylxanthine determination. Perceived exertion, oxygen saturation, symptomatology, and 'split times' were measured at selected points along the trail. None of the variables measured differed between placebo and caffeine ascents. The inability to demonstrate an improvement due to caffeine may have been due to unavoidable, confounding factors such as inclement weather on the second ascent, altitude acclimatization between ascents, and/or lack of compliance to a caffeine-free diet, as well as the small sample size. DTIC

N93-30897# Naval Command, Control and Ocean Surveillance Center, San Diego, CA. Research, Development, Test and Evaluation.
AN ALGORITHM FOR SIMPLE AND COMPLEX FEATURE DETECTION: FROM RETINA TO PRIMARY VISUAL CORTEX Final Report
M. R. BLACKBURN Feb. 1993 30 p
(AD-A264306; NRAD-TD-2456) Avail: CASI HC A03/MF A01

This report describes a hierarchy of functions for the processing of visual motion and pattern information culminating in descriptive sets of features. Processing elements that model simple feature detectors respond maximally only when a stimulus grating pattern with a specific orientation and spatial period is located in phase with the center and surround of the element's receptive field. Processing elements that model complex feature detectors respond maximally only when a stimulus grating pattern with a specific orientation and spatial period is moved in a specific direction through the element's receptive field. DTIC

N93-30904# Gordon Research Conferences, Inc., Kingston, RI.
THE GORDON RESEARCH CONFERENCE ON PINEAL CELL BIOLOGY Final Progress Report, 15 Jul. 1991 - 14 Jul. 1992
MARTIN ZATZ 14 Jul. 1992 12 p Conference held in Andover, NH, 12-16 Aug. 1991
(Contract AF-AFOSR-0279-91)
(AD-A264840; AFOSR-93-0217TR) Avail: CASI HC A03/MF A01

The objective of the 1991 Gordon Research Conference on Pineal Cell Biology was to bring together scientists so they could exchange recent research results and the conference provided a mechanism for the development of close interactions between these scientists. The quality of all of the lectures was exceptionally high and considerable discussion followed each lecture. Many of the conferees expressed very favorable comments about the intellectual stimulation provided by this conference. DTIC

N93-30908# Virginia Univ., Charlottesville. Dept. of Biology.
PHOTORECEPTORS REGULATING CIRCADIAN BEHAVIOR: A MOUSE MODEL Annual Report, 15 Mar. 1992 - 14 Mar. 1993
RUSSELL G. FOSTER 14 Mar. 1993 19 p
(Contract F49620-92-J-0205)
(AD-A264881; AFOSR-93-0352TR) Avail: CASI HC A03/MF A01

Recent studies examined circadian photoreception in mice with hereditary retinal disorders (rd/rd and rds/rds). Despite the loss of visual function in these mice, circadian responses to light remain unaffected. Using c-fos expression within the SCN as a marker of neural activation of the circadian entrainment pathway, identical levels of Fos in the SCN of rd/rd and +/+ mice in response to retinal illumination are found. On the basis of action spectrum studies, and measurements of photopigment retinoids using HPLC, it is believed the photopigment mediating circadian responses to light is based upon an opsin, and that 11-cis-retinaldehyde is the photopigment chromophore. Preliminary measurements of mouse rod opsin, blue cone, and green/red cone opsin mRNA in retinally degenerate mice suggest that none of these opsins are exclusively used to mediate circadian responses to light. Collectively our data suggest that circadian photoreception can be maintained by a very small number of rod or cone cells without outer segments, or alternatively, is performed by an unrecognized class of photoreceptive cell within the mammalian retina. DTIC

N93-31061# Texas A&M Univ., College Station. Dept. of Biology.
MELATONIN, THE PINEAL GLAND, AND CIRCADIAN RHYTHMS Annual Report, 1 Mar. 1992 - 30 Apr. 1993
VINCENT M. CASSONE 30 Apr. 1992 22 p
(Contract AF-AFOSR-0244-90)
(AD-A264099; AFOSR-93-0306TR) Avail: CASI HC A03/MF A01

Amniote circadian organization derives from the interaction circadian oscillator and photoreceptors located in the hypothalamic suprachiasmatic nuclei (SCN), the pineal gland, and the eyes. In mammals, circadian organization is dominated by the SCN which serve as 'master pacemakers' in the control of a wide array of

behavioral and physiological rhythms including locomotion, sleep/wake, thermoregulation, cardiovascular function, and many endocrine processes. Among the rhythms under SCN control in mammals is the circadian synthesis and secretion of the pineal hormone melatonin which relies on a multi-synaptic pathway via the sympathetic nervous system to maintain and entrain rhythmicity in this hormone. Several studies have indicated that pineal melatonin feeds back on SCN rhythmicity to modulate circadian patterns of activity and other processes. However, the nature and system-level significance of this feed-back is unknown. Recently published work indicates that while pinealectomy does not affect rat circadian rhythms in LD or DD, wheel-running activity rhythms are severely disrupted in LL. These data suggest that either pineal feedback regulates the light sensitivity of the SCN and/or it affects coupling among circadian oscillators within the SCN or between the SCN and its output. Research in our laboratory is currently addressing each of these hypotheses. DTIC

N93-31094# Texas Univ. Health Science Center, San Antonio.
INVESTIGATION OF LASER-INDUCED RETINAL DAMAGE
Annual Report, 1 Apr. 1992 - 31 Mar. 1993
RANDOLPH D. GLICKMAN and KWOK-WAI LAM 20 Apr. 1993 11 p
(Contract AF-AFOSR-0208-91)
(AD-A264096; UTHSCSA-OPH-93-01; AFOSR-93-0304TR) Avail: CASI HC A03/MF A01

Laser-induced damage in ocular tissue was studied with biochemical measures designed to characterize cellular damage mechanisms. Photochemical damage was identified by evidence of oxidative reactions resulting from photosensitizers and free radicals activated by the light exposure. Melanin, in the retinal pigment epithelial (RPE) cells, formed a free radical during illumination that rapidly oxidized ascorbic acid (AA). This specific reaction may safely direct excess photons into a chain of coupled redox reactions. RPE cells have a high capacity for utilizing AA; the cells have different transporters for AA and its oxidized form, dehydro-L-ascorbic acid (DHA), and are able to reduce DHA to AA. The kinetics of these transporters were measured in these studies. Light-activated melanin was also shown to react with linoleic acid, a model lipid. Thus, in the absence of sufficient AA, the melanin radical may initiate lipid peroxidation, a known concomitant of photochemical damage. Development of assays indicative of thermal damage was also started. Initial results suggested that extracellular potassium ion concentration increased following laser-induced thermal stress in RPE cells. This change was hypothesized to result from damage to sodium-potassium ionic pumps in the cell's plasma membrane. DTIC

N93-31138# EXOS, Inc., Burlington, MA.
PREVENTION OF CUMULATIVE TRAUMA DISORDERS
W. G. RICHARDSON and B. A. MARCUS Nov. 1992 98 p
(Contract NIOSH-R43-OH02097)
(PB93-188332) Avail: CASI HC A05/MF A02

The use of the GripMaster (GM) to measure the forces involved in hand functions performed on the job was investigated. The GM was designed to measure flexion/extension and radial/ulnar deviation of the wrist plus up to five finger and hand forces. In laboratory experiments the GM's force measurements were compared to a hand dynamometer and electromyograph measurement techniques; measurements of static wrist postures with the GM were compared to video analysis techniques. Force sensor reliability was tested. The GM was field tested at a lock manufacturing facility. While the GM tested in the study demonstrated a high degree of correlation with the more established techniques under certain circumstances, the calibration techniques and the ranges of force and motion measured were shown to be inadequate. The authors conclude that by extending the sensor range, improving the calibration techniques, and making the force sensing technology more robust, the GM can be a valuable tool in assessing and quantifying cumulative trauma disorder risks. NTIS

N93-31140# Centers for Disease Control, Atlanta, GA.
FUNDAMENTAL DIAGNOSTIC HEMATOLOGY: ANEMIA (SECOND EDITION)
B. L. EVATT, W. N. GIBBS (World Health Organization, Geneva, Switzerland.), S. M. LEWIS (Hammersmith Hospital, London, England.), and J. R. MCARTHUR (Washington Univ., Seattle.) 1992 147 p See also PB85-123313
(PB93-188662) Avail: CASI HC A07/MF A02

The guiding principle in the book has been to provide a practical approach with maximal use of simple tests for diagnosing anemia. For this reason the usefulness of blood film morphology has been emphasized. Indeed, in many cases, measurement of hemoglobin and examination of a blood film can (with some training) provide all the information necessary for identifying the prevalent kinds of anemia of public health importance in an area. Bone marrow examination has been included because it can be done relatively easily by a physician, and can provide information about the iron status as well as morphological data needed for diagnosis. Detailed discussion of the physiology and biochemistry of the red cell is beyond the scope of the book. However, brief comments are included because an understanding of normal red cell physiology is helpful for correlating the morphological changes of the red cells and results of other basic tests with the causes of anemia. NTIS

N93-31158# Centers for Disease Control, Atlanta, GA.
FUNDAMENTAL DIAGNOSTIC HEMATOLOGY: THE BLEEDING AND CLOTTING DISORDERS (SECOND EDITION)
B. L. EVATT, W. N. GIBBS (World Health Organization, Geneva, Switzerland.), S. M. LEWIS (Hammersmith Hospital, London, England.), and J. R. MCARTHUR (Washington Univ., Seattle.) 1992 122 p
(PB93-188670) Avail: CASI HC A06/MF A02

The first edition of the manual was published in 1985. In preparing the second edition, the rapid expansion of the field of hemostasis and the attendant advances in knowledge of the pathophysiology of bleeding and thrombosis has been taken into account. New and updated methods have been included where necessary, while retaining the essential requirement that the manual be designed for use in intermediate laboratories whose facilities are restricted to basic tests. The manual is also intended to help both laboratory staff and physicians deal with patients with bleeding and thrombotic disorders. Sections dealing with diagnosis and management of thromboembolic disease have been included and the title has been changed to reflect this. The importance of quality assurance to ensure reliable results has been emphasized. The chapter on this topic has been extensively revised, and procedures are described for internal quality control. These procedures are easily practiced in any laboratory. Increased awareness of the danger of blood-borne infectious diseases and other hazards has led to the inclusion of a chapter on laboratory safety. NTIS

N93-31225# Australian Inst. of Nuclear Science and Engineering, Lucas Heights.
THE THIRTEENTH AINSE RADIATION BIOLOGY CONFERENCE: CONFERENCE HANDBOOK
1991 74 p Presented at the AINSE Rediation Biology Conference, Lucas Heights, Australia, 2-4 Oct. 1991
(DE93-609131; INIS-MF-13374; CONF-9110426) Avail: CASI HC A04/MF A01 (US Sales Only)

The 13th Australian Institute of Nuclear Science and Engineering (AINSE) Radiation Biology conference was held 2-4 Oct. 1991. The forty one papers presented at this conference covered the areas of radiation induced lesions, apoptosis, genetics and radiobiological consequences of low level radiation exposure, clinical applications of radiation, mammalian cells radiosensitivity, and radiation-activated proteins. DOE

53

BEHAVIORAL SCIENCES

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

A93-42658
THE PSYCHOLOGICAL CHALLENGE OF SPACE [LE DEFI PSYCHOLOGIQUE DE L'ESPACE]
JACQUES COLLET (ESA, Paris, France) Nouvelle Revue d'Aeronautique et d'Astronautique no. 1 April 1993 p. 43-48. In FRENCH refs
Copyright

The European long-duration space missions planned for the end of this century will involve psychological problems for the flight crews. The investigation of such psychological problems is discussed in the present work. The first entirely space-oriented long-duration manned simulation campaign undertaken in Europe took place during 1990, involving a crew of six isolated for four weeks in a hyperbaric chamber complex. The psychological tests to which the crew were subjected were rather extensive, ranging from examinations of the subjective status and performance of individuals (evaluated on the basis of computer-based tests and questionnaires) to studies of the crew's social interaction and group dynamics (assessed by examining video tapes of discussions, meals, etc.). AIAA

A93-43024
INVESTIGATION OF INDIVIDUAL AND TYPOLOGICAL FEATURES OF AN OPERATOR'S NERVOUS SYSTEM UNDER DIFFERENT WORK REGIMES [ISSLEDOVANIE INDIVIDUAL'NO-TIPOLOGICHESKIKH KACHESTV NERVNOI SISTEMY OPERATORA V RAZNYKH REZHIMAKH RABOTY]
L. M. KOZAK, V. V. KAL'NISH, and E. EH. DIESPEROVA (ANU, Inst. Kibernetiki, Kiev, Ukraine) Kibernetika i Vychislitel'naya Tekhnika (ISSN 0454-9910) no. 94 1992 p. 79-83. In RUSSIAN refs
Copyright

The paper describes changes in the psychophysiological status of operators working at a computer display in various work regimes. The procedure used allowed evaluations of the mental work capacity, the rate of adaptation to the regular working tempo, the average reaction times to various types of signals, and the number of errors made in reactions to three types of signals. Results of an analysis of changes in these parameters during the regular work regime, where work included alternating periods of regular visual activity and work at the computer display, or tiring work at the display interrrupted regularly by 10 to 15 min-long rest periods, showed that 80 percent of the subjects did not display signs of fatigue accumulation, while 12 percent showed a small decline in work capacity at the end of a week, which was restored during weekends. Only in cases where work was uniformly monotonous and/or highly stressful, the dynamics of the capacity for the information processing showed abnormal trends. AIAA

A93-43330
MANNED SPACE-LABORATORIES CONTROL CENTRE (MSCC) TRAINING
L. BIERLING (DLR, Oberpfaffenhofen, Germany; Cray Systems, Woking, United Kingdom) and J. PELL (DLR, Oberpfaffenhofen, Germany) British Interplanetary Society, Journal (ISSN 0007-094X) vol. 46, no. 6 June 1993 p. 222-229.
Copyright

The MSCC will be one of the major European centers involved in the forthcoming Columbus manned space mission operations. The Deutsche Forschungsanstalt fuer Luft- und Raumfahrt (DLR) engineers with their manned space missions experience are cooperating in a technical study to develop the MSCC training concept and to define the required supporting tools. The approach taken in this study and the corresponding outputs are the subject of this paper. Author (revised)

A93-44922* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
THE ROLE OF SPATIAL ATTENTION IN VISUAL WORD PROCESSING
ROBERT S. MCCANN (Sterling Software, Inc., Palo Alto, CA), CHARLES L. FOLK (Villanova Univ., PA), and JAMES C. JOHNSTON (NASA, Ames Research Center, Moffett Field, CA) Journal of Experimental Psychology: Human Perception and Performance (ISSN 0096-1523) vol. 18, no. 4 1992 p. 1015-1029. refs
(Contract NCA2-225)
Copyright

Subjects made lexical decisions on a target letter string presented above or below fixation. In Experiments 1 and 2, target location was cued 100 ms in advance of target onset. Responses were faster on validly than on invalidly cued trials. In Experiment 3, the target was sometimes accompanied by irrelevant stimuli on the other side of fixation; in such cases, responses were slowed (a spatial filtering effect). Both cuing and filtering effects on response time were additive with effects of word frequency and lexical status (words vs. nonwords). These findings are difficult to reconcile with claims that spatial attention is less involved in processing familiar words than in unfamiliar words and nonwords. The results can be reconciled with a late-selection locus of spatial attention only with difficulty, but are easily explained by early-selection models. Author

A93-44923* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
BEHAVIORAL ASYMMETRIES OF PSYCHOMOTOR PERFORMANCE IN RHESUS MONKEYS (MACACA MULATTA) - A DISSOCIATION BETWEEN HAND PREFERENCE AND SKILL
WILLIAM D. HOPKINS, DAVID A. WASHBURN (Georgia State Univ., Atlanta), LESLIE BERKE, and MARY WILLIAMS (Bionetics Corp.; NASA, Ames Research Center, Moffett Field, CA) Journal of Comparative Psychology (ISSN 0735-7036) vol. 106, no. 4 1992 p. 392-397. refs
(Contract NAG2-438; NIH-HD-06016)
Copyright

Hand preferences were recorded for 35 rhesus monkeys (Macaca mulatta) as they manipulated a joystick in response to 2 computerized tasks. These preferences were then used to contrast 8 left- and 10 right-handed subjects on performance measures of hand skill. Individual hand preferences were found, but no significant population asymmetry was observed across the sample. However, the performance data reveal substantial benefits of right-handedness for joystick manipulation, as this group of monkeys mastered the 2 psychomotor tasks significantly faster than did their left-handed counterparts. The data support earlier reports of a right-hand advantage for joystick manipulation and also support the importance of distinguishing between hand preference and manual performance in research on functional asymmetries. Author

A93-44940* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
PERCEPTUAL BIAS FOR FORWARD-FACING MOTION
MICHAEL K. MCBEATH (NASA, Ames Research Center, Moffett Field, CA), KAZUNORI MORIKAWA (Stanford Univ., CA), and MARY K. KAISER (NASA, Ames Research Center, Moffett Field, CA) Psychological Science vol. 3, no. 6 Nov. 1992 p. 362-367. refs
(Contract NSF BNS-85-11685)
Copyright

When an occluded horizontal row of shapes is shifted laterally, apparent motion can be experienced in either the leftward or the rightward direction. Four experiments provide evidence for a motion bias in the direction that shapes appear to face. The bias tended to be largest when directionality was specified geometrically (e.g.,

triangles), next largest when it was specified biologically (e.g., mice), and absent when it was specified calligraphically (e.g., letter R). The bias increased parametrically as a function of triangle pointedness and was consistent with the directional interpretation of an ambiguous duck-rabbit. The results support the existence of a cognitively specified forward-facing attribute that can influence experienced direction of motion. Author

A93-45323
A COMPUTER SIMULATION MODEL FOR ATTENTION DISTRIBUTION AND EVENT GENERATION
NARISUKE UTSUKI Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858) vol. 33, no. 3 Sept. 1992 p. 75-85. In JAPANESE refs

A prototype of pilot's cognitive information processing model was developed. The model consists of five submodels: event generation, attention distribution, identification and recognition of events, short term memory store-restore, and flight environment. Computer simulations were conducted. The current model can be used to find better ways of distributing attention among visual channels when statistical information about event occurrence is available. The next step of the research will be to devise effective methods to evaluate readabilities of visual events which have a variety of luminance under ever-changing optical environment. Author (revised)

N93-29481# Aerospace Medical Research Labs., Brooks AFB, TX.
PILOT CANDIDATE SELECTION METHOD (PCSM): WHAT MAKES IT WORK? Interim Report, Jan. - Dec. 1992
THOMAS R. CARRETTA and MALCOLM J. RICE Mar. 1993 17 p
(Contract AF PROJ. 7719)
(AD-A262871; AL-TP-1992-0063) Avail: CASI HC A03/MF A01

A sample of 678 Air Force pilot training candidates were tested with a paper-and-pencil aptitude battery and computer-administered tests of psychomotor skills, information processing, and attitude toward risk. A self report of flying experience was also collected. These data were used in regression analyses to determine which variables provided the best prediction of two flying criteria, passing-failing flying training and class ranking at the end of flying training. The paper-and-pencil tests were found to be the best predictors. The measures of flying experience, psychomotor skills, and attitude toward risk incremented the prediction of the criteria. Information processing was not found to be incremental to the other variables in the prediction of the criteria. DTIC

N93-29564*# Dayton Univ., OH. Dept. of Mathematics.
QUANTIFICATION OF HUMAN RESPONSES
R. C. STEINLAGE, T. E. GANTNER, and P. Y. W. LIM (Boise Cascade Corp., Portland, OR.) *In* NASA. Johnson Space Center, North American Fuzzy Logic Processing Society (NAFIPS 1992), Volume 2 p 427-436 Dec. 1992
Avail: CASI HC A02/MF A03

Human perception is a complex phenomenon which is difficult to quantify with instruments. For this reason, large panels of people are often used to elicit and aggregate subjective judgments. Print quality, taste, smell, sound quality of a stereo system, softness, and grading Olympic divers and skaters are some examples of situations where subjective measurements or judgments are paramount. We usually express what is in our mind through language as a medium but languages are limited in available choices of vocabularies, and as a result, our verbalizations are only approximate expressions of what we really have in mind. For lack of better methods to quantify subjective judgments, it is customary to set up a numerical scale such as 1, 2, 3, 4, 5 or 1, 2, 3, ..., 9, 10 for characterizing human responses and subjective judgments with no valid justification except that these scales are easy to understand and convenient to use. But these numerical scales are arbitrary simplifications of the complex human mind; the human mind is not restricted to such simple numerical variations. In fact, human responses and subjective judgments are psychophysical phenomena that are fuzzy entities and therefore difficult to handle by conventional mathematics and probability theory. The fuzzy mathematical approach provides a more realistic insight into understanding and quantifying human responses. This paper presents a method for quantifying human responses and subjective judgments without assuming a pattern of linear or numerical variation for human responses. In particular, quantification and evaluation of linguistic judgments was investigated. Author (revised)

N93-29610* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AN ACCELERATED TRAINING METHOD FOR BACK PROPAGATION NETWORKS Patent
ROBERT O. SHELTON, inventor (to NASA) 13 Jul. 1993 21 p Filed 17 Jun. 1991 Supersedes N91-28730 (29 - 20, p 3381)
(NASA-CASE-MSC-21625-1; US-PATENT-5,228,113; US-PATENT-APPL-SN-716182; US-PATENT-CLASS-395-23; INT-PATENT-CLASS-G06F-15/18) Avail: US Patent and *Trademark Office*

The principal objective is to provide a training procedure for a feed forward, back propagation neural network which greatly accelerates the training process. A set of orthogonal singular vectors are determined from the input matrix such that the standard deviations of the projections of the input vectors along these singular vectors, as a set, are substantially maximized, thus providing an optimal means of presenting the input data. Novelty exists in the method of extracting from the set of input data, a set of features which can serve to represent the input data in a simplified manner, thus greatly reducing the time/expense to training the system. Official Gazette of the U.S. Patent and Trademark Office

N93-30026# Aerospace Medical Research Labs., Brooks AFB, TX.
PREDICTING AIRCREW TRAINING PERFORMANCE WITH PSYCHOMETRIC G Interim Report, Jan. - Jun. 1992
MICHELE M. OLEA and MALCOLM J. REE Apr. 1993 16 p
(Contract AF PROJ. 1121)
(AD-A264021; AL-TP-1993-0011) Avail: CASI HC A03/MF A01

A comparison of the validity of general cognitive ability, g, and specific ability, s, for predicting pilot and navigator training success revealed that g was the best predictor for all ten criteria and that s contributed little beyond g. The criteria included both academic performance, flying maneuvers, and airborne navigation. DTIC

N93-30027# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.
HANDEDNESS AND MOTOR PROGRAMMING EFFECTS OF MANUAL CONTROL AND MOVEMENT Final Report, Sep. 1987 - May 1991
DAVID CURRY Sep. 1992 134 p
(AD-A264022; AL-TR-1992-0127) Avail: CASI HC A07/MF A02

Four studies with a unidimensional, cursor-positioning task, employing both response-priming and response-precuing techniques, were performed to evaluate differences in motor control between the preferred and nonpreferred hands. None of the major hypotheses proposed previously to explain these differences (e.g., ones based on practice, force variability, feedback-processing speed, hemispheric specialization, and sequential movement control) was supported. Instead, hand differences may stem from greater automaticity during the execution of motor programs for moving by the preferred hand. Furthermore, the present studies do not support the distinctive-features model of motor programming proposed by Rosenbaum and other investigators. Such programs appear to be hierarchically organized and serially executed, with information about movement direction required before movement information is used. This conclusion is consistent with results obtained during both the initial programming of aimed movements and their reprogramming when the original information for them turns out to be incorrect. DTIC

N93-30033# New York Univ. Medical Center.
COMPUTING WITH NEURAL MAPS: APPLICATION TO PERCEPTUAL AND COGNITIVE FUNCTION Annual Report, 1 Aug. 1990 - 30 Jul. 1991
ERIC L. SCHWARTZ 26 Mar. 1993 4 p
(Contract AF-AFOSR-0275-88)
(AD-A264056; AFOSR-93-0314TR) Avail: CASI HC A01/MF A01

Models for visual attention, based on the representation of an attentional space as a two dimensional map have led to a model of visual attention which has been successfully used in the application of a space-variant active vision system, described below. Also, it has been demonstrated that stereo fusion limits, such as Panum's fusional area, scale in a manner which is determined by the size of a cortical hypercolumn, and the local value of cortical magnification factor. This in turn supports the notion that stereo disparity is computed by a local correlational operator defined on the span of a single pair of ocular dominance columns. A generalized image warp technique has been developed, which we term the 'protocolumn algorithm', which provides image level models of the mapping of ocular dominance and orientation column systems at the level of primary visual cortex. Finally, many of the ideas developed in this project have reached fruition in the construction of a space-variant active vision system. An initial prototype system has been constructed under hardware support from DARPA, and a number of difficult algorithmic problems in motor control, attention, space-variant image processing, and space-variant pattern classification, have begun to be studied. DTIC

N93-30163# Yale Univ., New Haven, CT.
REPRESENTATIONS OF SHAPE IN OBJECT RECOGNITION AND LONG-TERM VISUAL MEMORY Annual Report, 15 Jan. 1992 - 14 Jan. 1993
MICHAEL J. TARR 11 Feb. 1993 31 p
(Contract F49620-92-J-0169)
(AD-A264342; AFOSR-93-0237TR) Avail: CASI HC A03/MF A01

A variety of studies examining the mechanisms and representations underlying human object recognition have been conducted. One track has investigated the role of view-based object representations in perception and recognition. Results indicate that certain classes of viewpoint-dependent features may be used to define boundaries between characteristic views of objects. A second track has investigated the interaction between orientation-dependent and orientation-independent recognition mechanisms. Results here indicate that humans learn both object-based, orientation-independent and view-based, orientation-dependent representations regardless of the initial learning context. Other results indicate that task conditions mediate whether structural descriptions or episodic representations of objects are used in performing an implicit memory task. Finally, a third track has investigated the nature of spatial relations between objects, as well as the relationship between perceptual and lexical representations of spatial relations. Results indicate that spatial prepositions (e.g., above, left) encode the relationship between figural and reference objects as a gradient that decreases with distance from the qualitative or veridical position. Moreover, results indicate that this may in part be a lexical effect, in that stronger qualitative effects are found when subjects have lexically encoded the relationship--although further results indicate that qualitative gradients are present in purely perceptual judgments. DTIC

N93-30322 Hickling (James F.) Management Consultants Ltd., Ottawa (Ontario).
THE AIR TRAFFIC CONTROLLER'S MENTAL MODEL AND IT'S IMPLICATIONS FOR EQUIPMENT DESIGN AND TRAINEE SELECTION
RICHARD H. MOGFORD *In* Engineering Inst. of Canada, Canadian Conference on Electrical and Computer Engineering, Volumes 1 and 2 4 p 1990
Avail: Engineering Inst. of Canada, 2050 rue Mansfield, Suite 700, Montreal, Quebec H3A 1Z2 Canada

In the context of air traffic control, a controller's mental model is a hypothetical construct which refers to the operator's learning and concepts about a system and what it is supposed to do. It is suggested that the controller's picture of the various elements of the air traffic control system is an aspect of the mental model which is worthwhile investigating in order to assist in system design and the selection of controllers. Previous research on air traffic control mental models is reviewed and applied to air traffic control systems. It is seen that objective tools exist for exploring some facets of the operator's mental model of a complex system. There are promising indications that these tools can help measure some aspects of the controller's mental model or picture. There is also evidence that the quality of a controller's picture is related to operational skill level. Author (CISTI)

N93-30425# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.
FIELD TEST OF A COMPUTER-DRIVEN TOOL TO MEASURE PSYCHOLOGICAL CHARACTERISTICS OF AIRCREW Final Technical Report, 15 Nov. 1991 - 15 Nov. 1992
CHRISTOPHER F. FLYNN, WALTER E. SIPES, MILTON J. GROSENBACH, and JON ELLSWORTH Mar. 1993 36 p
(AD-A264484; AL-TR-1992-0171) Avail: CASI HC A03/MF A01

Twenty-eight (80%) subjects from a squadron of 36 F-16 pilots voluntarily participated in a newly developed anonymous, self-administered, computerized testing protocol. The test battery consisted of two 2.5-hour blocks that measured personality (MMPI-2), cognitive capacity (MAB), crew coordination skills (PCI), and potential psychiatric diagnoses (C-DIS); it also gathered demographic information. A peer rating survey gathered information about the squadron's top performers and their personal qualities. This pilot project demonstrated the success of the battery to gather aircrew information in a field location. Results also indicated that aviators can agree who are top performers and what personal qualities are important in top performers. DTIC

N93-30426# Naval Submarine Medical Research Lab., Groton, CT.
CONSPICUITY OF AIDS TO NAVIGATION. PART 1: TEMPORAL PATTERNS FOR FLASHING LIGHTS
KEVIN LAXAR and SANDRA L. BENOIT 3 May 1993 15 p
(Contract MIPR-Z51100-1-E27A57)
(AD-A264626; NSMRL-1187) Avail: CASI HC A03/MF A01

Mariners frequently have trouble picking out lighted aids to navigation in harbors and other areas that have a high density of background lights. The U.S. Coast Guard is seeking ways to enhance the conspicuity, or likelihood of being noticed, of these aids. Literature has shown that a flashing light is more conspicuous than a light that is not flashing. This investigation sought to improve conspicuity by finding the optimal flash characteristics for a light on a background of steady lights. Twenty observers searched for a flashing point source of light among backgrounds of steady lights of various numerosities on a computer controlled CRT screen. They indicated which of the five screen sectors contained the flashing target, and the computer recorded the accuracy and response time. Targets were flashed at the rates of 1, 2, and 3.85 Hz, each at duty cycles of .3, .5, and .8 (proportion of total time on). After a brief practice period, each observer completed 360 trials in a single one-hour session. An ANOVA showed significant effects of frequency, duty cycle, and background light density. Search time increased as the number of background lights increased. Conspicuity improved as frequency increased and as duty cycle decreased. The flash pattern that provides the greatest conspicuity consumes the least amount of electrical energy, an important consideration for an aid to navigation. The results can be used as guidelines for the flash characteristics of lighted aids to navigation. DTIC

N93-30542# Dayton Univ., OH. Research Inst.
EFFECTS OF AREA-OF-INTEREST DISPLAY CHARACTERISTICS OF VISUAL SEARCH PERFORMANCE AND HEAD MOVEMENTS IN SIMULATED LOW-LEVEL FLIGHT Final Technical Report, Sep. 1989 - Jul. 1992
HAROLD D. WARNER, GARY L. SERFOSS, and DAVID C.

HUBBARD Mar. 1993 37 p
(Contract F33615-90-C-0005)
(AD-A264661; AL-TR-1993-0023) Avail: CASI HC A03/MF A01

An investigation was conducted to evaluate the influence of area-of-interest (AOI) display characteristics on target detection performance and head movements. Two AOI display conditions were compared: a small (26.44 by 21.51 deg horizontal and vertical), higher resolution AOI and a large (40.00 by 30.00 deg horizontal and vertical), lower resolution AOI. The observers viewed a computer-generated visual scene consisting of three-dimensional cylinder-shaped objects placed upright on a desert like terrain surface. Black bands were modeled on some of the cylinders, and the bands constituted the targets. Cylinders height and diameter were varied along with the position of the banded cylinders relative to the flight path of the simulated aircraft. Both pilots and nonpilots were used as observers. Results indicate that target detection distance varied as a function of AOI condition and the height and diameter of the cylinders on which the bands were placed, but not type of observer. Both horizontal and vertical head movements were sensitive to the differences between the AOI conditions, and the vertical movements were also influenced by type of observer. It is recommended that the small, higher resolution AOI be used in situations where greater target detection distance and higher image detail are required. DTIC

N93-30543# Pennsylvania Univ., Philadelphia.
THE DYNAMICS OF VISUAL REPRESENTATION, ATTENTION, ENCODING, AND RETRIEVAL PROCESSES Final Report, 1 Oct. 1990 - 30 Oct. 1992
SAUL STERNBERG 20 Apr. 1993 12 p
(AD-A264674; AFOSR-91-0015; AFOSR-93-0339TR) Avail: CASI HC A03/MF A01

The Final Technical Report on the dynamics of visual representation: attention, encoding, and retrieval processes is presented. After a section describing the objectives of the work, the report provides a synopsis of the principal accomplishments, in five categories: (1) investigation of the relation between location-probe and probed-reciting paradigms, to test whether the transformations that underlie performance changes with probe delay in the two paradigms are the same or different; (2) investigation of the transformation associated with the location-probe paradigm; (3) extensive work with the probed-reciting paradigm at zero probe delay, manipulating the legibility of the displayed characters as another approach to studying the transformation required for response; (4) application of variants of a traditional visual search paradigm to investigate effects of properties of the early representation on the order of search, again by manipulating legibility; (5) development of new tests of stage models of mental operations. DTIC

N93-30575# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.
DETERMINANTS OF PERFORMANCE RATING ACCURACY: A FIELD STUDY Interim Report, Jan. 1990 - Dec. 1992
MARK S. TEACHOUT and TERRY L. DICKINSON Apr. 1993 93 p
(AD-A264726; AL-TP-1993-0010) Avail: CASI HC A05/MF A01

The purpose was to investigate the influence of rater and ratee characteristics, performance constraints, and rating system acceptability on the accuracy of supervisory performance ratings in a field setting. Participants were 212 raters and 405 ratees across three jobs in the United States Air Force. An hypothesized structural model of rating accuracy was tested using LISREL 7 to determine the relationships among nine latent variables. Although the goodness-of-fit statistics for the model were considered marginal, results indicated that motivation to rate accurately, trust in the appraisal process, rating form acceptability, rater cognitive ability, rater experience, and ratee experience were related to rating accuracy. Interpretations and suggestions for future research were discussed. DTIC

N93-30676*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
HELICOPTER SIMULATION: AN AIRCREW TRAINING AND QUALIFICATION PERSPECTIVE
RICHARD A. BIRNBACH and THOMAS M. LONGRIDGE *In its* NASA/FAA Helicopter Simulator Workshop p 35-38 Apr. 1992
Avail: CASI HC A01/MF A02

This paper reviews some of the unique considerations that distinguish the commercial rotary wing domain from its fixed-wing counterpart. These considerations should give the FAA cause to proceed cautiously in drawing upon its fixed-wing experience. One major point to consider is the following: device qualification should be accomplished in a context of an overall training and qualification system. This approach would take as its starting point a detailed analysis of rotary-wing missions and tasks from which proficiency objectives can be systematically developed. Author (revised)

N93-30679*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
TRAINING EFFECTIVENESS ASSESSMENT: WHERE ARE WE?
GREG MCGOWAN *In its* NASA/FAA Helicopter Simulator Workshop p 49-54 Apr. 1992
Avail: CASI HC A02/MF A02

Over 9,000 pilot training courses have been conducted at FSI using the Bell 222 and Sikorsky S-76 simulators. Through the use of FAA exemptions, these simulators can be used for certain training and checking credit. The history of the development and use of commercial helicopter simulators and the opportunities for their increased utilization and use were explored. Author

N93-30680*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
CURRENT TRAINING: WHERE ARE WE?
GERALD GOLDEN *In its* NASA/FAA Helicopter Simulator Workshop p 55-59 Apr. 1992
Avail: CASI HC A01/MF A02

Petroleum Helicopters, Inc. maintains a staff of 750 helicopter pilots. The initial, transition, upgrade, and recurrent training for these pilots requires a significant financial outlay. Since a major portion of that training is done to satisfy the requirements of FAR 61.57, 'Recent Flight Experience, Pilot in Command' and 135.297, 'Pilot in Command: Instrument Proficiency Check Requirements', much could be accomplished using an approved simulator. However, it is imperative that credit be given for training time spent in the simulators and that the device be realistic, practical, and affordable. Author

N93-30684*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
TRAINING EFFECTIVENESS ASSESSMENT: METHODOLOGICAL PROBLEMS AND ISSUES
KENNETH D. CROSS *In its* NASA/FAA Helicopter Simulator Workshop p 77-90 Apr. 1992
Avail: CASI HC A03/MF A02

The U.S. military uses a large number of simulators to train and sustain the flying skills of helicopter pilots. Despite the enormous resources required to purchase, maintain, and use those simulators, little effort has been expended in assessing their training effectiveness. One reason for this is the lack of an evaluation methodology that yields comprehensive and valid data at a practical cost. Some of these methodological problems and issues that arise in assessing simulator training effectiveness, as well as problems with the classical transfer-of-learning paradigm were discussed. Author

N93-31229# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany). Abt. Luft- und Raumfahrtspsychologie.
COMPUTER-GENERATED PARALLEL TESTS FOR APTITUDE MEASUREMENT IN THE SELECTION OF AVIATION OPERATORS [COMPUTER-GENERIERTE PARALLEL-TESTS FUER DIE FAEHIGKEITSMESSUNG IN DER EIGNUNGSAUSWAHL VON OPERATIONELLEM LUFTFAHRTPERSONAL]
KLAUS-MARTIN GOETERS and HERMANN RATHJE Sep. 1992 113 p In GERMAN
(ISSN 0939-2963)
(DLR-FB-92-29; ETN-93-93960) Avail: CASI HC A06/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

Psychological aptitude tests for pilot selection are developed in order to avoid external coaching and test repetition and to enable standardized performance testing. Objectives and development methodologies of the test program are presented. The following tests are described: position test for acquisition of inductive thinking, memorization of symbols and numbers, clearance test for acquisition of auditive sensitibility, concentration tests for attentiveness control, aircraft position tests for acquisition of spatial orientation, and cube rotation test for mental spatial manipulation ability evaluation. Psychometric qualities are discussed for each test.
ESA

N93-31230# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
BACKGROUND AND OBJECTIVES OF THE PARAT PROGRAM [HINTERGRUENDE UND ZIELSETZUNGEN DES PARAT-PROGRAMMS]
KLAUS-MARTIN GOETERS *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators p 9-14 Sep. 1992 In GERMAN
Avail: CASI HC A02/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

The PARAT 2000 program, which is part of selection programs of huge aviation organizations and is designed for psychological aptitude measurement validation in order to avoid external coaching and test repetition and to enable a standardized pilot performance testing, is described. The role of test repeatability, time delay between two tests, and previous study of test questions on the response quality is investigated. Parallel test versions were created and implemented with frequent renewal to reduce memory influence on test results. Processes were developed to allow psychological aptitude tests to be computer generated for selection of aircraft and space pilots. The first development phase was focused on logical thinking, short term and associative memory perception and attentiveness, spatial orientation, and visualization. ESA

N93-31231# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
PHASES OF THE PROJECT DEVELOPMENT AND EXAMINATION METHODOLOGIES [PHASEN DER PROJEKTABWICKLUNG UND UNTERSUCHUNGSMETHODIK]
HERMANN RATHJE *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators p 15-25 Sep. 1992 In GERMAN
Avail: CASI HC A03/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

Steps of test program development and proving and the methodological aspects of examination, such as population sampling and statistical processes, are described. The reference tests which are used for estimation of characteristics validity of new tests are presented. Test item construction and array to parallel forms were carried out by implementation of computer programmed algorithms and test layouts were adapted to DLR standards. Test preforms were examined under time controlled conditions with first pilot groups in the framework of aptitude studies for identifying test comprehensibility and representation time problems and estimating test reliability, after division of the test into two parallel equal parts. Test values were represented by an approximated normal distribution to establish that a satisfying and reliable differentiation of tested persons can be made. The Fisher reliability model was used for investigating test parallelism. ESA

N93-31232# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE POSITION TEST: A COMPUTER GENERATED PROCESS FOR ACQUISITION OF INDUCTIVE LOGIC THINKING [DER POSITIONS-TEST (POS): EIN COMPUTERGENERIERTES VERFAHREN ZUR ERFASSUNG DES INDUKTIV LOGISCHEN DENKENS]
MANFRED BARBARINO *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators p 27-34 Sep. 1992 In GERMAN
Avail: CASI HC A02/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test process for acquisition of inductive logic thinking is developed. The item material is made of free language signs and symbols and can be implemented without language limitation. Parallel version generation is possible through computer supported processes. Several verified test versions showed good adaptation to normal distribution by testing psychometric properties. Regular distributions of item difficulties, selectivity, and item intercorrelations were obtained after test revision. It is established, that knowledge of different item rules is conditioned by logical thinking processes and moderated by other cognitive mechanisms such as cognitive flexibility and learning ability. Validity of position test is demonstrated by comparing a mathematical logic test process with position test. ESA

N93-31233# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE TEST MEMORIZATION OF SYMBOLS AND NUMBERS: A COMPUTER GENERATED TEST FOR VISUAL SENSITIVITY [DER TEST MEMORIZATION OF SYMBOLS AND NUMBERS(MSN): EIN COMPUTERGENERIERTER TEST DER VISUELLEN MERKFAEHIGKEIT]
HERMANN RATHJE *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators p 35-45 Sep. 1992 In GERMAN
Avail: CASI HC A03/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test of memorization is developed independently on language. Parallel version generation is possible through computer supported processes. Psychometric properties and parallel test reliability are satisfying. Factor analysis examinations show test validity as visual sensitivity test. The test is designed to examine pilot capabilities for cockpit information flow acquisition and processing and is based on short term and associative memory exercises: symbols are presented to the pilot with a related number; the pilot must find the number when the symbol occurs. ESA

N93-31234# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE CLEARANCE TEST: A COMPUTER GENERATED PROCESS FOR ACQUISITION OF AUDITIVE SHORT TERM SENSITIVITY [DER CLEARANCE-TEST (CLE): EIN COMPUTERGENERIERTES VERFAHREN ZUR ERFASSUNG DER AUDITIVEN KURZZEITMERKFAEHIGKEIT]
HERMANN RATHJE *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators p 47-59 Sep. 1992 In GERMAN
Avail: CASI HC A03/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test for auditive capacity detection is improved with consideration of objectivity and reliability. Item models are developed under strongly controlled conditions such as sound level, diction velocity, and conservation duration and delay. A good knowledge of the English language is needed to answer the questions, which are made of a short, acoustically presented combination of letters and numericals, without signification, followed by three identical or nearly similar combinations. Identical parts of announcements must be identified. Some combinations are

superposed with a white noise to estimate pilot sensitivity to perturbations. Value distribution was proved by means of the Kolmogoroff-Smirnoff test. Difficulty, selectivity, and reliability estimations were achieved. ESA

N93-31235# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE CONCENTRATION LOADING TEST SYSTEM: A COMPUTER GENERATED PROCESS FOR ACQUISITION OF ATTENTIVENESS CONTROL [DAS KONZENTRATIONS-BELASTUNGS-PRUEFSYSTEM (KPB): EIN COMPUTERGENERIERTES VERFAHREN ZUR ERFASSUNG DER AUFMERKSAMKEITSSTEUERUNG]
KLAUS-MARTIN GOETERS *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators p 61-69 Sep. 1992 In GERMAN
Avail: CASI HC A02/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test for attentiveness and concentration abilities evaluation is presented. The test demands aptitudes in perception, recognition and calculation. Numerous parallel tests can be simultaneously performed and an economic automatic evaluation can be realized by means of reacting displays. The test is based on visual searching and processing of combinations of numerals and symbols which can be generated by a computer program. Test values were proved with the Kolmogoroff-Smirnoff test and were described by a normal distribution. Statistical correlations were achieved to ascertain test reliability. ESA

N93-31236# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE AIRCRAFT POSITION TESTS: A COMPUTER GENERATED PROCESS FOR ACQUISITION OF SPATIAL ORIENTATION CAPABILITY [DER FLUGZEUG-POSITIONS-TEST (FPT): EIN COMPUTER GENERIERTES VERFAHREN ZUR ERFASSUNG DES RAEUMLICHEN ORIENTIERUNGSVERMOEGENS]
IRENE SUS *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators p 71-80 Sep. 1992 In GERMAN
Avail: CASI HC A02/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test for spatial orientation ability evaluation is presented. The test consists of rapidly choosing direction variations with an aircraft from an estimated leaving position. A Turbo PASCAL computer program allows numerous items to be produced and parallel test versions to be obtained. Aircraft position test is shown to be a very economic and objective test process. Test values were proved with the Kolmogoroff-Smirnoff test and are shown to be correctly described by a normal distribution. Parallel test correlations were achieved for reliability estimations. Validity examinations were carried out by introducing the Pearson correlation coefficient and revealed the pilot concentration influence on results. ESA

N93-31237# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE CUBE ROTATION TEST: A COMPUTER GENERATED PROCESS FOR ACQUISITION OF MENTAL SPATIAL MANIPULATOR CAPABILITY [DER WUERFEL-ROTATIONS-TEST (ROT): EIN COMPUTERGENERIERTES VERFAHREN ZUR ERFASSUNG DER FAEHIGKEIT ZUR MENTALEN RAEUMLICHEN MANIPULATION]
GABRIELE STAHLBERG *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators p 81-92 Sep. 1992 In GERMAN
Avail: CASI HC A03/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

A test for detection of pilot abilities for representation of spatial occurrences and for recognition of spatial relations between objects is presented. Particular attention is given to capabilities of mentally rotating, distorting, and splitting up a two or three dimensional object. The pilot must develop a mental image of a body after acoustic information and generate toppling and rotation motions to put a cube in a given position. An algorithm was written in the Turbo PASCAL language for producing numerous motion configurations. Test reliability was estimated with Cronbach alpha coefficient. Test selectivity, difficulty, and internal consistence were examined with satisfying results. ESA

N93-31238# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany).
THE PARAT TESTS AS EXAMINATION SYSTEM [DIE PARAT-TESTS ALS UNTERSUCHUNGSSYSTEM]
HERMANN RATHJE *In its* Computer Generated Parallel Tests for Aptitude Measurement in the Selection of Aviation Operators p 93-107 Sep. 1992 In GERMAN
Avail: CASI HC A03/MF A02; DLR, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Germany, HC

The set of new pilot aptitude tests is reviewed. An examination of how the applicants have used and considered the information brochure they received before the tests was made to determine brochure utility and the role of coaching on applicant results. Statistical correlations show that applicants who consider the brochure as useful had good test results. A correlation matrix was calculated, based on factor analysis, in order to ascertain test system integrability. Error value structure was studied by means of statistical analysis. ESA

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

A93-41978
HUMAN HABITAT DESIGN FOR THE SPACE EXPLORATION INITIATIVE
ROBERT BOYD, SCOTT GEELS, BENTON C. CLARK, and CAROLYN COOLEY (Martin Marietta Planetary Sciences Lab., Denver, CO) *In* Engineering, construction, and operations in space - III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 1 New York American Society of Civil Engineers 1992 p. 25-33. refs
Copyright

In order to study the design, fabrication, and human-factors issues of long-term habitats, with an eye to the Space Exploration Initiative in particular, the Space Habitat and Operations Module (SHOM) facility is being constructed at the Martin Marietta Astronautics Group. This facility simulates a gravity-based habitat which can be used for both artificial gravity spacecraft and Martian and lunar surface habitats. SHOM is a fully functional split-level habitat, with crew quarters, exercise equipment, galley, personal hygiene facility, work and control areas, and a radiation shelter. As a result of this design study, methods are being determined to minimize the mass and power required for space habitats. The focus is on design problems such as minimum mass structural design, arranging adequate volume for various subsystems, including life support, lighting and control systems, and providing paths for cabling and air circulation. AIAA

A93-41991
LUNAR HABITATS - PLACES FOR PEOPLE
ROBERT PFEIFER (Fluor Daniel, Inc., Irvine, CA) *In* Engineering, construction, and operations in space - III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 1 New York American Society of Civil Engineers 1992 p. 183-188. refs
Copyright

Long-term effects of spaces on the behavior of inhabitants, which will be critical for lunar habitats, as well as recommended design qualities are discussed. Attention is given to territory, size of spaces, views, sunlight and fresh air, and privacy. It is argued that designing comfortable lunar habitats can be accomplished by recognizing the value of such consideration and by involving those professionals capable of advising on these qualities in the design process from the start. AIAA

A93-41995
LUNAR BASE REQUIREMENTS FOR HUMAN HABITABILITY
GARY T. MOORE, KERRY L. PARULESKI, JANIS HUEBNER-MOTHS, JOSEPH P. FIEBER, and PATRICK J. REBHOLZ (Wisconsin Space Grant Consortium; Wisconsin Univ., Milwaukee) *In* Engineering, construction, and operations in space - III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 1 New York American Society of Civil Engineers 1992 p. 224-239. refs
Copyright

This paper presents some of the requirements for lunar surface habitation. Emphasis is placed on human factor and environment-behavior requirements that impact on habitability for medium-duration crew-tended lunar habitats and longer-duration permanent lunar bases. Included are requirements dealing with anthropometric effects of 1/6th gravity, safety, social interaction and privacy, and place and identity - the quality of 'home'. Based on the requirements, a lunar base architecture is presented to illustrate ways in which the design of lunar habitation can respond to habitability issues. Conclusions are drawn about the importance of human habitability and the needs for additional work on developing habitability requirements for lunar outpost and base design. Author

A93-42094
SPACE HABITAT CONTAMINANT GROWTH MODELS. II
G. J. SMITH, T. MCADAMS, W. F. RAMIREZ, and G. W. MORGENTHALER (Colorado Univ., Boulder) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1370-1378. refs
Copyright

This paper reports on the continuation of work being done at NASA's Center for Space Environmental Health at the University of Colorado at Boulder on contaminant growth modeling for space habitats. The work described in this paper builds on the thermodegradation contaminant aspects of space habitat contamination modeling, using polytetrafluoroethylene (PTFE - Teflon) as a specific contaminant compound. The chemical breakdown sequence of PTFE upon the application of a heat source is modeled, using temperature-dependent reaction equations. An example simulation of PTFE thermal decomposition in a closed chamber yielded tetrafluoroethylene (C2F4), carbonyl fluoride (COF2) and hexafluoropropylene (C3F6) as the major products. The model is applied to a simulation of compartments within a space habitat. The sources and concentrations of contaminants must be considered in space designs and construction as well as their control and mitigation, which will require research and design models. Author (revised)

A93-42107
MITIGATION OF DUST CONTAMINATION DURING EVA OPERATIONS ON THE MOON AND MARS
PETER E. GLASER (Arthur D. Little, Inc., Cambridge, MA) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1512-1522. refs
Copyright

Lunar and Martian soil simulants are used to characterize the dust environments on the moon and Mars. Active techniques for removing dust contamination from space suits are considered. Removal of dust particles from space suit surfaces can be accomplished by a combination of brushing, vacuuming, and adhesive tapes. Techniques for dust decontamination in combination with space suit design features can be developed to approach 'clean room' levels in the habitation module to meet health, safety, and reliability requirements. Antistatic polymers and smooth fabric surfaces with suitable formulations of polymer coatings will reduce dust deposition, facilitate dust removal, and increase coating abrasion resistance. AIAA

A93-42114
AN OPERATIONAL EVALUATION PROCESS FOR LONG-DURATION MISSION HABITATS IN SPACE
M. NOVARA, E. RAFFNER, and D. ANTONELLI (ESTEC, Noordwijk, Netherlands) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1579-1590. refs
Copyright

Work being carried out in ESA on a comparative evaluation of candidate layouts for space station Habitation Module is described. The following tools are used to carry out the project: architectural design software (STAR), ergonomical engineering software (DYNAMAN), and reduced-scale model and video tools. It is shown that no tool is sufficient if used alone; some degree of integration of the various methods is the most promising option. The activity is expected to eventually lead to the acquisition of a full-scale Habitability Test Bed mock-up, integrated by campaigns of long-duration mission simulations in space-analogous environments. AIAA

A93-42119* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EVA OPERATIONAL GUIDELINES AND CONSIDERATIONS FOR USE DURING THE SPACE STATION FREEDOM DESIGN REVIEW PROCESS
ROBERT TREVINO (NASA, Johnson Space Center, Houston, TX) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1656-1667. refs
Copyright

The EVA hardware interfaces, standards, and considerations are examined, as are guidelines that EVA operations engineer will use when reviewing the design packages from the EVA operational point of view. By utilizing both the EVA and robotics interfaces standards, design requirements, and the EVA operational guidelines and considerations, the Space Station Freedom program design can be more cost effective in the long term and also more compatible and friendly for on-orbit assembly and on-orbit maintenance and repair. AIAA

A93-42121
EXTRACTION OF POTABLE WATER FROM URINE FOR SPACE APPLICATIONS
PETER J. HOLLAND, DONALD M. BIRD, and CAROLYN L. MILLER (U.S. Air Force Academy, Colorado Springs, CO) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1680-1689. refs
Copyright

The current status of a wastewater regenerative technology capable of managing water and wastewater on-board long-term manned space platforms is reviewed. In particular, the methods and initial results obtained during physical, chemical, and biological testing of product water lyophilized from human urine are discussed. Lyophilization is found to recover approximately 98 percent of water from human urine. Over 99 percent reduction of the raw urine's total solids is seen in the unfiltered and filtered lyophilized product water. E. Coli was not detected in the product water lyophilized from raw urine samples. Recommendations for future research are included. AIAA

A93-42122
SPACE STATION AND LUNAR/MARS LIFE SUPPORT RESEARCH
WINSTON HUFF (Lockwood Greene Engineers, Inc., Nashville, TN) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1690-1700. refs

Several current life support research projects for Space Station Freedom are reviewed. In particular, attention is given to research, development, and testing of water and air systems; research into long-term space flights and lunar/Mars stations; and new opportunities for engineering, construction, and research firms to benefit from the space programs. Regenerative life support exploration mission applications are summarized. AIAA

A93-42123
PRESSURE SUIT REQUIREMENTS FOR MOON AND MARS EVA'S
ERIC M. JONES (Los Alamos National Lab., NM) and HARRISON H. SCHMITT (Los Alamos National Lab., Albuquerque, NM) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1701-1708. Research supported by Los Alamos National Lab refs

In this paper, we examine the influence of pressure suit and backpack designs on astronaut productivity and on the frequency with which EVA's can be conducted during lunar base operations and during long stays on the Martian surface. The Apollo experience suggests that the EVA equipment of that era had a short enough useful life that, in the context of extended missions it would have to be considered a 'consumable'. The consumption rate is estimated to be 8 kg/day under optimal conditions. Consequently, in planning for extended missions, attention must be paid to issues of durability and, also, onsite maintenance and repair in order to reduce the number of suits which must be transported to the moon or Mars. The Apollo experience also indicates that improvements in mobility and suit flexibility can have a significant impact on astronaut productivity. Improvements in manual dexterity and reduction of forearm fatigue and abrasion-induced damage to the hands would have the greatest impact. Author

A93-42124* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
UTILIZATION OF ON-SITE RESOURCES FOR REGENERATIVE LIFE SUPPORT SYSTEMS AT A LUNAR OUTPOST
D. W. MING, D. C. GOLDEN, and D. L. HENNINGER (NASA, Johnson Space Center, Houston, TX) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1709-1719. refs

Regenerative life support systems (RLSS) will be required to regenerate air, water, and wastes, and to produce food for human consumption during long-duration stays on the moon. It may be possible to supplement some of the materials needed for RLSS from resources on the moon. Natural materials at the lunar surface may be used for a variety of lunar RLSS needs, including (i) soils or solid-support substrates for plant growth, (ii) sources for extraction of essential, plant-growth nutrients, (iii) substrates for microbial populations in the degradation of wastes, (iv) sources of O2 and H, which may be used to manufacture water, (v) feed stock materials for the synthesis of useful minerals (e.g., molecular sieves), and (vi) shielding materials surrounding the outpost structure to protect humans, plants, and microorganisms from harmful radiation. Author (revised)

A93-42125
LUNAR BASE PRESSURE, O2 FRACTION, AND EXTRAHABITAT ACTIVITY SUIT DESIGN
GEORGE W. MORGENTHALER, EDWARD G. BARRETT (Colorado Univ., Boulder), DALE A. FESTER, and CAROLYN G. COOLEY (Martin Marietta Civil Space and Communications, Denver, CO) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1720-1727. refs

Issues relevant to the optimum selection of space habitat pressure and atmospheric O2 percentage versus the type of ExtraHabitat Activity (EHA) pressure suit are examined. Potential implementation strategies for selecting habitat pressure/O2 ratio/suit type in establishing a lunar base are then discussed. It is noted that if the lunar base cannot be built and operated in a timely manner under the physiologically ideal conditions of 14.7 psi/21 pct O2, then a mixed strategy may need to be implemented whereby the needs for known human and equipment responses are balanced with the needs for easy EHA excursions and reduced resupply support. AIAA

A93-42127
ARTIFICIAL GRAVITY AUGMENTATION ON THE MOON AND MARS
LEX SCHULTHEIS (Johns Hopkins Medical Institutions, Baltimore, MD) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1738-1747. refs

The construction of an extraterrestrial railroad as a method of augmenting gravity on the moon and Mars is examined. As one of the solution to the problem of reduced gravity, the extraterrestrial railroad does not involve any exotic technology and can be readily expanded. Rail cars with laboratories, offices, or recreational facilities could be switched on and off the track as needed. As one shift of workers entered the virtual gravity environment, another could disembark for work on the surface. The need for further research to determine the required duration and periodicity of exposure to gravity to offset the pathological effects of reduced gravity on the body is emphasized. AIAA

A93-42128* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
REGENERATIVE LIFE SUPPORT TECHNOLOGY CHALLENGES FOR THE SPACE EXPLORATION INITIATIVE
VINCENT J. BILARDO, JR. (NASA, Ames Research Center, Moffett Field, CA) and RONALD L. A. THEIS (Illinois Univ., Urbana; NASA, Ames Research Center, Moffett Field, CA) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1748-1764. refs

Regenerative life support systems have been identified as one of the critical enabling technologies for future human exploration of space. This discipline encompasses processes and subsystems which regenerate the air, water, solid waste, and food streams typical of human habitation so as to minimize the mass and volume of stored consumables which must accompany the humans on a mission. A number of key technology challenges within this broad discipline are described, ranging from the development of new physical, chemical, and biological processes for regenerating the air, water, solid waste, and food streams to the development of improved techniques for monitoring and controlling microbial and trace constituent contamination. A continuing challenge overarching the development of these new technologies is the need to minimize the mass, volume, and electrical power consumption of the flight hardware. More important for long duration exploration missions, however, is the development

of highly reliable, long-lived, self- sufficient systems which absolutely minimize the logistics resupply and operational maintenance requirements of the life support system and which ensure human safety through their robust, reliable operating characteristics. Author (revised)

A93-42129
LIAC - A CLOSED ECOSYSTEM RESEARCH FACILITY
DEREK E. SHIPLEY, MARK S. MILLER, JEFFREY D. SMITH, and MARVIN W. LUTTGES (Colorado Univ., Boulder) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1765-1776. refs
Copyright

A preliminary design for a closed research facility capable of supporting multispecies and ecosystem level experiments is presented. This project will support NASA's Controlled Ecological Life Support System (CELSS) program while providing hardware validation for the future man-rating of life support systems. The Life In A Can project, or LIAC, is designed to support a variety of organisms in a closed environment on Earth, in Low Earth Orbit (LEO), and on the lunar surface for periods of up to 10 years. LIAC utilizes a phased implementation plan that allows for the realization of specific deliverables and the production of spin-off technologies while remaining flexible to fluctuating budgetary constraints. The benefits of this project are not limited to space but will also be useful in ecology, biomedical studies, exobiology, and other earthbound applications. Author

A93-42130
AN INTEGRATED HUMAN/PLANT METABOLIC MASS BALANCE MODEL
A. B. THOMPSON, J. R. SCHULZ, and C. G. COOLEY (Martin Marietta Civil Space and Communications, Denver, CO) *In* Engineering, construction, and operations in space III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1777-1788. refs
Copyright

The design and development of Controlled Ecological Life Support Systems (CELSS) in support of future Lunar and Martian bases requires analytical models for evaluating human and biological systems and the interactions between the two. An integrated model consisting of human and plant modules (which can be later expanded to include animals) has been proposed. The human module models human metabolic inputs (O2, macronutrients and micro-nutrients) and outputs (CO2, urine, feces, insensible water, and toxic gases) as a function of crew activity levels, energy expenditure rates (EERs), and body mass. The plant module models plant metabolic activity as a function of inputs. The final integrated module will determine total crew inputs and outputs and determine the ability of plant-based systems to satisfy the crew's macro-/micronutrient and mineral requirements. Issues associated with definition of EERs are addressed, including a comparison of actual versus theoretical EERs. Scenarios for use of the model in planning for future manned exploration missions are included. Author

A93-42149
A SYSTEMS APPROACH TO WATER RECYCLING RESEARCH
JON SCHULZ (Martin Marietta Civil Space and Communications, Denver, CO) and JOANN SILVERSTEIN (Colorado Univ., Boulder) *In* Engineering, construction, and operations in space - III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 1996-2007. refs
Copyright

A research effort aimed at the development of a water recycling system for long-duration space missions is reviewed. The research focuses on health effects of recycling water (toxicological and disease risk factors); system performance, stability, and reliability of water recycling systems during long missions; microbial ecology of spacecraft water systems; distribution and accumulation of microbes, treatment chemicals, and leached contaminants in recycled water; and development of standards and contaminant exposure limits for recycled water. AIAA

A93-42151
SPACE HABITAT ENVIRONMENTAL HEALTH - A SYSTEMS ISSUE
JON R. SCHULZ and RALPH N. EBERHARDT (Martin Marietta Civil Space and Communications, Denver, CO) *In* Engineering, construction, and operations in space - III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 2023-2034. refs
Copyright

The design of space habitats (space-based, lunar, and Mars) for long duration human missions must consider environmental health. Contamination, with its toxicological and epidemiological ramifications, must be addressed early in the requirements and system definition phase to preclude costly system redesign or loss of health and productivity during the mission or even possibly loss of the mission itself. This paper addresses the fundamental differences between short and long term missions, sources of habitat internal contamination in an extended space architecture, the need for a systems approach and use of crew habitat system modeling, and identifies contamination management strategy options. Author

A93-42173* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AN ANALYSIS OF HUMAN PERFORMANCE IN SIMULATED PARTIAL-GRAVITY ENVIRONMENTS
NATHAN R. MOORE (NASA, Johnson Space Center, Houston, TX) and DAVID J. GUTIERREZ (Johnson Engineering Corp., Houston, TX) *In* Engineering, construction, and operations in space - III: Space '92; Proceedings of the 3rd International Conference, Denver, CO, May 31-June 4, 1992. Vol. 2 New York American Society of Civil Engineers 1992 p. 2282-2292.
Copyright

Three unique partial gravity test environments; parabolic flight, water immersion and a mechanical-relief device provide the environment to evaluate human locomotion, reach sweeps, and posture in the reduced gravity levels of the moon (1/6) and Mars (3/8). The development of a motion analysis database for 1/6 and 3/8 gravity environments as well as an initial understanding of human motion in low gravity environments are the focus of these experiments. Each of the three partial-gravity simulations provided a unique environment with some specific limitations. Water immersion provides a continuous testing environment but must factor in the effects of water viscosity drag, subject weighting, and breathing apparatus. Parabolic flight provides the most realistic testing environment although the test must be interrupted every 40 seconds to execute a complete parabolic maneuver of the aircraft. Mechanical force relief systems also provide uninterrupted testing. However, the body support harness necessary for use of mechanical force relief systems can potentially hinder test subject movement. By using the test results generated from all three test arenas, the Man-Systems Division will create a database of human locomotion specific to the lunar and Mars gravity environments. The information gathered is being used to enhance the development and design of future human habitation elements. Author

A93-42814
A COGNITIVE CLASSIFICATION OF PILOT PERFORMANCE IN AIR COMBAT
MICHAEL R. HOUCK (Dayton Univ., Williams AFB, AZ), LESLIE A. WHITAKER (Dayton Univ., OH), and ROBERT R. KENDALL *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc.

1992 p. 503-509. refs
(Contract F33615-90-C-0005)
Copyright

Much of the air-to-air combat conducted in modern fighter aircraft occurs while the enemy is beyond visual range. This beyond-visual-range combat places heavy cognitive demands on the fighter pilot. The authors have developed a behavioral taxonomy that focuses on the cognitive aspects of this task. This taxonomy is specific to F-15C air-to-air combat and is based on mission and cognitive task analyses of the defensive counter-air mission flown by these crews. The authors conducted extensive interviews with F-15C fighter pilots to identify the critical activities, decisions, and information requirements of this mission. They then classified pilot behaviors according to two models of human information processing: supervisory control and multiple resources theory. The resulting taxonomy provides a foundation for developing measures to assess the training effectiveness of manned air combat simulations. Author

A93-42840
HUMAN PERFORMANCE DATA VISUALIZATION FOR SYSTEM DESIGN TEAMS
SARAH J. SWIERENGA (Logicon Technical Services, Inc., Dayton, OH), DONALD L. MONK (USAF, Armstrong Lab., Wright-Patterson AFB, OH), and CLIFFORD E. BROWN (Wittenberg Univ., Springfield, OH) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 675-680. Research sponsored by FAA, U.S. Army, U.S. Navy, et al. refs
(Contract F33615-89-C-0532)
Copyright

A multimedia design tool is being developed to enhance the usability of ergonomic data by crew system designers and multidisciplinary design teams. The Computer-Aided Systems Human Engineering: Human Performance Visualization Subsystem (CASHE: HPVS), Version 1.0, will help both individual designers and design teams to experience and manipulate human performance technical data so that performance implications of design decisions can be understood more clearly. By providing the ability to gain a common understanding of behavioral data through direct experience via simulation, the HPVS is also intended to reduce miscommunication in multidisciplinary design teams regarding human performance issues. Author

A93-42841
COMPUTER-SUPPORTED COLLABORATIVE WORK - A NEW AGENDA FOR HUMAN FACTORS ENGINEERING
MICHAEL D. MCNEESE (USAF, Armstrong Lab., Wright-Patterson AFB, OH), BRIAN S. ZAFF (Logicon Technical Services, Inc., Dayton, OH), and CLIFFORD E. BROWN (Wittenberg Univ., Springfield, OH) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 681-686. refs
Copyright

The authors discuss the concept of collaborative work and the ways in which the emerging computer technologies may or may not support these group efforts. The domain of computer-supported collaborative work sets a new agenda for human factors engineering, and, in keeping with a human factors perspective, a group-centered approach to collaborative system design is proposed and discussed. Author

A93-42842
TASK ALLOCATION AND AUTOMATION IN DESIGN AND OPERATION OF MAN-MACHINE SYSTEMS
CRAIG M. ARNDT (USAF, Armstrong Lab., Wright-Patterson AFB, OH) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 687-690. refs

The Structure of Intellect Capability-Requirement (SOI C-R) method has been found to be well suited to the evaluation of automation philosophies and new technologies. The SOI C-R method approach to function allocation and automation implementation is to fully describe the requirements of a task in a numeric representation and to represent the capabilities of task performance operators within the same numeric modeling space. The specific task requirements and capabilities of possible task operators can be compared numerically and an objective determination as to the best solution can be made. The first application of the SOI C-R method was the development of a domain suitability analysis tool for expert systems. This tool is the first comprehensive evaluation tool for determining whether a task should be allocated to expert systems. Also discussed is projected future research in this field. Author

A93-42843
DESIGN OF THE MAN-MACHINE INTERFACE FOR AN AUTOMATIC TARGET CUER SYSTEM
GILBERT G. KUPERMAN (USAF, Armstrong Lab., Wright-Patterson AFB, OH) and ANNETTE L. SOBEL (Logicon Technical Services, Inc., Dayton, OH) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 691-697. refs
Copyright

The authors explain the role of automatic target cuer (ATC) technology in crew-aided target acquisition systems. Requirements for such system concepts are developed with regard to the Automatic Target Recognizer Working Group. A process for designing the man-machine interface (MMI) for crew-aided systems is presented. The design and assessment of a specific, conceptual man-machine interface are described. The conceptual design of the ATC/MMI emphasized its role as a crew decision-support subsystem. The task environment was time-constrained and the task itself was critical to mission success. Author

A93-42844
AN EVALUATION OF MINIATURIZED AIRCRAFT KEYBOARDS
KATHERINE BUTKUS, EDWARD HUGHES, and WILLIAM MORONEY (USAF, Aeronautical Systems Div., Wright-Patterson AFB; Dayton Univ., OH) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 698-704. refs
Copyright

A study was conducted to examine the accuracy of the keyboard requirements of MIL-STD-1472D and to assess the consequences of operating an aircraft keyboard which was reduced in size to values below the requirements of the military standard. Four keyboard configurations were examined: (1) key size and separation within MIL-STD-1472D requirements; (2) key size and separation within the requirements, with key barriers; (3) key separation below the requirements; and (4) key separation below the requirements, with key barriers. The barrier design was proposed as a technique for reducing the probability of inadvertent key activation, especially for the smaller keyboard configuration. The experiment was conducted in two phases. Phase 1 consisted of keyboard training, and examined data entry (keying speed and accuracy) in a ground environment. Phase 2 examined both the extent of keyboard entry degradation during a simulated flying task, and the consequences of increasing flying task workload on keying performance. High levels of accuracy were attained for all keyboards. Under the simulated flying task, increased error rates were obtained with the close-separation keyboards. Under the simulated flying task, error rates were slightly higher than under the training condition when the barrier was used. Barriers increase entry time without reducing errors. Author

A93-42845* National Aeronautics and Space Administration, Washington, DC.
VISUAL SPECIFICATION OF ROBOT MOTION
Y. C. SHIU, R. CHONG, K. RUNNER, T. SCAGGS, N. SETH (Wright

State Univ., Dayton, OH), and R. CRAVEN (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 705-708. Research supported by NASA and Ohio Aerospace Inst refs

Copyright

The authors describe the use of stereo pairs of images to specify robot motion. The experimental setup includes a SUN workstation, a PUMA 560 robot, and an Imaging 151 vision system. An X-window environment displays stereo images of the work scene. Image processing is performed to extract linear edge segments from the images and the results are displayed on screen. Using a pointing device, the user selects a group of edges from the object relevant to the task. The 3D structure of this group of features is found by stereo triangulation and they can be displayed in 3D from any point of view. A viewpoint orthogonal to the plane defined by these 3D edges is used to specify the robot position relative to object position. The actual robot will then be moved to the specified position. Author

A93-42847

'LIVEWARE' SURVEY OF HUMAN SYSTEMS INTEGRATION (HSI) TOOLS

FRANK C. GENTNER (USAF, Crew Systems Ergonomics Information Analysis Center, Wright-Patterson AFB, OH) and MONA J. CRISSEY (DOD, Training and Performance Data Center, Orlando, FL) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 715-723. refs

Copyright

Liveware is the name coined to describe collectively all acquisition disciplines which directly affect humans in defense systems. Liveware domains include manpower, personnel, training, safety, health hazards prevention, and human engineering. To build this liveware database, the Department of Defense Training and Performance Data Center (TPDC) developed automated and manual survey instruments to collect essential information from HSI tool and database developers, maintainers, and users. TPDC enlisted the Crew System Ergonomics Information Analysis Center to assist with the survey and verification of database content. TPDC will make the resulting database available online and on disk to government and industry. This database will support use of HSI tools and databases throughout the acquisition process. Ultimately, the goal is to help defense acquisition personnel and their contractors develop the most cost-effective systems possible by optimizing the use of and environment for people within acquired or modified systems. Author

A93-42848

FAILURE MODE WORKLOAD THEORY AND PLANNING

CRAIG M. ARNDT (USAF, Armstrong Lab., Wright-Patterson AFB, OH) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 729-733. refs

The author emphasizes the importance of investigating the possibility of redefining system allocation decisions based on the new ground rules associated with operation under failure mode. One possible solution would be to define an emergency mode of automation authority. The author describes the efforts now under way within the US Air Force and the FAA to address this aspect of crew workload and automation design. By studying workload based on failure mode operation one may be able to develop designs and procedures which can help eliminate some of the most catastrophic operator-involved failures. Author

A93-42849

A COMPARISON OF TWO SCORING PROCEDURES WITH THE NASA TASK LOAD INDEX IN A SIMULATED FLIGHT TASK

WILLIAM F. MORONEY, DAVID W. BIERS, F. T. EGGEMEIER (Dayton Univ., OH), and JENNIFER A. MITCHELL (Virginia Polytechnic Inst. and State Univ., Blacksburg) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 734-740. refs

Copyright

Two issues which pertain to NASA Task Load Index (TLX) application procedures and scoring techniques were investigated. One issue concerned the procedure used to combine ratings on the TLX dimensions into one overall rating. The second issue dealt with the delay of TLX workload ratings for a time period subsequent to completion of a rated flight segment. Participants flew several simulated flight missions under three difficulty levels and rated the workload either immediately following a flight segment or after 15-minute or 48-hour delays. Overall workload ratings were derived through the use of either a weighted or an unweighted combination of TLX dimensions. The results of the scaling techniques were highly correlated ($r = 0.94$), and analyses revealed no differences between the resulting scaling procedures. Analyses involving both scaling solutions indicated that immediate and 15-minute delayed workload ratings did not differ, and that both delay conditions discriminated the workload associated with the crosswind conditions. Ratings under the 48-hour delay differed from the other two conditions, and did not discriminate workload levels. These findings lead to the conclusion that the time-consuming use of weighting scales is not necessary and that delaying TLX reports up to 15 minutes does not significantly interfere with recall of workload ratings. Author

A93-42850

CSERIAC CASE STUDIES IN ERGONOMICS INFORMATION ANALYSIS

LAWRENCE D. HOWELL, JR. and MICHAEL D. GRAVELLE (USAF, Crew Systems Ergonomics Information Analysis Center, Wright-Patterson AFB, OH) *In* NAECON 92; Proceedings of the IEEE 1992 National Aerospace and Electronics Conference, Dayton, OH, May 18-22, 1992. Vol. 2 New York Institute of Electrical and Electronics Engineers, Inc. 1992 p. 741-746. refs

Copyright

The objective of the Crew System Ergonomics Information Analysis Center (CSERIAC) is to support the requirements of the US Department of Defense, other government agencies, industry, and academia for incorporating crew system ergonomics in the design and operation of human-machine systems. In order to accomplish its mission, CSERIAC offers a variety of services, including a technical inquiry service, which is designed to answer questions concerning the ergonomics of human-system design as directly and quickly as possible. CSERIAC has within its means a variety of approaches to extracting data, information, and knowledge to provide answers to questions and solutions to problems. Case studies are used to illustrate the process of responding to user requests for information. The case studies were chosen to reflect both the range of inquiries received and the different ways CSERIAC responds to those inquiries. The case studies comprise an important compilation of lessons learned. Author

A93-43722

THE EFFECTS OF FIELD OF VIEW SIZE ON THE CONTROL OF ROLL MOTION

ROBERT V. KENYON (Illinois Univ., Chicago) and EDWARD W. KNELLER (U.S. Navy, Ocean Naval Air Station, Virginia Beach, VA) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472) vol. 23, no. 1 Jan.-Feb. 1993 p. 183-193. Research supported by USAF refs

Copyright

How much FOV is needed to extract performance improvements in an operator during a fixed-base visual roll disturbance nulling task is investigated. The critical tracking task of Jex et al. (1966) is used to measure the subject's 'effective' time delay and other performance indices with different FOV sizes ranging from 10 to

120 deg. The results show that tracking performance increases with widening FOV size and that these performance gains begin to plateau at an FOV as small as 20 deg. AIAA

A93-44846
EVALUATION OF SPEECH TECHNOLOGY FOR ENHANCING PERFORMANCE OF MAN-MACHINE SYSTEMS
SHANGUANG CHEN and QIYUAN JIANG (Inst. of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837) vol. 6, no. 1 1993 p. 31-38. refs

The effectivity of Chinese speech-input and -output technology and related ergonomics in computer-machine systems was investigated using apparatus consisting of a microcomputer with a monitor, an A/D converter, a speech board, the CS-II Chinese speech synthesis card, and a two-axis controller. These devices were used in four types of computer-simulated tracking tasks, denoted as SK, CK, SS, and CS, where the first letter refers to the display modes in speech (S) or character (C) on CRT screen for information concerning the direction of tracking, and the second letter refers to data input mode using speech (S) or keyboard (K). It was found that the mean operation/response time (ORT) for the task SK was 6.3 percent less than that for task CK, and the mean ORT for task SS was 5.8 percent less than that for task CS. Among the mean ORT values, the mean ORT for task SS was the shortest, while that for task CK was the longest. However, the operation/response error rate for speech input mode (2.98 percent) was higher than that for the keyboard input mode (1.13 percent). AIAA

A93-44895* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
BENEFITS, LIMITATIONS, AND GUIDELINES FOR APPLICATION OF STEREO 3-D DISPLAY TECHNOLOGY TO THE COCKPIT ENVIRONMENT
STEVEN P. WILLIAMS (U.S. Army, Joint Research Program Office, Hampton, VA), RUSSELL V. PARRISH, and ANTHONY M. BUSQUETS (NASA, Langley Research Center, Hampton, VA) May 1992 13 p. NATO, AGARD, Conference on Advanced Aircraft Interfaces: The Machine Side of the Man Machine Interface, Madrid, Spain, May 18-21, 1992, Paper refs

A survey of research results from a program initiated by NASA Langley Research Center is presented. The program addresses stereo 3-D pictorial displays from a comprehensive standpoint. Human factors issues, display technology aspects, and flight display applications are also considered. Emphasis is placed on the benefits, limitations, and guidelines for application of stereo 3-D display technology to the cockpit environment. AIAA

A93-45436* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
SPACE STATION FREEDOM PAYLOAD OPERATIONS IN THE 21ST CENTURY
C. S. GRINER and S. R. NONEMAN (NASA, Marshall Space Flight Center, Huntsville, AL) Space Technology - Industrial and Commercial Applications (ISSN 0892-9270) vol. 13, no. 3 May 1993 p. 255-261. IAF, International Astronautical Congress, 42nd, Montreal, Canada, Oct. 5-11, 1991, IAF Paper 91-101. Previously cited in issue 02, p. 239, Accession no. A92-12505

N93-29406# Army Air Mobility Research and Development Lab., Fort Eustis, VA.
SOUND ATTENUATION CHARACTERISTICS OF THE STANDARD DH-132A AND SPH-4 HELMETS WORN IN COMBINATION WITH STANDARD ISSUE EARPLUGS
BEN T. MOZO, LINDA S. BARLOW, and BARBARA A. MURPHY Jan. 1993 19 p
(AD-A263011; USAARL-93-10) Avail: CASI HC A03/MF A01

The Health Hazard Assessment (HHA) of Army systems usually requires a review of noise and hearing protection associated with the systems used. Hearing protection for crews in combat vehicles is specified to be the DH-132A and, in some cases where noise levels are extremely high, earplugs are worn in combination with the helmet in order to provide adequate protection. Hearing protection for Army helicopter crewmembers is the SPH-4 helmet with a few exceptions. The attenuation data used for the HHA are measured at this Laboratory. This report incorporates the results of attenuation measurements of the SPH-4 and DH-132A helmets worn in combination with the standard Army issue earplugs. Earplugs used in the study were the single flange, triple flange, and yellow/white foam plug. DTIC

N93-29444 Naval Postgraduate School, Monterey, CA.
PERFORMANCE MEASUREMENT SYSTEMS: A BEST PRACTICES STUDY M.S. Thesis
SANDRA K. CHACHULA Dec. 1992 106 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(AD-A262180) Avail: CASI HC A06

The purpose of this cost management research was the identification and analysis of internal performance measurement best practices which can serve as a benchmark for companies who seek to improve their performance measurement systems and competitiveness. The study used data that were previously collected from eleven diverse, high performing companies. This study identified twenty-one characteristics of performance measurement systems across eleven companies and across levels of management. The twenty-one characteristics have previously been identified in the performance measurement literature as characteristics necessary for organizations to maintain their competitive edge. The study, therefore, is confirmatory. The summary of performance measurement best practices identified in this study, then, can be used as a benchmark by organizations who seek to improve their performance measurement systems and their competitiveness. DTIC

N93-29471# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
EVALUATION OF PERSONAL COOLING SYSTEMS IN CONJUNCTION WITH EXPLOSIVE ORDNANCE DISPOSAL SUITS
J. FRIM and ANDREW MORRIS Jun. 1992 71 p
(AD-A262862; DCIEM-92-31) Avail: CASI HC A04/MF A01

This study examined the capabilities of three technologies (a liquid cooled undergarment, a thickly-ribbed vest of hydrophylic nylon, and an air vest) to alleviate thermal strain in personnel working in Explosives Ordnance Disposal (EOD) clothing under environmental conditions of 18 C and 40% relative humidity (rh), 340 C and 40% rh, and 34 C and 80% rh. Simulated EOD tasks consisted of treadmill walking (10 min), unstacking/carrying/stacking weighted boxes (10 min), and a rest period (15 min) with the EOD helmet and jacket removed repeated for a target duration time of 90 min. Physiological data included rectal temperature, skin temperature, heart rate, sweat production and evaporation, metabolic rate, and subjective evaluations of thermal comfort and perceived exertion. The results indicated that wearing the EOD suit produces significant increases in thermal physiological strain over performing the same tasks in a standard station uniform. However, the liquid-cooled Exotemp personal cooling system was very effective in reducing that strain during heat exposure. Rectal temperatures, heart rates, and fluid losses (dehydration) were reduced back to values comparable to those when not wearing the EOD suit, while skin temperatures were actually lower with the cooling system than with only the station uniform. Subjects indicated reduced perceived exertion levels and improved thermal comfort when wearing the liquid-cooled garment with the EOD suit. In contrast, the ribbed vest and air vest showed no significant benefits with the EOD suit. It is concluded that the increase in thermal physiology strain, resulting from wearing the EOD suit during EOD work in hot environments can effectively be minimized by use of Exotemp personnel cooling system. DTIC

N93-29484# Science Applications International Corp., McLean, VA.
PREDICTING RADIATION INDUCED PERFORMANCE DECREMENTS OF AH-1 HELICOPTER CREWS. VOLUME 2: EVALUATION OF MODELING AND SIMULATION TECHNIQUES FOR PREDICTING RADIATION INDUCED PERFORMANCE DECREMENTS Technical Report, 25 Sep. 1986 - 30 Nov. 1991
WILLIAM A. PEREZ, VAUGHAN W. INMAN, JOSEPH I. PETERS, ROBERT R. SANCHEZ, and ROBERT W. YOUNG 1 Mar. 1993 118 p
(Contract DNA001-86-C-0308)
(AD-A262872; DNA-TR-92-54-V2-VOL-2) Avail: CASI HC A06/MF A02

The effects of intermediate doses of ionizing radiation on Army helicopter crew performance are investigated. The analysis of performance on the Walter Reed Performance Assessment Battery (WRPAB), and the development of an initial model for the WRPAB using Multidimensional Scaling (MDS) techniques is documented. The WRPAB was used in a study where 20 AH-1 pilots (1) predicted the effects of various symptom complexes on their performance, (2) went through a 36-hour protocol to induce symptoms similar to symptoms that follow exposure to intermediate doses of radiation, (3) performed a simulated AH-1 mission before and after symptom induction, and (4) were administered the WRPAB approximately every 2 hours throughout the 36-hour protocol. MicroSAINT models for AH-1 tank engagements were developed that used PAB performance to predict AH-1 performance degradation. The results indicate that the WRPAB (or some other test battery) has utility for the prediction of operator performance as affected by stressors such as ionizing radiation. DTIC

N93-29606 *Department of the Navy, Washington, DC.*
HELMET VISOR SUPPORT APPARATUS Patent
DANIEL J. SCHMIDT, inventor (to Navy) and JOHN D. JACKS, inventor (to Navy) 12 Jan. 1993 11 p Filed 10 Dec. 1991
(AD-D015684; US-PATENT-5,177,816;
US-PATENT-APPL-SN-805281; US-PATENT-CLASS-2-424)
Avail: US Patent and Trademark Office

Helmet visor support apparatus is provided which can move the visor between a raised and a lowered position by the operation of one hand. The apparatus comprises a visor support arm pivotally attached to the helmet at a pivot point for moving the visor between the raised and lowered positions. A positioning means is attached to the helmet at the pivot point and has at least two bores corresponding to the raised and lowered visor positions. A locking pin retractably engages either one of the bores in the positioning means to lock the visor support arm in position. A spring coiled around the locking pin normally biases the locking pin in engagement with one of the bores. A manually activatable retracting means is attached to the locking pin for retracting the locking pin from the one of the bores upon being manually activated, thereby allowing the visor support arm to pivot. The retracting means is supported on the visor support arm between the two ends thereof and is positioned to be activated by manual movement away from the pivot point and towards the visor. DTIC

N93-29607 Department of the Navy, Washington, DC.
GOGGLES EMERGENCY RELEASE APPARATUS Patent
DANIEL J. SCHMIDT, inventor (to Navy), THOMAS J. DILLON, inventor (to Navy), and RICKY L. GRETH, inventor (to Navy) 5 Jan. 1993 7 p Filed 30 Dec. 1991
(AD-D015685; US-PATENT-5,176,342;
US-PATENT-APPL-SN-815294; US-PATENT-CLASS-244-122)
Avail: US Patent and Trademark Office

A goggles emergency release apparatus is disclosed wherein an actuator, positioned adjacent the goggles latching mechanism, drives a wedge into the mechanism to push a release pin into the open position and push the goggles away from the helmet. The actuator receives its initiation power when the ejection seat movement closes a microswitch. DTIC

N93-29675 IIT Research Inst., Chicago, IL.
ENGINEMAN STRESS AND FATIGUE: PILOT TESTS Final Report, Feb. 1991 - Jun. 1992
G. I. KUEHN Feb. 1993 74 p Sponsored by Federal Railroad Administration, Washington, DC, Office of Research and Development Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract DTFR53-82-C-00254)
(PB93-175008; IITRI-E06641; FRA/ORD-92/17) Avail: CASI HC A04

In the pilot study, the effects of fatigue on the train handling performance and vigilance of four certified train service locomotive engineers was assessed while they operated the Federal Railroad Administration (FRA), Research and Locomotive Evaluator/Simulator (RALES). Subjects operated on an hourly cycle of 12 work-12 rest-8 work as a normal cycle followed by an hourly cycle of 12W-8R-8W the following week as a fatigue cycle. Subject activity diaries, scoring of various aspects of train handling, subject exit interviews, and observer's run observation notes were collected. Core body temperature and performance on a fitness for work measure were also recorded. The sleep records of the subjects were plotted and found to be atypical in comparison with those of non-engineer persons. The controlled, low interruption rest periods of the study may have been superior to the rest normally attained by the subjects, thus accounting for the failure to show differences between the two experimental conditions. The observed deterioration of performance regardless of schedule, coupled with the irregular sleep/work patterns of the subjects suggest continued research which focuses on sleep/work patterns and those performance related variables which were attendant on the decreases in performance in the pilot study. NTIS

N93-29727*# *Colorado Univ., Boulder.*
EARTH TO LUNAR CELSS EVOLUTION
In Universities Space Research Association, Houston, Proceedings of the Seventh Annual Summer Conference. NASA/USRA: University Advanced Design Program p 123-132 1991
Avail: CASI HC A02/MF A03

The comprehensive results of human activities on the environment, such as deforestation and ozone depletion, and the natural laws that govern the global environment have yet to be determined. Closed Ecological Life Support Systems (CELSS) research can play an instrumental role in dispelling these mysteries, as well as have the ability to support life in hostile environments, which the Earth one day may become. CELSS conclusions, such as the timescales in which plants fix carbon dioxide (CO2), will be the key to understanding each component and how it affects the ecological balance between plants and animals, the environment, and the biological engines that drive Earth's system. However, to understand how CELSS can be used as an investigative tool, the concept of a CELSS must be clearly defined. A definition of CELSS is given. The evolutionary establishment of a lunar base with a bioregenerative life support system in a Space Station Freedom (SSF) module to support a crew of four for two weeks duration was chosen as the design topic. Derived from text

N93-29728*# Florida Univ., Gainesville.
DESIGN OF BIOMASS MANAGEMENT SYSTEMS AND COMPONENTS FOR CLOSED LOOP LIFE SUPPORT SYSTEMS
In Universities Space Research Association, Houston, Proceedings of the Seventh Annual Summer Conference. NASA/USRA: University Advanced Design Program p 133-137 1991
Avail: CASI HC A01/MF A03

The goal of the EGM 4000/1 Design class was to investigate a Biomass Management System (BMS) and design, fabricate, and test components for biomass management in a closed-loop life support system (CLLSS). The designs explored were to contribute to the development of NASA's Controlled Ecological Life Support System (CELSS) at Kennedy Space Center. Designs included a sectored plant growth unit, a container and transfer mechanism, and an air curtain system for fugitive particle control. The work performed by the class members is summarized. Author

N93-29733*# Idaho Univ., Moscow.
EXERCISE/RECREATION FACILITY FOR A LUNAR OR MARS ANALOG
In Universities Space Research Association, Houston, Proceedings of the Seventh Annual Summer Conference. NASA/USRA: University Advanced Design Program p 155-158 1991
Avail: CASI HC A01/MF A03

The University of Idaho, NASA/USRA project for the 1990-91 school year is an exercise/recreation station for an Earth-based simulator of a lunar or martian habitat. Specifically, a stationary bicycle that will help people keep fit and prevent muscular atrophy while stationed in space was designed. To help with motivation and provide an element of recreation during the workout, the bicycle is to be enhanced by a virtual reality system. The system simulates various riding situations, including the choice of a mountain bike or a road bike. The bike employs a magnetic brake that provides continuously changing tension to simulate actual riding conditions. This braking system is interfaced directly with the virtual reality system. Also, integrated into the virtual reality display will be a monitoring system that regulates heart rate, work rate, and other functions during the course of the session. Author

N93-29734*# Kansas State Univ., Manhattan.
AUTOMATION OF CLOSED ENVIRONMENTS IN SPACE FOR HUMAN COMFORT AND SAFETY
In Universities Space Research Association, Houston, Proceedings of the Seventh Annual Summer Conference. NASA/USRA: University Advanced Design Program p 159-163 1991
Avail: CASI HC A01/MF A03

The development of Environmental Control and Life Support Systems (ECLSS) for Space Station Freedom, future colonization of the Moon, and Mars missions presents new challenges for present technologies. ECLSS that operate during long-duration missions must be semi-autonomous to allow crew members environmental control without constant supervision. A control system for the ECLSS must address these issues as well as being reliable. The Kansas State University Advanced Design Team is in the process of researching and designing controls for the automation of the ECLSS for Space Station Freedom and beyond. The ECLSS for Freedom is composed of six subsystems. The temperature and humidity control (THC) subsystem maintains the cabin temperature and humidity at a comfortable level. The atmosphere control and supply (ACS) subsystem insures proper cabin pressure and partial pressures of oxygen and nitrogen. To protect the space station from fire damage, the fire detection and suppression (FDS) subsystem provides fire-sensing alarms and extinguishers. The waste management (WM) subsystem compacts solid wastes for return to Earth, and collects urine for water recovery. The atmosphere revitalization (AR) subsystem removes CO2 and other dangerous contaminants from the air. The water recovery and management (WRM) subsystem collects and filters condensate from the cabin to replenish potable water supplies, and processes urine and other waste waters to replenish hygiene water supplies. These subsystems are not fully automated at this time. Furthermore, the control of these subsystems is not presently integrated; they are largely independent of one another. A fully integrated and automated ECLSS would increase astronauts' productivity and contribute to their safety and comfort. Author

N93-29747*# Prairie View Agricultural and Mechanical Coll., TX.
MARS HABITAT
In Universities Space Research Association, Houston, Proceedings of the Seventh Annual Summer Conference. NASA/USRA: University Advanced Design Program p 253-263 1991
Avail: CASI HC A03/MF A03

The College of Engineering & Architecture at Prairie View A&M University has been participating in the NASA/USRA Advanced Design Program since 1986. The interdisciplinary nature of the program allowed the involvement of students and faculty throughout the College of Engineering & Architecture for the last five years. The research goal for the 1990-1991 year is to design a human habitat on Mars that can be used as a permanent base for 20 crew members. The research is being conducted by undergraduate students from the Department of Architecture. Author

N93-29748*# Puerto Rico Univ., Rio Piedras.
SELENIA: A HABITABILITY STUDY FOR THE DEVELOPMENT OF A THIRD GENERATION LUNAR BASE
In Universities Space Research Association, Houston, Proceedings of the Seventh Annual Summer Conference. NASA/USRA: University Advanced Design Program p 265-273 1991
Avail: CASI HC A02/MF A03

When Apollo astronauts landed on the Moon, the first generation of lunar bases was established. They consisted essentially of a lunar module and related hardware capable of housing two astronauts for not more than several days. Second generation lunar bases are being developed, and further infrastructure, such as space station, orbital transfer, and reusable lander vehicles will be necessary, as prolonged stay on the Moon is required for exploration, research, and construction for the establishment of a permanent human settlement there. Human life in these habitats could be sustained for months, dependent on a continual flow of life-support supplies from Earth. Third-generation lunar bases will come into being as self sufficiency of human settlements becomes feasible. Regeneration of water, oxygen production, and development of indigenous construction materials from lunar resources will be necessary. Greenhouses will grow food supplies in engineered biospheres. Assured protection from solar flares and cosmic radiation must be provided, as well as provision for survival under meteor showers, or the threat of meteorite impact. All these seem to be possible within the second decade of the next century. Thus, the builders of Selenia, the first of the third-generation lunar bases are born today. During the last two years students from the School of Architecture of the University of Puerto Rico have studied the problems that relate to habitability for prolonged stay in extraterrestrial space. An orbital personnel transport to Mars developed originally by the Aerospace Engineering Department of the University of Michigan was investigated and habitability criteria for evaluation of human space habitats were proposed. An important finding from that study was that the necessary rotational diameter of the vessel has to be on the order of two kilometers to ensure comfort for humans under the artificial gravity conditions necessary to maintain physiological well being of passengers, beyond the level of mere survival. Author (revised)

N93-29760*# Wisconsin Univ., Milwaukee.
GENESIS 2: ADVANCED LUNAR OUTPOST
GARY T. MOORE *In* Universities Space Research Association, Houston, Proceedings of the Seventh Annual Summer Conference. NASA/USRA: University Advanced Design Program p 329-334 1991
(Contract NASW-4435)
Avail: CASI HC A02/MF A03

Advanced, second-generation lunar habitats for astronauts and mission specialists working on the Moon are investigated. The work was based on design constraints set forth in previous publications. Design recommendations are based on environmental response to the lunar environment, habitability, safety, near-term technology, replaceability and modularity, and suitability for NASA lunar research missions in the early 21st century. Scientists, engineers, and architects from NASA/JSC, Wisconsin aeronautical industry, and area universities gave technical input and offered critiques at design reviews throughout the process. The recommended design uses a lunar lava tube, with construction using a combination of Space Station Freedom-derived modules and lightweight Kevlar-laminate inflatables. The outpost includes research laboratories and biotron, crew quarters and support facility, mission control, health maintenance facility, and related areas for functional and psychological requirements. Furniture, specialized equipment, and lighting are included in the design analysis.
Author

N93-29845*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
PLATFORM STAIR LIFT Patent Application
BRUCE WEDDENDORF, inventor (to NASA) and KOSTA VARNAVAS, inventor (to NASA) 22 Mar. 1993 21 p
(NASA-CASE-MFS-28772-1; NAS 1.71:MFS-28772-1; US-PATENT-APPL-SN-035345) Avail: CASI HC A03/MF A01

A motorized lift system for carrying a wheelchair user up or down a flight of stairs includes a platform sized to underlie and support a wheelchair and a person sitting thereon. The platform is driven upwardly or downwardly along one side of the stairway between the floors at the opposite ends thereof, in response to manual operation of a start/stop switch mounted on an upwardly projecting side rail portion of the platform, in a manner maintaining the platform in a horizontal orientation at all times. With the platform resting on the floor at the appropriate end of the stairs, a user simply rolls his wheelchair onto the platform and pushes the start button. This initiates the movement of the platform toward the opposite end of the stairs and also automatically closes guard rail structures at the opposite ends of the platform to retain the wheelchair thereon during platform movement. When the platform reaches the opposite end of the stairs, and is brought to rest on the floor adjacent thereto, the platform movement is automatically terminated and the guard rail structure opened. This permits the user to simply roll his wheelchair off the platform onto the floor and be on his way after comfortably and conveniently traversing the stairs on the platform. NASA

N93-29888# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.
AN EVALUATION OF B-1B PILOT PERFORMANCE DURING SIMULATED INSTRUMENT APPROACHES WITH AND WITHOUT STATUS INFORMATION Final Report, Mar. 1991 - Jul. 1992
BRADLEY D. PURVIS Sep. 1992 87 p
(Contract AF PROJ. 7184)
(AD-A263874; AL-TR-1992-0088) Avail: CASI HC A05/MF A01

The majority of aircraft incidents occur during the approach to landing phase of flight. Little research has been conducted that evaluates the efficiency of the instrument display format used by the pilots for the approach to landing. This research examined the effects of two Instrument Landing System display formats on the tracking performance of pilots in a B-1B simulator under varying crosswind and starting conditions. One display contained flight director command steering supplemented with raw glideslope and localizer data; the other display was the same minus the raw data. This research was based on the hypothesis that superior tracking performance would result with flight director and raw glideslope and localizer data on the Instrument Landing System display. The independent variables were as follows: display types, initial starting point, and wind. The dependent variables were as follows: glideslope deviation, localizer deviation, airspeed, roll rate variability, pitch rate variability, and altitude Above Ground Level. Twelve qualified B-1 pilots served as subjects in this simulation study, each subject flew a total of 16 Instrument Landing System approaches after practice. The two types of Instrument Landing System formats were evaluated under two wind conditions that began with two starting positions. DTIC

N93-29889# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.
METHODS FOR CHARACTERIZING THE HUMAN HEAD FOR THE DESIGN OF HELMETS Final Report, Sep. 1990 - Apr. 1992
KATHLEEN M. ROBINETTE and JENNIFER J. WHITESTONE Apr. 1992 73 p
(Contract AF PROJ. 7184)
(AD-A263875; AL-TR-1992-0061) Avail: CASI HC A04/MF A01

For complex helmet systems that include optical displays and enhancements, as well as advanced sound attenuation, etc., the old methods for using anthropometry in design are inadequate. In this report, approaches for characterizing the human in the design process are described that provide, for the first time, shape and contour information. These methods have begun to revolutionize the helmet design process. DTIC

N93-29924# Dayton Univ. Research Inst., OH.
CATS EYES ADJUSTMENT PROCEDURES Final Report, Nov. 1992 - Jan. 1993
JOSEPH C. ANTONIO Apr. 1993 16 p
(Contract F33615-90-C-0005)
(AD-A264069; AL-TR-1993-0025) Avail: CASI HC A03/MF A01

Night vision goggles (NVGs) have been employed in a variety of aircraft for over 20 years; however, only recently has their application begun in fighter/attack aircraft. Research accomplished by the Night Vision Programs Office at the Aircrew Training Research Division of the USAF Armstrong Laboratory demonstrated the loss of NVG performance resulting from improper goggle adjustments. This report describes correct adjustment procedures for the CATS EYES NVG system currently being used by USAF, USN, and USMC fighter/attack pilots. The procedures described were developed so aircrews could take advantage of the adjustments available on the NVGs. Additionally, image descriptions are given to help aircrews evaluate NVG performance. Information on the necessary equipment/space needed for proper evaluation is also included. DTIC

N93-30167# Krug Life Sciences, Inc., San Antonio, TX. San Antonio Div.
UTILITY OF A GHOST HORIZON AND CLIMB/DIVE LADDER LINE TAPERING ON A HEAD-UP DISPLAY Final Report, Aug. 1991 - Aug. 1992
LISA F. WEINSTEIN and WILLIAM R. ERCOLINE Apr. 1993 17 p
(Contract DA PROJ. 2930)
(AD-A264401; AL-TR-1992-0168) Avail: CASI HC A03/MF A01

As part of a United States Air Force (USAF) effort to standardize head-up display (HUD) symbology, an unusual attitude recovery task was employed to investigate the utility of a cue, the ghost horizon, that indicates the direction of the actual horizon when the climb/dive ladder (CDL) horizon line is not within the HUD field of view. Six HUD-experienced and 6 non-HUD-experienced military pilot subjects were used to determine whether there was improvement, with the ghost horizon, in ability to recover from nose-down unusual attitudes in a flight simulator. The ghost horizon was evaluated with 3 different CDL line configurations (tapered, nontapered, reverse tapered). In terms of accuracy of the initial stick input, the ghost-horizon configurations resulted in significantly better performance (about 11% better) than did the non-ghost-horizon configurations. The ghost horizon had no effect on initial stick input reaction time or total recovery time. The CDL line taper configuration did not affect accuracy, initial stick input reaction time, or total recovery time. Subjective data indicated that the pilots did not have a strong preference for any of the configurations. These findings suggest that the ghost horizon is a useful aid to unusual attitude recovery performance, and may reduce spatial disorientation. DTIC

N93-30204 Stanford Univ., CA.
VISUALIZATION TECHNIQUES FOR ANALYZING CONTROL OF HUMAN MOVEMENT: AFFINE MAPPINGS BETWEEN MULTI-DIMENSIONAL SPACES Ph.D. Thesis
ARTHUR DANIEL KUO 1993 124 p
Avail: Univ. Microfilms Order No. DA9309625

Control of human movement is difficult to study in part due to the number of muscles, joints, and degrees-of-freedom about the joints. Interpreting the commands generated by the central nervous system or the resultant motion generated by muscles is not possible without a method for reducing the number of variables examined. The goal is to develop and apply a method for understanding control of movement through visualization. This is made possible by examining the possible outputs of a system in terms of vectors composed of achievable accelerations and forces. The effect of many variables can then be seen in the final output, which is the summation of intermediate transformations. The visualization is

predicated on a mathematical characteristic of the equations of motion, that they describe affine mappings. A theory of muscle function in terms of output vectors was developed and applied to the study of the action of muscles that cross more than one joint, a topic of contemporary interest in the biomechanics community. It was found that each muscle can be described in terms of its resultant output vector. Any presumed special qualities are due to the muscle's unique location rather than the number of joints it crosses, as had been previously thought. The theory of muscle function was also extended to encompass the set of all possible outputs. This set is useful to study when the actual command inputs or muscle forces are unknown, as is often the case in human movement. Movements made in response to postural perturbations were examined in light of the constraints acting upon this set. The constraints were found to greatly restrict the choices available to the central nervous system when forming a control. Sensitivity studies indicated that strengthening certain muscles can effect changes on the possible outputs. Finally, given the limited choices available, a model for central nervous system control showed that simple stability criteria are sufficient to approximate human behavior. Dissert. Abstr.

N93-30566*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
PROSTHETIC ELBOW JOINT Patent Application
BRUCE WEDDENDORF, inventor (to NASA) 8 Jul. 1992 19 p (NASA-CASE-MFS-28707-1; NAS 1.71:MFS-28707-1; US-PATENT-APPL-SN-912953) Avail: CASI HC A03/MF A01

An artificial manually positionable elbow joint for use in an upper extremity, above-elbow, prosthetic which provides a locking feature that is easily controlled by the wearer is described. The instant elbow joint is very strong and durable to withstand the repeated heavy loadings encountered by a wearer who works in an industrial, construction, farming or similar environment. The elbow joint of the present invention comprises a turntable, a frame, a forearm, and a locking assembly. The frame generally includes a housing for the locking assembly and two protruding ears. The forearm includes an elongated beam having a cup-shaped cylindrical member at one end and a locking wheel having a plurality of holes along a circular arc on its other end with a central bore for pivotal attachment to the protruding ears of the frame. The locking assembly includes a collar having a central opening with a plurality of internal grooves, a plurality of internal cam members each having a chamfered surface at one end and a V-shaped slot at its other end; an elongated locking pin having a crown wheel with cam surfaces and locking lugs secured thereto; two coiled compression springs; and a flexible filament attached to one end of the elongated locking pin and extending from the locking assembly for extending and retracting the locking pin into the holes in the locking wheel to permit selective adjustment of the forearm relative to the frame. In use, the turntable is affixed to the upper arm part of the prosthetic in the conventional manner and the cup-shaped cylindrical member on one end of the forearm is affixed to the forearm piece of the prosthetic in the conventional manner. The elbow joint is easily adjusted and locked between maximum flex and extended positions. NASA

N93-30590 Anacapa Sciences, Inc., Fort Rucker, AL.
THE EFFECTS OF SUPERIMPOSING SYMBOLOGY ON A SIMULATED NIGHT VISION GOGGLE DISPLAY Interim Report
D. M. MCANULTY, JOHN W. RUFFNER, and DAVID B. HAMILTON Feb. 1993 84 p Limited Reproducibility: More than 20% of this document may be affected by microfiche quality
(Contract MDA903-92-D-0025)
(AD-A263458; ARI-RR-1636) Avail: CASI HC A05

The U.S. Army is acquiring a system that superimposes instrument symbology on night vision goggle (NVG) imagery. However, previous research indicates that the symbology may distract a pilot's attention from obstacle detection, recognition, and avoidance and may interfere with proper scanning patterns. To test the effects of combining imager and symbology, 36 helicopter pilots were presented night-flight scenarios simulating NVG imagery only, symbology only, and imagery plus symbology. The aviators were required to monitor and respond to predefined scene and symbology targets. They detected and responded rapidly to a high percentage of targets when viewing the scene-only and symbology-only scenarios. Their performance decreased significantly when the two types of information were presented together, but the decrease was small when compared to the increased amount of information available in the display. Aviator performance improved with practice and was related to experience and eye dominance. The aviators suggested several modifications for the symbology suite. DTIC

55

SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

A93-43791
ON THE REACTION OF 2-AMINOPROPIONITRILE IN AQUEOUS MEDIA
KATSUHIRO KAWASHIRO, SHIGEAKI SENO, SHIGERU SUGIYAMA, and HIROMU HAYASHI (Tokushima Univ., Japan) Origins of Life and Evolution of the Biosphere (ISSN 0169-6149) vol. 23, no. 3 June 1993 p. 153-165. refs
Copyright

The reactions of 2- and 3-aminopropionitriles (APNs) in aqueous ammoniacal media were investigated, and the APN reactivities were compared with that of aminoacetonitrile (AAN), obtained by Kawashiro et al. (1980). Also studied was the reaction of iminodipropionitrile (IDPN), which is known to be formed easily from 2-APN in aqueous media. The reactions were carried out at pH between 9.7 and 10.4 (i.e., at slightly higher pH than the pH of primitive ocean). The results were well consistent with those found for AAN. The IDPN reaction yielded the same products as the 2-APN reaction. On the other hand, under similar conditions 3-APN yielded 3-alanine via 3-alanine amide. 3-APN was found to be more stable than 2-APN. AIAA

A93-43792
EVAPORATION CYCLE EXPERIMENTS - A SIMULATION OF SALT-INDUCED PEPTIDE SYNTHESIS UNDER POSSIBLE PREBIOTIC CONDITIONS
SOMPORN SAETIA, KLAUS R. LIEDL, ARTUR H. EDER, and BERND M. RODE (Innsbruck Univ., Austria) Origins of Life and Evolution of the Biosphere (ISSN 0169-6149) vol. 23, no. 3 June 1993 p. 167-176. refs
(Contract FFWF PROJECT P-8475-MOB)
Copyright

Evaporation cycles applied to dilute solutions of amino acids, Cu(II) and NaCl lead to peptides within 1-3 days. This simulation of possible coastal or laguna processes in a primitive earth environment gives further indications towards the relevance of the salt-induced peptide formation reaction in chemical evolution. The experiments were successfully applied to glycine, alanine, aspartic and glutamic acid. Besides isolated amino acids, also their mixtures with glycine as reaction partner were studied, leading to peptides for all of the aforementioned substances, as well as for valine and proline, which do not dimerize alone. Sequence preferences and some conservation of optical purity were observed. Author

A93-43793
CATALYTIC ACCRETION OF THERMAL HETEROCOMPLEX MOLECULES FROM AMINO ACIDS IN AQUEOUS MILIEU
HAJIME HONDA, MIYUKI MAEZAWA, EIICHI IMAI, and KOICHIRO MATSUNO (Nagaoka Univ. of Technology, Japan) Origins of Life and Evolution of the Biosphere (ISSN 0169-6149) vol. 23, no. 3 June 1993 p. 177-183. refs
Copyright

Thermal heterocomplex molecules were made by heating aspartic acid and proline, and their behavior in aqueous suspension

was investigated under various temperature and concentration conditions. It was found that, within appropriate temperature and concentration ranges, the heterocomplex molecules in aqueous suspension exhibit an autocatalytic accretion. Such an autocatalytic accretion is considered to be prerequisite to autocatalytic replication of molecules and microsystems (Bachmann et al. (1992). AIAA

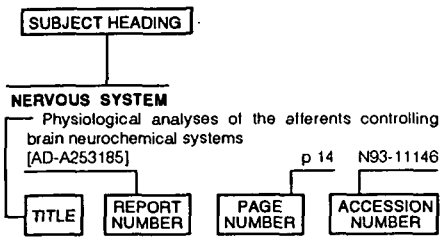
A93-44877* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

RELEVANCE OF ANTARCTIC MICROBIAL ECOSYSTEMS TO EXOBIOLOGY

CHRISTOPHER P. MCKAY (NASA, Ames Research Center, Moffett Field, CA) *In* Antarctic microbiology New York Wiley-Liss, Inc. 1993 p. 593-601. *refs*

Antarctic microbial ecosystems which provide biological and physical analogs that can be used in exobiology are studied. Since the access to extraterrestrial habitats is extremely difficult, terrestrial analogs represent the best opportunity for both formulation and preliminary testing of hypothesis about life. Antarctica, as one of few suitable environments on earth is considered to be a major locus of progress in exobiology. AIAA

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

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

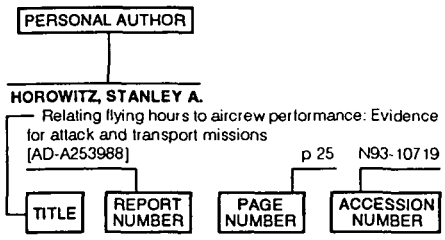
V

W

X

Y

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document is used to provide a brief description of the subject matter. The report number helps to indicate the type of document (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

AARON, ELIZABETH A.
Effect of chronic hypoxia on hypoxic ventilatory response in awake rats p 323 A93-42187

ALDASHEV, ALMAS A.
Functional and structural adaptation of the yak pulmonary circulation to residence at high altitude p 326 A93-44181

ALSTON, JIM A.
Continued results of the seeds in space experiment p 330 N93-29703

ANTONELLI, D.
An operational evaluation process for long-duration mission habitats in space p 345 A93-42114

ANTONIO, JOSEPH C.
CATS EYES adjustment procedures
[AD-A264069] p 353 N93-29924

ARNDT, CRAIG M.
Task allocation and automation in design and operation of man-machine systems p 348 A93-42842
Failure mode workload theory and planning p 349 A93-42848

B

BAKER-FULCO, CAROL J.
Field trial of caffeine on physical performance at altitude: An attempt to overcome the challenge
[AD-A264260] p 337 N93-30894

BALAKLEEVSKIJ, A. I.
The role of serotonin and histamine in increasing the resistance of the organism to certain extreme conditions p 324 A93-43034

BALDWIN, KENNETH M.
Activity-induced regulation of myosin isoform distribution - Comparison of two contractile activity programs p 326 A93-44183
Interaction of various mechanical activity models in regulation of myosin heavy chain isoform expression p 327 A93-44184

BARBARINO, MANFRED
The position test: A computer generated process for acquisition of inductive logic thinking p 343 N93-31232

BARBER, JUDY A.
Acquisition of physiological data during G-induced Loss of Consciousness (G-LOC)
[AD-A264492] p 335 N93-30400

BARLOW, LINDA S.
Sound attenuation characteristics of the standard DH-132A and SPH-4 helmets worn in combination with standard issue earplugs
[AD-A263011] p 350 N93-29406

BARRETT, EDWARD G.
Lunar base pressure, O2 fraction, and ExtraHabitat Activity suit design p 346 A93-42125

BATTLE, D. S.
Discomfort glare from high-intensity discharge headlamps: Effects of context and experience
[PB93-174720] p 336 N93-30659

BENOIT, SANDRA L.
Conspicuity of aids to navigation. Part 1: Temporal patterns for flashing lights
[AD-A264626] p 341 N93-30426

BERGH, KARE
Variability over time of complement activation induced by air bubbles in human and rabbit sera p 323 A93-42190

BERKE, LESLIE
Behavioral asymmetries of psychomotor performance in rhesus monkeys (Macaca mulatta) - A dissociation between hand preference and skill p 339 A93-44923

BIERLING, L.
Manned Space-Laboratories Control Centre (MSCC) training p 339 A93-43330

BIERS, DAVID W.
A comparison of two scoring procedures with the NASA task load index in a simulated flight task p 349 A93-42849

BILARDO, VINCENT J., JR.
Regenerative life support technology challenges for the Space Exploration Initiative p 346 A93-42128

BIRD, DONALD M.
Extraction of potable water from urine for space applications p 345 A93-42121

BIRNBACH, RICHARD A.
Helicopter simulation: An aircrew training and qualification perspective p 342 N93-30676

BLACKBURN, M. R.
A simple computational model of center-surround receptive fields in the retina
[AD-A264723] p 336 N93-30515
An algorithm for simple and complex feature detection: From retina to primary visual cortex
[AD-A264306] p 337 N93-30897

BLEWETT, CAMERON
Quantitative EMG analysis in soleus and plantaris during hindlimb suspension and recovery p 326 A93-44176

BODE, ARTHUR P.
Evaluation of dried storage of platelets for transfusion: Physiologic integrity and hemostatic functionality
[AD-A263240] p 334 N93-29620

BORTNIKOVA, G. I.
Possible biological significance of the curvature of equipotential surfaces of gravity-force tidal variations p 324 A93-43025

BOYD, ROBERT
Human habitat design for the Space Exploration Initiative p 344 A93-41978

BRATUS', L. V.
Mechanisms of the antihypoxic effect of taurine p 325 A93-43073

BROCK, THOMAS G.
Cell wall and enzyme changes during the graviresponse of the leaf-sheath pulvinus of oat (Avena sativa) p 329 A93-44941

BROWN, CLIFFORD E.
Human performance data visualization for system design teams p 348 A93-42840
Computer-supported collaborative work - A new agenda for human factors engineering p 348 A93-42841

BRUBAKK, ALF O.
Variability over time of complement activation induced by air bubbles in human and rabbit sera p 323 A93-42190

BULEKBAEVA, L. EH.
Correlation between the lymph dynamics and venous pressure during short-term antiorthostatic effects p 325 A93-43070

BURR, ROBERT E.
Medical aspects of cold weather operations: A handbook for medical officers
[AD-A263559] p 336 N93-30588

BUSQUETS, ANTHONY M.
Benefits, limitations, and guidelines for application of stereo 3-D display technology to the cockpit environment p 350 A93-44895

BUTKUS, KATHERINE
An evaluation of miniaturized aircraft keyboards p 348 A93-42844

BYERS, S.
Carbon monoxide exposure of subjects with documented cardiac arrhythmias
[PB93-179943] p 337 N93-30890

C

CAIOZZO, VINCE J.
Activity-induced regulation of myosin isoform distribution - Comparison of two contractile activity programs p 326 A93-44183

CARPITA, NICHOLAS C.
Cell wall and enzyme changes during the graviresponse of the leaf-sheath pulvinus of oat (Avena sativa) p 329 A93-44941

CARRETTA, THOMAS R.
Pilot Candidate Selection Method (PCSM): What makes it work?
[AD-A262871] p 340 N93-29481

CARROLL, L. W.
Carbon monoxide exposure of subjects with documented cardiac arrhythmias
[PB93-179943] p 337 N93-30890

CASSONE, VINCENT M.
Melatonin, the pineal gland, and circadian rhythms
[AD-A264099] p 337 N93-31061

CHACHULA, SANDRA K.
Performance measurement systems: A best practices study
[AD-A262180] p 350 N93-29444

CHAITMAN, B. R.
Carbon monoxide exposure of subjects with documented cardiac arrhythmias
[PB93-179943] p 337 N93-30890

CHANG, S.-R.
Cell wall and enzyme changes during the graviresponse of the leaf-sheath pulvinus of oat (Avena sativa) p 329 A93-44941

CHANG, S.-W.
Endotoxin priming followed by high-altitude causes pulmonary edema in rats p 323 A93-42186

CHELAFLORES, J.
Spontaneous regulating mechanisms that may have led to the origin of life
[DE93-603677] p 331 N93-31161

CHEN, MEI
Radiation dose measurement and biostack experiment in biocabin on board satellite p 327 A93-44845

CHEN, SHANGUANG
Evaluation of speech technology for enhancing performance of man-machine systems p 350 A93-44846

CHONG, R.
Visual specification of robot motion p 348 A93-42845

CINTRON, NITZA M.
Pharmacokinetics and Pharmacodynamics in Space
[NASA-CP-10048] p 333 N93-29502

CLARK, BENTON C.
Human habitat design for the Space Exploration Initiative p 344 A93-41978

COLLET, JACQUES
The psychological challenge of space p 339 A93-42658

D

E

F

G

M

N

O

P

Q

R

S

T

U

V

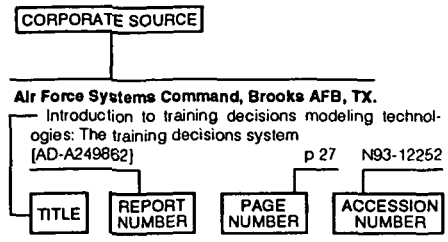
W

X

Y

Z

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.

K

M

N

O

P

S

T

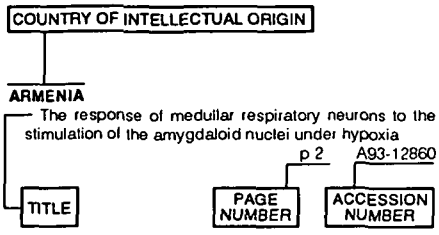
V

W

Y

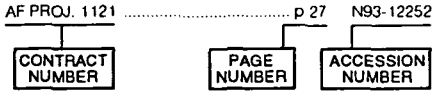
FOREIGN TECHNOLOGY INDEX

Typical Foreign Technology Index Listing



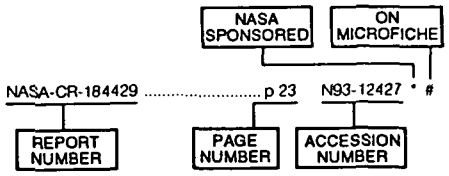
Listings in this index are arranged alphabetically by country of intellectual origin. The title of the document is used to provide a brief description of the subject matter. The page number and accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

Typical Contract Number Index Listing



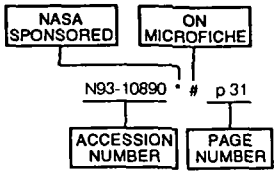
Listings in this index are arranged alphanumerically by contract number. Under each contract number the accession numbers denoting documents that have been produced as a result of research done under the contract are shown. The accession number denotes the number by which the citation is identified in the abstract section. Preceding the accession number is the page number on which the citation may be found.

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.

Typical Accession Number *Index Listing*



Listings in this index are arranged alphanumerically by accession 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.

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A93-10000 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 (N93-10000 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, and their addresses are listed on page APP-3. 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: CASI. Sold by the NASA Center for AeroSpace Information. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page APP-5.

NOTE ON ORDERING DOCUMENTS: When ordering publications from CASI, use the N accession number or other report 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.

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 page APP-3.

Avail: Fachinformationszentrum, Karlsruhe. Gesellschaft für wissenschaftlich-technische Information mbH 7514 Eggenstein-Leopoldshafen 2, Germany.

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: 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.

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration (JBD-4), Public Documents Room (Room 1H23), Washington, DC 20546-0001, or public document rooms located at NASA installations, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: NTIS. Sold by the National Technical Information Service. Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) are available. For information concerning this service, consult the NTIS Subscription Section, Springfield, VA 22161.

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 on page APP-3. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

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 53 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 53 regional depositories. A list of the regional GPO libraries, arranged alphabetically by state, appears on the inside back cover of this issue. 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 NASA Center for AeroSpace Information (CASI) on standing order subscription. 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.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeonautics
and Astronautics
Technical Information Service
555 West 57th Street, 12th Floor
New York, NY 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, TN 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, VA 22110

Engineering Sciences Data Unit
International, Ltd.
251-259 Regent Street
London, W1R 7AD, England

Fachinformationszentrum Karlsruhe
Gesellschaft für wissenschaftlich-technische
Information mbH
7514 Eggenstein-Leopoldshafen 2, Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Center for AeroSpace Information
800 Elkridge Landing Road
Linthicum Heights, MD 21090-2934

National Aeronautics and Space Administration
Scientific and Technical Information Program
(JTT)
Washington, DC 20546-0001

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, CA 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, MI 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey Library National Center
MS 950
12201 Sunrise Valley Drive
Reston, VA 22092

U.S. Geological Survey Library
2255 North Gemini Drive
Flagstaff, AZ 86001

U.S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025

U.S. Geological Survey Library
Box 25046
Denver Federal Center, MS914
Denver, CO 80225

CASI PRICE TABLES

(Effective August 1, 1993)

STANDARD PRICE DOCUMENTS

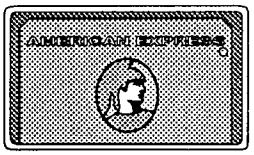
PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	$ 9.00	$ 18.00
A02	12.50	25.00
A03	17.50	35.00
A04-A05	19.50	39.00
A06-A09	27.00	54.00
A10-A13	36.50	73.00
A14-A17	44.50	89.00
A18-A21	52.00	104.00
A22-A25	61.00	122.00
A99	Call For Price	Call For Price

MICROFICHE

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	$ 9.00	$ 18.00
A02	12.50	25.00
A03	17.50	35.00
A04	19.50	39.00
A06	27.00	54.00
A10	36.50	73.00

IMPORTANT NOTICE

CASI Shipping and Handling Charges
U.S.—ADD $3.00 per TOTAL ORDER
Canada and Mexico—ADD $3.50 per TOTAL ORDER
All Other Countries—ADD $7.50 per TOTAL ORDER
Does NOT apply to orders
requesting CASI RUSH HANDLING.
CASI accepts charges to American Express, Diners Club, MasterCard and VISA.



REPORT DOCUMENT PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA SP-7011 (380)		

4. Title and Subtitle	5. Report Date
Aerospace Medicine and Biology A Continuing Bibliography (Supplement 380)	October 1993
	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.
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, DC 20546-0001	13. Type of Report and Period Covered Special Publication
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This report lists 192 reports, articles and other documents recently announced in the NASA STI Database.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Aerospace Medicine Bibliographies Biological Effects	Unclassified - Unlimited Subject Category - 52

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	78	A05/HC

For sale by the NASA Center for AeroSpace Information, 800 Elkridge Landing Road, Linthicum Heights, MD 21090-2934

FEDERAL REGIONAL DEPOSITORY LIBRARIES

ALABAMA

AUBURN UNIV. AT MONTGOMERY LIBRARY
Documents Dept.
7300 University Dr.
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 83309-0184
(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 DEPOS.
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. LIB.
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
Alderrman Library
Govt. Documents
Charlottesville, VA 22903-2498
(804) 824-3133 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

National Aeronautics and
Space Administration
Code JTT
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

Please circulate this publication to other colleagues within your organization.