NASA SP-7011 (370)
January 1993

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

NASA STI PROGRAM
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National Aeronautics and Space Administration
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INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 219 reports, articles and other documents originally announced in December 1992 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue are:

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IAA (A-10000 Series)	A92-53430 — A92-57500

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

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

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

A cumulative index for 1992 will be published in early 1993.

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

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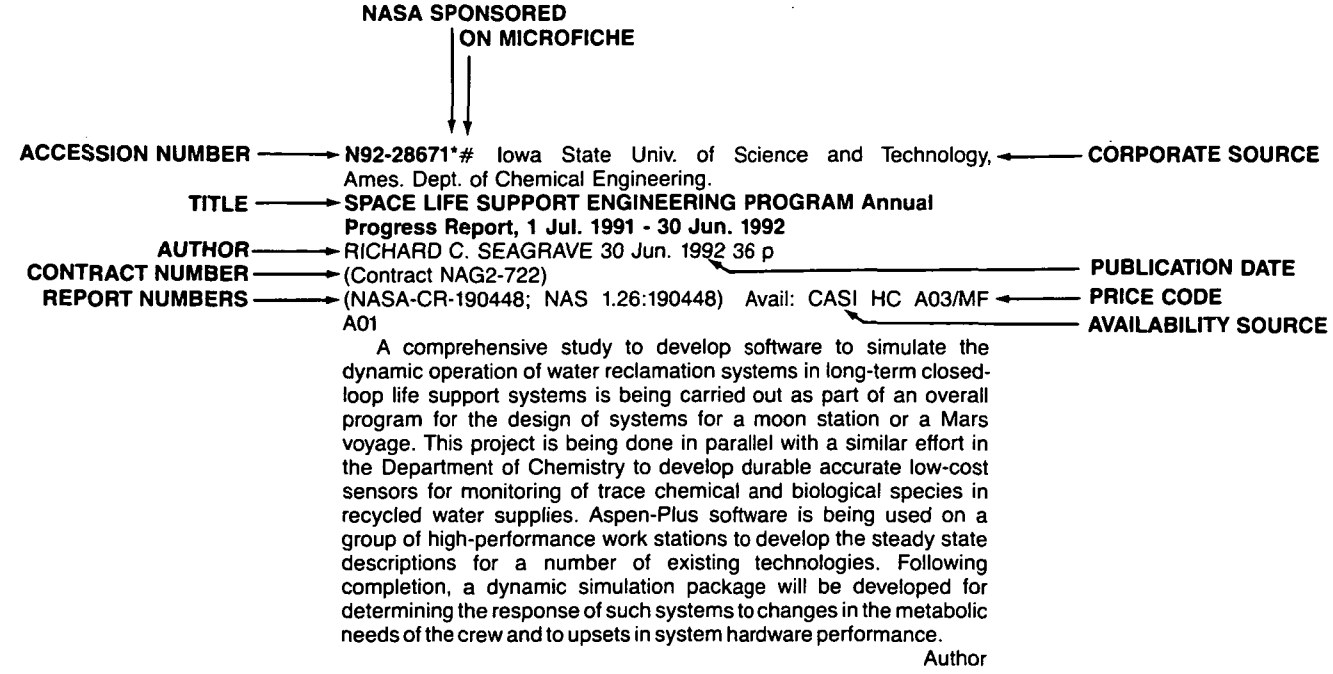

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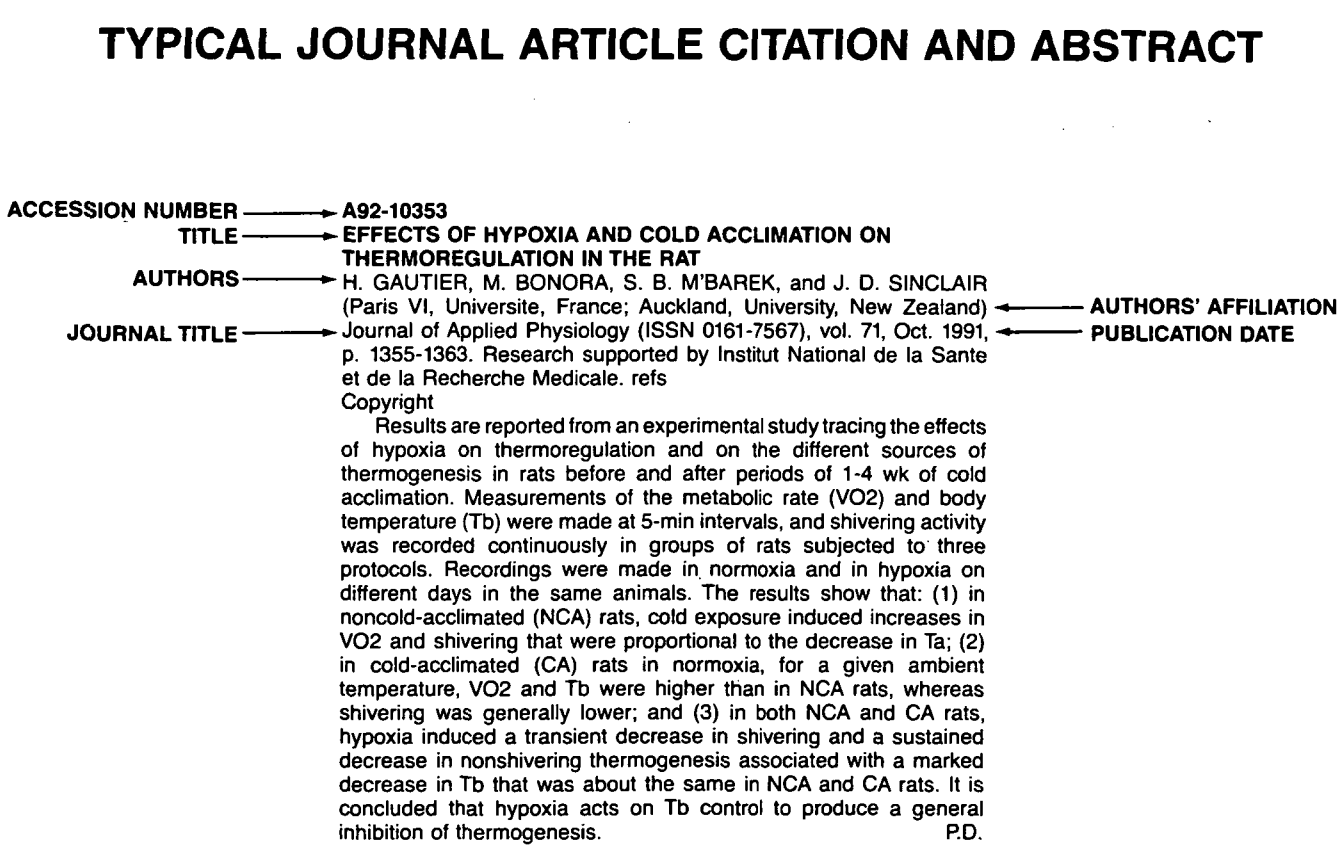

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 370)

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LIFE SCIENCES (GENERAL)

A92-53735
POSTURE CONTROL OF GOLDFISH IN MICROGRAVITY
AKIRA TAKABAYASHI (Fujita Health University, Japan), SATORU WATANABE, SHIGEO MORI, MASAFUMI TANAKA, SOUKITI SAKURAGI, and SADAHARU TAKAGI (Nagoya University, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2015-2020. refs
Copyright

Unilaterally labyrinthectomized (ULT) and bilaterally labyrinthectomized (BLT) goldfish which were adapted under a 1 G environment for 43 weeks after a surgical operation were flown in an aircraft so that dorsal light response (DLR) in microgravity could be observed. Maximum tilt angle and tilt speed of DLR measured by changing the illumination from the top to the side, which were increased just after the operation in both ULT and BLT fish, gradually decreased and reached to a steady level which was not identical to that of normal fish. In microgravity, however, the maximum tilt angle and tilt speed increased and there were no significant differences among the normal, ULT, and BLT fish. These results suggest that not only visual and vestibular input but also other sensory input may play some role in the DLR under 1 G conditions, and visual input may be the most important to control posture in microgravity. Author

A92-53736
TELESCIENCE TESTBED FOR BIOMEDICAL EXPERIMENT IN SPACE - OPERATIONAL MANAGEMENTS
MASAMICHI YAMASHITA (Institute of Space and Astronautical Science, Sagamihara, Japan), TAKATOSHI SHOJI (Kawasaki Heavy Industries, Ltd., Technical Institute, Akashi, Japan), HIDEO SUDOH (Kawasaki Heavy Industries, Ltd., Kakamigahara, Japan), TAKEHISA MATSUMOTO (NASDA, Tokyo, Japan), FLEMMING BONDE-PETERSEN (Danish Aerospace Medical Centre of Research, Copenhagen, Denmark), and SATORU WATANABE (Nagoya University, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2021-2030. refs
Copyright

'Telescience', which allows investigators to conduct space biomedical experiments from suitably 'teletool-equipped' ground stations, is presently implemented in a testbed which simulates the influence of a telescience system on the results of scientific studies. An effort is made to refine the simulated methods in view of the results thus obtained. The testbed experiments give attention to blood samples, muscle biopsies, and operations for the embedding of a sensor and the collection of specimen muscle tissue. O.C.

A92-53737
THE CARDIAC RESPONSES OF MONKEYS EXPOSED TO CENTRIFUGAL ACCELERATION
HIROTAKA SATAKE and KEN'ICHIRO MATSUNAMI (Gifu University, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2037-2040. refs
Copyright

The cardiac system effects of positive and negative centrifugal acceleration were studied in three anesthetized monkeys every two weeks for 2-3 months. When the cardiac responses of intact monkeys are compared with those of bilaterally labyrinthectomized ones, striking differences are observed in $+g(z)$ but not $-g(x)$ exposure. It appears that the vestibuloautonomic reflex modulates responses in heart rate, perhaps through the activation of the sympathetic nerve. The vestibuloautonomic reflex may have assisted the cardiovascular reflex. O.C.

A92-53738
THE EFFECT OF ENDURANCE EXERCISE ON SUSPENSION-INDUCED ATROPHY OF RAT SLOW AND FAST SKELETAL MUSCLE FIBERS
TOSHITADA YOSHIOKA, KATSUMASA YAMASHITA, HIROYOSHI KASUGAI, KUNIAKI SHIMIZU (St. Marianna University, Kawasaki, Japan), and HIROAKI TAKEKURA (National Institute of Fitness and Sports, Kagoshima, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2041-2045. refs
Copyright

In order to prevent degenerative alterations in structural and functional properties of skeletal muscle fiber resulting from experimental hypogravity rats, were forced to exercise by endurance running training before exposure to hypogravity. There was no significant difference in glycolytic enzyme activity among slow-twitch oxidative, fast-twitch oxidative and glycolytic, and fast-twitch glycolytic fibers whether after endurance training or in the suspension groups. On the other hand, the activity of oxidative enzyme decreased in fast-twitch oxidative and glycolytic and fast-twitch glycolytic fibers following hindlimb suspension hypokinesia but increased in all types of fiber after endurance exercise. A recovery in oxidative capacity was shown in previously trained muscle fiber even after exposure to hypogravity conditions. The mitochondrial volume analyzed by a point-counting method did not decrease in response to suspension in the previously trained muscle, although it decreased in muscle in the suspension-only group. Lipid droplet volume did not show the same trend. The results indicate that the skeletal muscle trained by a proper protocol of endurance exercise could maintain functional and structural properties even after exposure to hypogravity conditions. Author

A92-53743
ABIOTIC SYNTHESIS OF AMINO ACIDS AND NUCLEIC ACID BASES SIMULATING AN ACTION OF COSMIC RADIATION
KENSEI KOBAYASHI, TAKEO KANEKO, MASAHIKO TSUCHIYA (Yokohama National University, Japan), TAIRO OSHIMA (Tokyo Institute of Technology, Japan), HIROSHI YANAGAWA (Mitsubishi Kasei Institute of Life Sciences, Tokyo, Japan), and TAKESHI SAITO (Tokyo, University, Japan) IN: International Symposium

on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2071-2076. refs
Copyright

Proton irradiation of simulated primitive earth atmospheres was performed to study the roles of cosmic radiation in chemical evolution. A mixture of carbon monoxide and nitrogren over water was irradiated by high energy protons (3 MeV, 0.6 micro-A) generated by a Van de Graaff accelerator. Various kinds of compounds of biological importance were identified in the product, including proteinous amino acids, imidazole, purines, and pyrimidines. The present results suggest that compounds of biological importance could have been synthesized on the primitive earth and in extraterrestrial environments by radiation of cosmic rays and/or solar flare particles. Author

A92-53744
CAN TERRESTIAL MICROORGANISMS SURVIVE IN INTERSTELLAR ENVIRONMENT?
JUNPEI KOIKE and TAIRO OSHIMA (Tokyo Institute of Technology, Nagatsuta, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2077-2081. refs
Copyright

In connection with planetary quarantine, the survival rates of eight species of terrestrial microorganisms (virus, bacteria, yeast and fungi) under simulated interstellar conditions are investigated. If common terrestrial microorganisms cannot survive in space even for a short period, the cost of sterilizing space probes can be greatly reduced. The interstellar environment has been simulated by using an ultra-low temperature-high vacuum (77K, 4 x 10 exp -6 torr) and proton irradiation from a Van de Graaff generator. After exposing a barrage of the protons corresponding to about 250 years irradiation in space, it was shown that Tobacco mosaic virus, Bacillus subtilis (spores), Aspergillus niger (spores) and Clostridium mangenoti (spores) survived at rates of 82 percent, 45 percent, 28 percent and 25 percent, respectively. Author

A92-53745* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
RAPID INCREASE OF INOSITOL 1,4,5-TRISPHOSPHATE IN THE HELA CELLS AFTER HYPERGRAVITY EXPOSURE
YASUHIRO KUMEI (Tokyo Medical and Dental University, Japan), PEGGY A. WHITSON, NITZA M. CINTRON (NASA, Johnson Space Center, Houston, TX), and ATSUSHIGE SATO (Tokyo Medical and Dental University, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2083-2085. refs
Copyright

The IP3 level in HeLa cells has been elevated through the application in hypergravity in a time-dependent manner. The data obtained for the hydrolytic products of PIP2, IP3, and DG are noted to modulate c-myc gene expression. It is also established that the cAMP accumulation by the IBMX in hypergravity-exposed cells was suppressed relative to the control. In light of IP3 increase and cAMP decrease results, a single GTP-binding protein may play a role in the hypergravity signal transduction of HeLa cells by stimulating PLC while inhibiting adenylate cyclase. O.C.

A92-53746
BEHAVIORAL RESPONSES OF PARAMECIUM TO GRAVITY
AKIRA MURAKAMI and KEIICHI TAKAHASHI (Tokyo, University, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2087-2089. refs
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The swimming behavior of Paramecium was recorded and analyzed under various gravitational conditions. The responses to hypergravity were investigated using a centrifuge microscope. When centrifuged, the paramecia were gradually oriented parallel or antiparallel to the direction of the centrifugal force. Paramecia that had been centrifuged shortly before were more rapidly oriented than those without the precentrifugation, as long as the centrifugal force was above 70 g. A gravitational acceleration of 1 g is not enough to induce gravitactic orientation by the mechanism suggested by the 'physical hypothesis' of geotaxis. Analyses of the swimming tracks of paramecia under 1 g indicated that the negative gravitactic behavior was caused by upward orientation of the swimming organisms. The swimming behavior of paramecia during a free fall was recorded using the 18 m drop facility in Bremen. The results suggest that a physiological mechanism is involved in the response of Paramecium to microgravity. Author

A92-53747
OBSERVATION OF BEHAVIOR OF TREEFROGS IN SPACE
AKEMI IZUMI-KUROTANI, MASAMICHI YAMASHITA (Institute of Space and Astronautical Science, Sagamihara, Japan), and ATSUSHI OKETA (Tokyo Broadcasting System, Inc., Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2091-2095.
Copyright

The Russian space station Mir will use Japanese treefrogs for experimental observations of microgravity effects on their behavior under various stimuli. Experimental system verification trials will give attention to the mechanical and gaseous media environment, materials selection, and biological contamination for the experiment's life-support box, frog observation system, and frog recovery box. O.C.

A92-53748
DEVELOPMENT OF CLOSED RESEARCH ANIMAL HOLDING FACILITY (CRAHF) FOR SPACE STATION - LONG-TERM (THREE MONTH) ANIMAL-FEEDING EXPERIMENT WITH BBM
TADASHI UEDA, HIDEO SUDOH, HIROBUMI YAMADA (Kawasaki Heavy Industries, Ltd., Kakamigahara, Japan), TAKATOSHI SHOJI, SHUICHIRO HATAKEYAMA (Kawasaki Heavy Industries, Ltd., Akashi Technical Institute, Japan), SATORU WATANABE, MITURO KIDA, MASAFUMI TANAKA, SADAHARU TAKAGI (Nagoya University, Japan), and MAKOTO OKANO (Kawaju Gifu Engineering, Ltd., Kakamigahara, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2097-2106. refs
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In preparation for animal experiments in Space Station, animal-feeding experiments have been conducted using the fully-closed CRAHF breadboard models (ground-based facility) for 5 years. Based on a trend analysis of data obtained from an experiment of 3 consecutive months, in addition to 1- and 2-month experiments previously conducted, it is concluded that long-term animal experiments exceeding 3 months are possible with the CRAHF. Future prospects for animal experimentation with the CRAHF in the Space Station are reviewed. Author

A92-53749
EXPERIMENTAL EQUIPMENT FOR SPACE BIOLOGY
J. SCHAWER and J. WARRELMANN (ERNO Raumfahrttechnik GmbH, Bremen, Germany) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2107-2111.
Copyright

The Biological Life-support Unit for Microgravity Experiments (BLUME) is an autonomous facility for gravitational biology experiments; its controlled life-support system will employ the containers of NASA's Space Shuttle-based Get-Away Special program. All BLUME components are mounted within a cylindrical structure of 710-mm height and 480-mm diameter. The life support system encompasses three plant cuvettes, a water-supply loop, a support-medium loop, CO2 and O2 supplies, an air-drying loop, and a device for the removal of phytotoxic components. O.C.

A92-53750
SPACE BIOLOGY EXPERIMENT SYSTEM FOR SFU
T. KIMURA, M. TAKAYANAGI, Y. ZAIKI, S. KITAMURA (Fujitsu, Ltd., Space Development Promotion Group, Kawasaki, Japan), S. KOMADA (Fujitsu, Ltd., Mechatronics in Space Laboratory, Kawasaki, Japan), A. IZUMI-KUROTANI, and M. YAMASHITA (Institute of Space and Astronautical Science, Sagamihara, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2113-2117. Research supported by Institute of Space and Astronautical Science. refs
Copyright

The Japanese Space Flyer Unit (SFU) will carry two biological experiments, one of which involves female newts and the other the eggs of a small fresh-water fish. Each of the SFU's two experimental units employs a control system and a power supply. Specimen behavior is monitored by a CCD camera. This experiment design yields maximum performance with minimum resources, and is scheduled for H-II booster launch aboard the SFU in 1994. O.C.

A92-53766
DEVELOPMENT OF SAMPLE HANDLING SUBSYSTEM FOR SPACE BORNE ELECTROPHORESIS FACILITY
YUSUKE TAKAGI, KENJI MITANI, NOBUO HAMANO (Hitachi, Ltd., Space Systems Div., Yokohama, Japan), YOSHIO KOJIMA, TSUTOMU OKUSAWA, and KUNIYOSHI TSUBOUCHI (Hitachi, Ltd., Mechanical Engineering Research Laboratory, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2225-2229. refs
Copyright

The Electrophoresis Facility (EPF) for space use necessitates a suitable Sample Handling Subsystem (SHS) for space experiment to separate and purify biosamples. To meet this requirement, a new type of SHS has been developed. The subsystem stores and exchanges multiple biosamples using sample vessels and fluid valves which utilize freeze/defreeze principle. This subsystem satisfies various demands for space such as low microgravity disturbance, restriction on mass, volume and power consumption, and low level biocontamination, as well as enables the automated operation of EPF. Author

A92-53768
DEVELOPMENT OF AN ELECTROMAGNETIC DEGASSER OF BIOTECHNOLOGY DEVICES IN MICROGRAVITY
TSUTOMU OKUSAWA, KUNIYOSHI TSUBOUCHI, YOSHIO KOJIMA (Hitachi, Ltd., Mechanical Engineering Research Laboratory, Japan), NOBUO HAMANO, YUUSUKE TAKAGI, and KENJI MITANI (Hitachi, Ltd., Space System Div., Yokohama, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2237-2241.
Copyright

The degassing of microgravity biotechnology experiments is presently approached by novel means involving a vacuum chamber, magnets, and a tubular hydrophobic membrane. The experimental results obtained with this device show that gas can be removed from a two-phase (gas-liquid) flow without buoyancy support. The electromagnetic field generated by the device furnished higher separation effectiveness than the conventional degassing system that employs vacuum and a separation membrane alone. O.C.

A92-54276* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
ORDINAL JUDGMENTS OF NUMERICAL SYMBOLS BY MACAQUES (MACACA MULATTA)
DAVID A. WASHBURN and DUANE M. RUMBAUGH (Georgia State University, Atlanta) Psychological Science, vol. 2, no. 3, May 1991, p. 190-193. Research supported by Georgia State University. refs
(Contract NAG2-438; NIH-HD-06016)
Copyright

Two rhesus monkeys (Macaca mulatta) learned that the arabic numerals 0 through 9 represented corresponding quantities of food pellets. By manipulating a joystick, the monkeys were able to make a selection of paired numerals presented on a computer screen. Although the monkeys received a corresponding number of pellets even if the lesser of the two numerals was selected, they learned generally to choose the numeral of greatest value even when pellet delivery was made arrhythmic. In subsequent tests, they chose the numerals of greater value when presented in novel combinations or in random arrays of up to five numerals. Thus, the monkeys made ordinal judgments of numerical symbols in accordance with their absolute or relative values. Author

A92-54548* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
ALTERED DISTRIBUTION OF MITOCHONDRIA IN RAT SOLEUS MUSCLE FIBERS AFTER SPACEFLIGHT
GORDON J. BELL, THOMAS P. MARTIN (Alberta, University, Edmonton, Canada), E. I. IL'INA-KAKUEVA, V. S. OGANOV (Institute of Biomedical Problems, Moscow, Russia), and V. R. EDGERTON (California, University, Los Angeles) Journal of Applied Physiology (ISSN 8750-7587), vol. 73, no. 2, Aug. 1992, p. 493-497. Research supported by Alberta Heritage Foundation for Medical Research. refs
(Contract NCA2-IR-390-502)
Copyright

The effect of an exposure to microgravity on the distribution of the succinate dehydrogenase (SDH) activity throughout the soleus muscle fibers was investigated by measuring SDH activity throughout the cross section of 20-30 fibers each of the slow-twitch oxidative and fast-twitch oxidative-glycolytic types of fibers in rats exposed to 12.5 days in space aboard Cosmos 1887. It was found that, after the spaceflight, the entire regional distribution of SDH activity was significantly altered (as compared to ground controls) in the slow-twitch oxidative fibers, whereas the fast-twitch oxidative-glycolytic fibers from muscles of flown rats exhibited a significantly lower SDH activity only in their subsarcolemmal region. I.S.

A92-55075
OLIGOMERIZATION OF RIBONUCLEOTIDES ON MONTMORILLONITE - REACTION OF THE 5-PRIME-PHOSPHORIMIDAZOLIDE OF ADENOSINE
JAMES P. FERRIS and GOZEN ERTEM (Rensselaer Polytechnic Institute, Troy, NY) Science (ISSN 0036-8075), vol. 257, no. 5075, Sept. 4, 1992, p. 1387-1389. refs
(Contract NSF CHE-90-00187)
Copyright

The regiospecific formation of oligomers from unblocked monomers in aqueous solution is one of the central tenets in research on the origins of life on earth. Direct experimental support for this hypothesis has been obtained in studies of the condensation of the 5-prime-phosphorimidazolide of adenosine (ImpA) with itself and with P1, P2-diadenosine-5-prime, 5-prime-pyrophosphate (AppA) in water in the presence of a montmorillonite clay. Oligomers of up to ten nucleotides in length are formed. Analysis of the trimers, tetramers, and pentamers formed from a 9:1 ImpA:AppA mixture shows that 85 percent of the bonds formed are 3-prime, 5-prime-linked and that any 2-prime, 5-prime-lingages present are at the phosphodiester bond next to the 3-prime-terminus of the oligomers. Author

A92-55688
EXPERIENCES DURING A 14 MONTHS OVERWINTERING WITH RESPECT TO POTENTIAL HUMAN HABITATION ON OTHER PLANETS
MONIKA P. PUSKEPPELEIT (German Working Group on Polar Medicine, Glucksburg, Germany) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 7 p.
(IAF PAPER 92-0249) Copyright

Studies conducted during an overwintering experiment with human subjects are reviewed in terms of their potential application to analogous phenomena during the habitation of other planets.

Of particular interest are studies regarding: (1) changes in the immune system; (2) human response to isolation in a remote and extreme environment; (3) the ability to perform tasks in the environment. Changes in cutaneous, systemic, and mucosal immunity are shown to be related to the effects of stress factors on the immune system, and the relationship between exposure to UV radiation and immune response is expected to be important. Aerobic exercise and physical labor are shown to mitigate some of the effects of overwintering, while the uniformity of the environment, lack of seasons, and social deprivation can lead to distortions in perception and unusual social behavior. C.C.S.

A92-55706* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
RODENT GROWTH, BEHAVIOR, AND PHYSIOLOGY RESULTING FROM FLIGHT ON THE SPACE LIFE SCIENCES-1 MISSION
G. JAHNS (NASA, Ames Research Center, Moffett Field, CA), J. MEYLOR, T. FAST, N. HAWES (Lockheed Engineering & Sciences Co.; NASA, Ames Research Center, Moffett Field, CA), and G. ZAROW (USVA, Medical Center, San Francisco, CA) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 9 p. refs
(IAF PAPER 92-0268)

A rodent-based spaceflight study is conducted to investigate physiological changes in rats vs humans and the effects of changes in the design of the Research Animal Holding Facility (RAHF) and the Animal Enclosure Module (AEM). Rats were housed in the AEM and the RAHF, and controls were kept in identical flight hardware on earth subjected to the same flight-environmental profile. Biosamples and organ weights are taken to compare the rats before and after flight, and food/water intake are also compared. Weight gain, body weight, and food consumptions in the flight rats are significantly lower than corresponding values for the control subjects. Flight rats tend to have smaller postexperiment spleens and hearts, and flight rats consumed more water in the AEM than in the RAHF. The rodents' behavior is analogous to humans with respect to physiological and reconditioning effects, showing that the rat is a good model for basic research into the effects of spaceflight on humans. C.C.S.

A92-55707* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
SPACELAB LIFE SCIENCES 3 BIOMEDICAL RESEARCH USING THE RHESUS RESEARCH FACILITY
R. W. BALLARD, N. D. SEARBY, L. S. STONE, R. P. HOGAN (NASA, Ames Research Center, Moffett Field, CA), M. VISO, and M. VENET (CNES, Toulouse, France) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 11 p. refs
(IAF PAPER 92-0269)

In 1985, a letter of agreement was signed between the French space agency, CNES, and NASA, formally initiating a joint venture called the RHESUS Project. The goal of this project is to provide a facility to fly rhesus monkeys (Macaca mulatta) to support spaceflight experiments which are applicable but not practical to carry out on human subjects. Biomedical investigations in behavior/performance, immunology/microbiology, muscle physiology, cardiopulmonary physiology, bone/calcium physiology, regulatory physiology, and neurophysiology disciplines will be performed. The Rhesus Research Facility, hardware capable of supporting two adult rhesus monkeys in a microgravity environment, is being developed for a first flight on Spacelab Life Sciences in early 1996. Author

A92-55711
TEST RESULTS OF THE SECOND LABORATORY PROTOTYPE OF C.E.B.A.S.-AQUARACK AND SELECTED EXAMPLES OF THE SCIENTIFIC FRAME PROGRAM
V. BLUEM (Bochum, Ruhr-Universitaet, Germany), K. KREUZBERG (DLR, Cologne, Germany), and E. STRETZKE (Bochum, Ruhr-Universitaet, Germany) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. Research supported by DARA, BMFT, and Ministerium fuer Wissenschaft und Forschung des Landes Nordrhein-Westfalen. refs
(IAF PAPER 92-0274) Copyright

The principal objective of the CEBAS-AQUARACK project together with its scientific frame program is primarily basic research to study the possible influence of space conditions on aquatic plants and animals in long-term multigeneration experiments. Closed Equilibrated Biological Aquatic System (CEBAS) comprises a zoological component, a botanical component, and an electronic component (a process control system) for the Columbus space station. This report explains the basic concept, demonstrates the hardware construction principle of the second laboratory prototype, presents the current status and test results, and gives examples of findings of the present zoological research focusing on fish reproductive biology in the scientific frame program. R.E.P.

A92-55712
CONSIDERATION FOR BIOMEDICAL SUPPORT OF EXPEDITION TO MARS
A. I. GRIGOR'EV, V. M. PETROV, A. N. POTAPOV, and E. N. SVETAILO (Institute of Biomedical Problems, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 6 p. refs
(IAF PAPER 92-0275) Copyright

Medical techniques and technologies based on the support used for two Soviet missions are considered with respect to an extended Martian expedition. Attention is given to the needs for onboard preventive, diagnostic, and therapeutic measures including surgery and a crewmember who can function as a medical doctor. The need for psychological monitoring and diagnosis is established, and the biomedical implications of life-support systems are discussed. Significant risks are associated with the exposure to radiation in space including Galactic cosmic rays. The development of automated medical and life-support control systems is concluded to be both important and effective based on Soviet space experience. Hazard assessment for radiation risks and the development of biological and hybrid life-support systems are identified as two key areas of research. C.C.S.

A92-55716* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
SPACELAB LIFE SCIENCES 1, DEVELOPMENT TOWARDS SUCCESSIVE LIFE SCIENCES FLIGHTS
B. P. DALTON, G. JAHNS, and R. HOGAN (NASA, Ames Research Center, Moffett Field, CA) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 13 p. refs
(IAF PAPER 92-0280)

A general review is presented of flight data and related hardware developments for Spacelab Life Sciences (SLS) 1 with an eye toward applying this knowledge to projected flight planning. Specific attention is given to the Research Animal Holding Facility (RAHF), the General Purpose Work Station (GPWS), the Small Mass Measuring Instrument (SMMI), and the Animal Enclosure Module (AEM). Preflight and in-flight testing methods are detailed including biocompatibility tests, parametric engineering sensitivity analyses, measurements of environmental parameters, and studies of operational interfaces. Particulate containment is demonstrated for some of the equipment, and successful use of the GPWS, RAHF, AEM, and SMMI are reported. The in-flight data are useful for developing more advanced hardware such as the AEM for SLS flight 2 and the modified RAHF for SLS flight 3. C.C.S.

A92-55717
'SVET' BIOTECHNOLOGICAL SYSTEM, CONTROLLING THE ENVIRONMENTAL CONDITIONS FOR GROWING HIGHER PLANTS IN WEIGHTLESSNESS
T. IVANOVA (Bulgarian Academy of Sciences, Space Research Institute, Sofia, Bulgaria) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 7 p. refs
(IAF PAPER 92-0282) Copyright

An automated system is described that controls the environmental conditions in a higher-plant growth unit for use in experimental microgravity conditions. A laboratory model was

developed to verify the concept for both automated and manual override operations in a simulated experimental vehicle. The space greenhouse is presented emphasizing four primary elements: the plant growth unit, the light unit, the vegetation vessel, and the control unit. A block diagram outlines the structure of the subelements for the automated device which includes a microprocessor, analog measurement devices, and the machinery required to maintain the optimal lighting and ambient conditions for plant growth. The 'Svet' biotechnological system is found to be an effective method for comparing the growth of higher plants in space and on earth. C.C.S.

A92-56260
PROTECTIVE EFFECTS OF KANGWEI-1 ON MULTIPOTENTIAL HEMOPOIETIC STEM CELLS IN GAMMA-RAY IRRADIATED MICE
YONG-FA ZHANG and RUI-JUN ZHANG (Institute of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 2, 1992, p. 91-95. refs

Observations of the protective effects of Kangwei-1 (KW-1) on multipotential hemopoietic stem cells in gamma-ray irradiated mice with colony-forming unit assay are reported. The administration of KW-1 for five days both before and after irradiation increased endogenous colony formation of the hemopoietic tissue of the surface of the spleen, spleen weight, and the number of nucleated bone marrow cells in irradiated mice. It enhanced the recovery of the number of the colony-forming units of spleen (CFU-S) after irradiation by 4.0 Gy. The number of CFU-S recovered to 67.8 percent of its physiological level on the 14th day after irradiation in the KW-1 group, but only to 40.7 percent in the control group. The CFU-S dose-survival curve indicated that the differences of both the impact numbers of irradiation on the target cells between the KW-1 did not influence the radiosensitivity of CFU-S. The beneficial effects of KW-1 on the hemopoiesis were one of the important mechanisms of its protection against radiation. C.A.B.

A92-56262
OBSERVATION OF ULTRASTRUCTURAL CHANGES OF MITOCHONDRIA IN CEREBRAL NEURONS IN RATS UNDER HIGH SUSTAINED +GZ STRESS
BAO-SHENG XIE, JINGQUAN LAN, and YUQING WANG (Institute of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 2, 1992, p. 102-106. In Chinese. refs

Ultrastructural changes of mitochondria in cerebral neurons in rats exposed to +5 Gz and +8 Gz for 3 min were observed with the electron microscope technique. It was found that a number of mitochondria in neurons of the cerebral cortex swelled, cristae splitted and disappeared, and the matrix became dilute. These changes were more obvious under +8 Gz than those under +5 Gz, and recovered within 24 h after exposure. The results indicate that a substantial and recoverable change in brain energy metabolism occurred during high sustained +Gz stress. Author

A92-56264
THE RELATIONSHIP BETWEEN BLOOD FLOW AND MECHANICAL CHARACTERISTICS OF SOLEUS MUSCLE IN WHOLE BODY SUSPENDED RATS
YA-ZHI SUN, JUNMING ZHU, QINLU XIANG, and XIANGCHANG ZHUANG (Institute of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 2, 1992, p. 118-121. In Chinese. refs

Specially designed tension transducers and displacement transducers were used to determine the mechanical characteristics of the soleus muscles in three groups of rats during a 15-day experiment. The first was the control group, the second was the group in which the whole body was suspended with one of the hind limbs irradiated with a 3 h/d FIR, and the third was the whole-body suspension group without irradiation. The results indicated that the blood flow in the soleus muscles of the rats in the second group increased but decreased in rats in the third group. A relationship was found between the blood flow and mechanical characteristics of the soleus muscles. Since the mechanical characteristics can reflect the degree of muscle atrophy, the decrease of blood flow in the soleus muscles might be one of the causes of muscle atrophy in the whole-body-suspended rats. C.A.B.

A92-56265
THE RELATIONSHIP BETWEEN HYPERBARIC OXYGEN-INDUCED CONVULSION AND CHANGE OF BRAIN GAMMA-AMINOBUTYRIC ACID CONTENT AND ULTRASTRUCTURE OF GLOBUS PALLIDUS
YANG WU, QIN SHEN, and QINGQUAN ZHANG (Nantong Medical College, China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 2, 1992, p. 122-127. In Chinese. refs

Observations of the effects of hyperbaric oxygenation (HBO) on the behavior, brain gamma-aminobutyric acid (GABA) content and ultrastructure of the globus pallidus in mice are reported. An analysis is made of pathomorphological changes of the globus pallidus and the brain GABA neurotransmitter system involved during acupuncture for oxygen-induced convulsions. It was found that when mice were exposed to 97 percent oxygen at a pressure of 6 atm absolute, the animals suffered from severe convulsions about 7 min after exposure. The content of GABA in the exposed animals was significantly lower than that in the unexposed ones. The globus pallidus was also damaged, and obvious pathogenic changes occurred which included dilation of the endoplasmic reticulum and swelling of the mitochondria in the neurons. It is concluded that HBO-induced seizure might be related to damage to structures, or disorders of the metabolism and function of the GABA neurotransmitter system in the globus pallidus. The globus pallidus might be an indispensable transfer station through which the central nervous system participates in the development of seizure. C.A.B.

A92-56266
PROTECTIVE EFFECTS OF SEVERAL CHINESE HERBS AGAINST GAMMA-RAY IRRADIATION IN MICE
YU-SHENG LIU, SHUQING WANG, and RUIJUN ZHANG (Institute of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 2, 1992, p. 128-132. In Chinese. refs

In order to investigate the protective effects of several Chinese herbs and their extracted components against gamma ray irradiation, changes in mortality and survival days were observed in mice of the Kunming strain. The ginsenosides (GSS) and extracted component of ligustrum lucidum ait (LLA) and a Chinese herb-compound KW-I were administered to the mice 7 days before exposures to Co-60 irradiation of 6.4 and 8 Gy. The results showed that GSS and CLL reduced mortality and lengthened survival days significantly. Fairly good protection against radiations were also provided by KW-1. A further observation was made on chromosome aberrations of bone marrow cells induced by gamma-ray irradiation. The results showed that GSS and CLL administered before exposure to irradiation significantly reduced the chromosome aberration rate of bone marrow cells in mice. Author

A92-56705
DIPHYTANYL GLYCEROL ETHER DISTRIBUTIONS IN SEDIMENTS OF THE ORCA BASIN
TAMARA K. PEASE, EDWARD S. VAN VLEET, and JILL S. BARRE (South Florida, University, Saint Petersburg, FL) Geochimica et Cosmochimica Acta (ISSN 0016-7037), vol. 56, no. 9, Sept. 1992, p. 3469-3479. Research supported by ACS Petroleum Research Fund. refs
(Contract NSF OCE-87-23072)
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Results are presented of an investigation of the archaebacterially produced diphytanyl glycerol ether (DPGE) carried out in core sediments from the Orca Basin, an anoxic hypersaline basin in the northwestern Gulf of Mexico, in order to observe its spatial variability and potential origin. Archaebacterial lipids were evident at all depths for the unbound and intermediate-bound

fractions. Concentrations of DPGE ranged from 0.51 to 2.91 micro-g/g dry sediment at the surface and exhibited secondary maxima deeper in basin sediments. P.D.

A92-56706
STABILITY OF PEPTIDES IN HIGH-TEMPERATURE AQUEOUS SOLUTIONS
EVERETT L. SHOCK (Washington University, Saint Louis, MO) Geochimica et Cosmochimica Acta (ISSN 0016-7037), vol. 56, no. 9, Sept. 1992, p. 3481-3491. refs
(Contract NSF EAR-88-03822; NSF EAR-90-18468)
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Estimated standard molal thermodynamic properties of aqueous dipeptides and their constituent amino acids indicate that temperature increases correspond to increased stability of peptide bonds relative to hydrolysis reactions. Pressure increases cause slight decreases in peptide bond stability, which are generally offset by greater stability caused by temperature increases along geothermal gradients. These calculations suggest that peptides, polypeptides, and proteins may survive hydrothermal alteration of organic matter depending on the rates of the hydrolysis reactions. Extremely thermophilic organisms may be able to take advantage of the decreased energy required to form peptide bonds in order to maintain structural proteins and enzymes at elevated temperatures and pressures. As the rates of hydrolysis reactions increase with increasing temperature, formation of peptide bonds may become a facile process in hydrothermal systems and deep in sedimentary basins. Author

A92-56943
VENTILATORY AND METABOLIC RESPONSES TO COLD AND HYPOXIA IN INTACT AND CAROTID BODY-DENERVATED RATS
HENRY GAUTIER and MONIQUE BONORA (Paris VI, Universite, France) Journal of Applied Physiology (ISSN 8750-7587), vol. 73, no. 3, Sept. 1992, p. 847-854. Research supported by Institut National de la Sante et de la Recherche Medicale. refs
Copyright

A92-56945
PAF ANTAGONISTS INHIBIT PULMONARY VASCULAR REMODELING INDUCED BY HYPOBARIC HYPOXIA IN RATS
S. ONO, J. Y. WESTCOTT, and N. F. VOELKEL (Colorado, University, Denver) Journal of Applied Physiology (ISSN 8750-7587), vol. 73, no. 3, Sept. 1992, p. 1084-1092. refs
Copyright

The effects of two structurally unrelated antagonists of platelet-activating factor (PAF), WEB 2170 and BN 50739, on hypoxia-induced pulmonary vascular remodeling were investigated in rats exposed to normoxia or hypoxia (via simulated altitude at 5100 m), or CoCl2 treatment (to induce pulmonary hypertension). It was found that both PAF antagonists had no effect on the hematocrit in any of these rats. Both agents reduced hypoxia-induced the pulmonary hypertension and right ventricular hypertrophy after three weeks of hypoxic exposure. Hypoxia-induced pulmonary hypertension was associated with an increase in the vessel-wall thickness of the muscular arteries and with a reduction in the number of peripheral arterioles. These changes were significantly less severe in rats treated with WEB 2170 than in untreated chronically hypoxic rats. I.S.

A92-56946* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
FATIGABILITY AND BLOOD FLOW IN THE RAT GASTROCNEMIUS-PLANTARIS-SOLEUS AFTER HINDLIMB SUSPENSION
K. S. MCDONALD, M. D. DELP, and R. H. FITTS (Marquette University, Milwaukee, WI; Georgia, University, Athens) Journal of Applied Physiology (ISSN 8750-7587), vol. 73, no. 3, Sept. 1992, p. 1135-1140. refs
(Contract NAG2-212)
Copyright

The hypothesis that hindlimb suspension (HS) increases the fatigability of the soleus during intense contractile activity and that the increased fatigue is associated with a reduced muscle blood flow was tested using caged control rats and rats subjected to HS for 15 days. After 15 days, either the soleus or the gastrocnemius-plantaris-soleus (G-P-S) muscle group was stimulated in situ (10 min at 100 Hz, 100 ms trains at 120/min), and in the G-P-S preparation, blood flow was measured with radiolabeled microspheres before and at 2 min and 10 min after the start of contractile activity. The results indicate that 15 days of HS resulted in increased fatigability of the soleus, but the effect was not caused by a reduced muscle blood flow. I.S.

N92-32345# Maryland Univ., College Park.
MEASUREMENT OF THE MAGNETIC AND ELECTRICAL ACTIVITY OF INDIVIDUAL CELLS IN VITRO Report, 24 Sep. 1990 - 23 Sep. 1991
CHRISTOPHER C. DAVIS 3 Dec. 1991 17 p
(Contract DAMD17-90-Z-0052; DA PROJ. 3M1-61102-BS-15)
(AD-A250881) Avail: CASI HC A03/MF A01

This progress report has two parts. The first part reports progress to date on the development of a common-path, optical heterodyne fiber sensor for remote monitoring of the electrically induced birefringence of cells and tissue. The second part concerns the the development of a very small SQUID, NanoSQUID, which will allow monitoring of the magnetic fields from cells and tissues within about 2mm of tissue at physiological temperature. The SQUID is at (-)4K. GRA

N92-32571# Washington Univ., Seattle.
BACTERIAL RESPONSES TO EXTREME TEMPERATURES AND PRESSURES AND TO HEAVY ORGANIC LOADING Final Report
20 Feb. 1992 6 p
(Contract N00014-89-J-1048)
(AD-A247456) Avail: CASI HC A02/MF A01

The goals of this project centered around two areas of research: (1) the study of hyperthermophilic archaebacteria from submarine hydrothermnal vents on the East Pacific Rise; and (2) the study of physiologically diverse microbial populations associated with a whale carcass partially buried in sediments of the Santa Catalina Basin. Specific objectives included the following: (1) completion of analyses of all geochemical, biochemical, and microbiological measurements made on smoker fluid samples; (2) further characterization of DNA from smoker samples and selected isolates to assess phylogenetic origin; (3) determination of upper temperature and pressure limits for growth and survival of hyperthermophilic archaebacteria; and (4) tests for production of thermostable extra-cellular enzymes at extreme conditions. It was found that physiological types of bacterial-invertebrate symbioses in the deep sea directly reflect available energy sources, and that deep-sea conditions of low temperature and elevated pressure do not limit bacterial responses to intense organic loading. GRA

N92-32844# Laboratoire d'Automatique et d'Analyse des Systemes, Toulouse (France). Equipe Conduite Automatique de Procedes Biotechnologiques.
ON PHYSICAL SYSTEMS QUALITATIVE APPROACH: REAL TIME HELP FOR FERMENTATION PROCESS CONTROL Ph.D. Thesis - Toulouse Univ. [SUR UNE APPROCHE QUALITATIVE DES SYSTEMES PHYSIQUES: AIDE EN TEMPS REEL A LA CONDUITE DES PROCEDES FERMENTAIRES]
JEAN-PHILIPPE STEYER 1991 198 p In FRENCH Sponsored in part by SANOFI
(LAAS-91445; ETN-92-91678) Avail: CASI HC A09/MF A03

The main features and the advantages of qualitative physics are addressed and the following methodologies are proposed: modeling the influences among the process variables by means of a causal graph; seasoning about the standard state to retrace the causal path explaining the observed behavior according to the trends of the observable variables; in conflict situations (i.e., a single event having a multiple cause), the aforementioned reasoning technique needs to be supported by temporal notions and relations to filter out the behaviors. Those concepts, which can be

generalized to most physical systems, were tailored to biotechnological processes, mainly to batch fermentation processes, with the aim of deriving the behavior of the process's inner variables (from microscopic standpoint) from the process's outer behavior (macroscopic variables). To process with the causal graph, ten operators were defined to express the main interactions among the process variables. Those operators were then implemented using KHEOPS, an extended propositional logic based system. Tests were made on different fermentation processes. Two online expert systems which deal with real world problems are developed. ESA

N92-33103*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
DEVELOPMENT OF STATIC SYSTEM PROCEDURES TO STUDY AQUATIC BIOFILMS AND THEIR RESPONSES TO DISINFECTION AND INVADING SPECIES
G. A. SMITHERS Aug. 1992 17 p
(NASA-TM-103598; NAS 1.15:103598) Avail: CASI HC A03/MF A01

The microbial ecology facility in the Analytical and Physical Chemistry Branch at Marshall Space Flight Center is tasked with anticipation of potential microbial problems (and opportunities to exploit microorganisms) which may occur in partially closed systems such as space station/vehicles habitats and in water reclamation systems therein, with particular emphasis on the degradation of materials. Within this context, procedures for microbial biofilm research are being developed. Reported here is the development of static system procedures to study aquatic biofilms and their responses to disinfection and invading species. Preliminary investigations have been completed. As procedures are refined, it will be possible to focus more closely on the elucidation of biofilm phenomena. Author

N92-33181# California Univ., Davis.
NEUTRON SCATTER STUDIES OF CHROMATIN STRUCTURES RELATED TO FUNCTIONS
E. M. BRADBURY 1992 7 p
(Contract DE-FG03-88ER-60673)
(DE92-014032; DOE/ER-60673/T4) Avail: CASI HC A02/MF A01

We have made considerable progress in chromatin reconstitution with very lysine rich histone H1/H5 and in understanding the dynamics of nucleosomes. A ferromagnetic fluid was developed to align biological molecules for structural studies using small-angle-neutron-scattering. We have also identified and characterized an intrinsically bent DNA region flaking the RNA polymerase I binding site of the ribosomal RNA gene in Physarum Polycephalum. Projects in progress are in the areas of studying the interactions of histone H4 amino-terminus peptide 1-23 and acetylated 1-23 peptide with DNA using thermal denaturation; studying the GGAAT repeats found in human centromeres using high resolution Nuclear Magnetic Resonance and nuclease sentivity assay; and studying the role of histones and other sperm specific proteins with sperm chromatin. DOE

N92-33301# Pennsylvania Univ., Philadelphia. Dept. of Chemistry.
CHARACTERIZATION OF GLUCOSE MICROSENSORS SMALL ENOUGH FOR INTRACELLULAR MEASUREMENTS
TAKAYUKI ABE, YAU Y. LAU, and ANDREW G. EWING 22 Jan. 1992 22 p
(AD-A252954; TR-013) Avail: CASI HC A03/MF A01

Ultrasmall glucose sensors were constructed by using platinum deposited carbon ring microelectrodes with glucose oxidase. Response times as low as 270 ms were obtained with these sensors. Moreover, there is a linear relationship between sensor tip diameter and response times. The use of these sensors was demonstrated in the detection of glucose in a single cell cytoplasm of the large dopamine cell of the pond snail, Planorbis corneus. Current responses obtained at these sensors implanted into a cell increase following injection of 2 pL glucose solution (3 M) into the cell. Results obtained from these experiments show that these sensors are suitable for glucose monitoring in ultrasmall environments. In addition, characterization of these sensors was investigated under different O2 concentrations. At atmospheric oxygen concentrations, glucose levels in the submillimolar range can be measured without oxygen interference; however, oxygen interference can be substantial at low oxygen concentrations. GRA

N92-33465# Nottingham Univ. (England). Dept. of Life Science.
BIOLOGY AND TELESCIENCE
L. G. BRIARTY *In* ESA, Telescience for Space Experimentation in the Fields of Space Science, Life, Materials and Fluid Sciences and Earth and Environmental Sciences p 53-57 Mar. 1992
Copyright Avail: CASI HC A01/MF A02; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

The telescience testbed developed by ESA was used successfully to control an experiment on plant phototropism; the effects of delays and errors in the data stream, and the value of image compression were assessed. Telescience requirements for a proposed Eureca botany facility experiment are presented, together with suggestions for improvements of data handling facilities for life science experiments. ESA

N92-33563# Interface Foundation of North America, Inc., Fairfax Station, VA.
COMPUTING SCIENCE AND STATISTICS: PROCEEDINGS OF THE SYMPOSIUM ON THE TWENTY-THIRD INTERFACE CRITICAL APPLICATIONS OF SCIENTIFIC COMPUTING: BIOLOGY, ENGINEERING, MEDICINE AND SPEECH Final Report, 15 Mar. 1991 - 14 Mar. 1992
JON R. KETTENRING and ELAINE M. KERAMIDAS 1992 665 p Proceedings held in Seattle, WA, 21-24 Apr. 1991
(Contract DAAL03-91-G-0085)
(AD-A252938; ARO-28534.1-MA-CF) Avail: CASI HC A99/MF A06

The extremely successful workshop on Computational Molecular Biology featured world-renowned speakers. The workshop served as a focused example of the very real interface between biology, statistics, and computing science. Much of the success of a conference can be measured in terms of the number of attendees and the number of contributed talks, which, for this Symposium, were approximately 400 and 116, respectively. These Proceedings include 78 percent of the contributed papers and 65 percent of the invited papers that were given in Seattle - a more than adequate representation of the work presented at the Symposium. GRA

N92-33651# Technische Univ., Berlin (Germany). Fachbereich Physik.
FLUORESCENCE AND UV SPECTROSCOPIC EXAMINATIONS WITH PS-TIME RESOLUTION FOR SYSTEM 2 OF PHOTOSYNTHESIS Ph.D. Thesis [FLUORENSZENZ- UND UV-SPEKTROSKOPISCHE UNTERSUCHUNGEN MIT PS-ZEITAUFLOESUNG AM SYSTEM 2 DER PHOTOSYNTHESE]
JOHANNES BERNARDING 1991 172 p In GERMAN
(ETN-92-92129) Avail: CASI HC A08/MF A02

Determinations of ultraviolet absorption changes and fluorescence decay kinetics in a PS (Photon System) field were carried out for charge and energy transfer in PS2 enriched membrane fragments. A test impulse spectrometer was developed for measuring time resolved absorption changes in an ultraviolet field. The scanning pulse was produced by frequency doubling of a small part of the excitation beam. A model describing absorption changes after excitation, using laser pulses of various pulse energies, was developed. Strong continuous light from the visible spectral field led to various effects on both components of the fluorescence decay curve under aerobic and strongly reducing conditions. ESA

N92-33698*# Alabama A & M Univ., Normal. Dept. of Plant and Soil Science.
A PROPOSAL TO DEMONSTRATE PRODUCTION OF SALAD CROPS IN THE SPACE STATION MOCKUP FACILITY WITH PARTICULAR ATTENTION TO SPACE, ENERGY, AND LABOR CONSTRAINTS Annual Progress Report, 1 Jul. 1991 - 30 Jun. 1992
CAROLYN BROOKS 30 Jun. 1992 44 p
(Contract NCC2-607)
(NASA-CR-190575; NAS 1.26:190575) Avail: CASI HC A03/MF A01

This research has continued along two lines, one at Marshall Space Flight Center with Salad Machine Rack development and the design and construction of a mockup for placement in the Huntsville Space Station Freedom mockup. The second avenue of research has addressed issues of relevance to the operation of the Salad Machine and Bioregenerative systems. These issues include plant species compatibility when grown on shared hydroponic systems and microbial populations of mixed species hydroponic systems. Significant progress is reported. Author

N92-33747*# National Academy of Sciences - National Research Council, Washington, DC. Commission on Physical Sciences, Mathematics, and Applications.
BIOLOGICAL CONTAMINATION OF MARS: ISSUES AND RECOMMENDATIONS
1992 123 p
(Contract NASW-4627)
(NASA-CR-190819; NAS 1.26:190819) Avail: CASI HC A06/MF A02

The ad hoc Task Group on Planetary Protection formed by the Space Studies Board (SSB) of the National Research Council focused on making recommendations concerning the protection of Mars from forward contamination (i.e., Earth to Mars) during upcoming missions by both the United States and the former Soviet Union. In so doing, it distinguished between missions whose goals include reconnaissance and measurement and those that specifically include experiments to detect life. The task group also discussed what additional knowledge will be needed in order to assure that future recommendations regarding contamination of Earth from Mars might be made with a higher degree of certainty than is now possible. Following a short introduction to the rationale underlying planetary exploration (Chapter 1) is a brief summary of approved and contemplated missions to Mars (Chapter 2). Chapter 3 briefly reviews the state of knowledge in several areas pertinent to the problem of planetary protection, in the limits of life on Earth and the abilities of known terrestrial organisms to withstand extreme environment conditions, as well as new approaches to detecting life forms. Chapter 5 includes a review and comments (made in light of current knowledge)- on the recommendations made in 'Recommendations on Quarantine Policy for Mars, Jupiter, Saturn, Uranus, Neptune, and Titan'. Updates to the recommendations made in 1978 are also given in Chapter 5. Chapter 6 gives additional recommendations concerning collection of essential data, spacecraft sterilization and bioburden assessment, and future research, as well as legal and social issues and NASA's overall planetary protection program. I.I.C.

N92-33863# Nagoya Univ. (Japan). Dept. of Aerospace Physiology.
RESULT OF AIRCRAFT EXPERIMENTS
SATORU WATANABE *In* Science and Technology Agency, The 14th Space Station Utilization Workshop in Japan p 141-146 21 Jan. 1992 In JAPANESE
Avail: CASI HC A02/MF A02

Airborne experiments were conducted on biological system phenomena under microgravity conditions. The effect of gravity change on the vestibular apparatus in goldfish was examined. Negative reaction to light, in microgravity conditions, was also examined. One fish had its vestibular apparatus removed and the other did not. The latter always swam with its back directed upward (0 deg) when illuminated from above, but it swam with its back directed at an angle (20 to 30 deg) when illuminated from the side (90 deg). The former laid down with its back directed toward the light. Normal goldfish took an attitude called diving response (head down) in microgravity, but diving response was not observed in the fish that had undergone removal of the vestibular apparatus. Fish which returned to normal swimming after the operation showed diving response, though they had no vestibular apparatus, making it clear that diving response is not caused by said organ. Author (NASDA)

N92-33978# California Univ., Los Angeles.
CARBON DIOXIDE AND THE STOMATAL CONTROL OF WATER BALANCE AND PHOTOSYNTHESIS IN HIGHER PLANTS
1992 7 p
(Contract DE-FG03-90ER-20011)
(DE92-016530; DOE/ER-20011/T1) Avail: CASI HC A02/MF A01

Research continued into the investigation of the effects of carbon dioxide on stomatal control of water balance and photosynthesis in higher plants. Topics discussed this period include a method of isolating a sufficient number of guard cell chloroplasts for biochemical studies by mechanical isolation of epidermal peels; the measurement of stomatal apertures with a digital image analysis system; development of a high performance liquid chromatography method for quantification of metabolites in guard cells; and genetic control of stomatal movements in Pima cotton. DOE

N92-33995# European Space Agency, Paris (France).
EXOGENOUS AND ENDOGENOUS CONTROL OF ACTIVITY BEHAVIOUR AND THE FITNESS OF FISH Ph.D. Thesis - Cologne Univ. [DIE EXOGENE UND ENDOGENE STEUERUNG DES AKTIVITAETSVERHALTENS UND DIE LEISTUNGSFAEHIGKEIT VON FISCHEN]
DIETER SEIBT (Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Cologne, Germany, F.R.) Apr. 1992 156 p Transl. into ENGLISH of Die Exogene und Endogene Steuerung des Aktivitaetsverhaltens und die Leistungsfaehigkeit von Fischen (Cologne, Fed. Republic of Germany, DLR), 1990 161 p Original language document was announced as N90-29766
(ESA-TT-1221; DLR-FB-90-14; ETN-92-91962) Avail: CASI HC A08/MF A02; DLR, Wissenschaftliches Berichtswesen, Postfach 90 60 58, 5000 Cologne, Fed. Republic of Germany, HC

The activity behavior of goldfish was examined under various light conditions. Under LL and DD only a few indications of endogenous components were found. In most cases the behavior was random and could be characterized by its exponential functions. LD (Light/Darkness) cycles differing from 24 hours demonstrated the influence of the exogenous factors in activity. The dorsal light reation of the guppy was used for a fitness and performance test. Fish were vertically arranged and thus light orientation was separated from gravity orientation. Quality precision and speed of the orientation reactions after changes in the angle of incident light were measured and the reactions examined for periodical variations. ESA

N92-34004# Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H., Vienna.
EXAMINATION OF NITROGEN FIXATION BY LEGUMINOSES AND ITS SECONDARY EFFECT ON GRAINS USING N-15 [UNTERSUCHUNG DER STICKSTOFFIXIERUNG DURCH LEGUMINOSEN UND DEREN NACHWIRKUNG AUF GETREIDE MITTELS 15N]
MOHAMED K. ELWARAKY (Agricultural Research Station, Mallawy, Egypt) and ERNST HAUNOLD May 1991 9 p Repr. from VDLUFA-Schriftenreihe 30 (Bayreuth, Fed. Republic of Germany), 1990 p 135-140 In GERMAN Presented at the 101th Verband Deutscher Landwirtschaftlicher Untersuchungs- und Forschungsanstalten Ordnungsgemaesse Landwirtschaft, Bayreuth, Fed. Republic of Germany, 18-23 Sep. 1989
(OEFZS-4580; ETN-92-91339) Copyright Avail: CASI HC A02/MF A01

The leguminoses showed the greatest nitrogen fixation at low

supply of manure nitrogen. The fixed air nitrogen amounted to 95 percent in beans, 86 percent in peas, and 65 percent in barley, as related to the total nitrogen. The fixation efficiency dropped with increasing manure, and the manure nitrogen absorption rose. The secondary effects of fixed air nitrogen on spring wheat led to an increase on efficiency of 68, 66, and 47 percent for peas, beans, and barley, respectively, with regard to spring barley spring wheat crop rotation. ESA

N92-34138# Norwegian Defence Research Establishment, Kjeller.
AUTONOMIC CHOLINERGIC NEUROTRANSMISSION IN THE RESPIRATORY SYSTEM: EFFECT OF ORGANOPHOSPHATE POISONING AND ITS TREATMENT Ph.D. Thesis - Oslow Univ., 1991
PER WALDAY 20 May 1992 105 p
(Contract DAMD17-87-G-7004) (ISSN 0800-4412)
(NDRE/PUBL-92/1002) Avail: CASI HC A06/MF A02

The present study has shown that the organophosphate anticholinesterase soman inhibits the acetylcholinesterase (AChE), butyrylcholinesterase (BuChE), and carboxylesterase (CarbE) activities in the respiratory system in vitro (rat and guinea pig) and in vivo after inhalation exposure (rat). The rat and guinea pig in vitro brochial smooth muscle response, and the rat ex vivo tracheal response to nerve-mediated stimulation, were substantially inhibited by soman. This was probably due to an increased basal tone of the smooth muscle, induced by decreased inactivation and subsequent accumulation of acetylcholine (ACh) in the neuroeffector junctions. In vitro bronchial contractions induced by histamine in guinea pig were, however, not affected by soman, indicating that soman does not affect the airway smooth muscle itself but only the cholinergic system. During inhalation with soman, CarbE both in the respiratory system and plasma may function as a detoxifying scavenger. Author

N92-34229* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
THREE-DIMENSIONAL CO-CULTURE PROCESS Patent
DAVID A. WOLF, *inventor (to NASA)* and THOMAS J. GOODWIN, inventor (to NASA) 6 Oct. 1992 6 p Filed 2 Mar. 1989 Supersedes N90-18852 (28 - 11, p 1538) Continuation-in-part of US-Patent-Appl-SN-213558, filed 30 Jun. 1988 and continuation-in-part of US-Patent-Appl-SN-213559, filed 30 Jun. 1988 and continuation-in-part of US-Patent-Appl-SN-317776, filed 2 Mar. 1989
(NASA-CASE-MSC-21560-1; US-PATENT-5,153,132;
US-PATENT-APPL-SN-317931; US-PATENT-APPL-SN-213558;
US-PATENT-APPL-SN-213559; US-PATENT-APPL-SN-317776;
US-PATENT-CLASS-435-240.24; US-PATENT-CLASS-435-3;
US-PATENT-CLASS-435-240.25; US-PATENT-CLASS-435-286)
Avail: US Patent and Trademark Office

The present invention relates to a 3-dimensional co-culture process, more particularly to methods or co-culturing at least two types of cells in a culture environment, either in space or in unit gravity, with minimum shear stress, freedom for 3-dimensional spatial orientation of the suspended particles and localization of particles with differing or similar sedimentation properties in a similar spatial region to form 3-dimensional tissue-like structures. Several examples of multicellular 3-dimensional experiences are included. The protocol and procedure are also set forth. The process allows simultaneous culture of multiple cell types and supporting substrates in a manner which does not disrupt the 3-dimensional spatial orientation of these components. The co-cultured cells cause a mutual induction effect which mimics the natural hormonal signals and cell interactions found in the intact organism. This causes the tissues to differentiate and form higher 3-dimensional structures such as glands, junctional complexes polypoid geometries, and microvilli which represent the corresponding in-vitro structures to a greater degree than when the cell types are cultured individually or by conventional processes. This process was clearly demonstrated for the case of two epithelial derived colon cancer lines, each co-cultured with normal human fibroblasts and with microcarrier bead substrates. The results clearly demonstrate increased 3-dimensional tissue-like structure and biochemical evidence of an increased differentiation state. With the present invention a variety of cells may be co-cultured to produce tissue which has 3-dimensionality and has some of the characteristics of in-vitro tissue. The process provides enhanced 3-dimensional tissue which create a multicellular organoid differentiation model.
Official Gazette of the U.S. Patent and Trademark Office

N92-34231* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
THREE-DIMENSIONAL CELL TO TISSUE ASSEMBLY PROCESS Patent
DAVID A. WOLF, inventor (to NASA), RAY P. SCHWARZ, inventor (to NASA), MARIAN L. LEWIS, inventor (to NASA), JOHN H. CROSS, inventor (to NASA), and MARY H. HULS, inventor (to NASA) 13 Oct. 1992 16 p Filed 2 Mar. 1989 Supersedes N91-13860 (29 - 5, p 693) Continuation-in-part of US-Patent-Appl-SN-213558, filed 30 Jun. 1988 and continuation-in-part of US-Patent-Appl-SN-213559, filed 30 Jun. 1988
(NASA-CASE-MSC-21559-1; US-PATENT-5,155,034;
US-PATENT-APPL-SN-317776; US-PATENT-APPL-SN-213558;
US-PATENT-APPL-SN-213559; US-PATENT-CLASS-435-240.24;
US-PATENT-CLASS-435-3; US-PATENT-CLASS-435-240.25;
US-PATENT-CLASS-435-286; US-PATENT-CLASS-435-312)
Avail: US Patent and Trademark Office

The present invention relates a 3-dimensional cell to tissue and maintenance process, more particularly to methods of culturing cells in a culture environment, either in space or in a gravity field, with minimum fluid shear stress, freedom for 3-dimensional spatial orientation of the suspended particles and localization of particles with differing or similar sedimentation properties in a similar spatial region. Official Gazette of the U.S. Patent and Trademark Office

N92-34232* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
HIGH ASPECT REACTOR VESSEL AND METHOD OF USE Patent
DAVID A. WOLF, inventor (to NASA), CLARENCE F. SAMS, inventor (to NASA), and RAY P. SCHWARZ, inventor (to NASA) 6 Oct. 1992 10 p Filed 11 Dec. 1990 Supersedes N91-17531 (29 - 3, p 313)
(NASA-CASE-MSC-21662-1; US-PATENT-5,153,131;
US-PATENT-APPL-SN-625345; US-PATENT-CLASS-435-240.240;
US-PATENT-CLASS-435-284; US-PATENT-CLASS-435-286;
US-PATENT-CLASS-435-311; US-PATENT-CLASS-435-312;
US-PATENT-CLASS-435-313; US-PATENT-CLASS-435-315)
Avail: US Patent and Trademark Office

An improved bio-reactor vessel and system useful for carrying out mammalian cell growth in suspension in a culture media are presented. The main goal of the invention is to grow and maintain cells under a homogeneous distribution under acceptable biochemical environment of gas partial pressures and nutrient levels without introducing direct agitation mechanisms or associated disruptive mechanical forces. The culture chamber rotates to maintain an even distribution of cells in suspension and minimizes the length of a gas diffusion path. The culture chamber design is presented and discussed.
Official Gazette of the U.S. Patent and Trademark Office

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AEROSPACE MEDICINE

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

A92-53739
RELATIONS BETWEEN CARDIAC FUNCTION AND BODY TILTING ANGLE

MASAMICHI SUDOH, SACHIO IKAWA, KENJI KAWAKAMI, MASATOSHI SHIOTA, KUNINOBU YOKOTA, and YOSHIO HONDA (Jikei University, Tokyo, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2047-2052. refs
Copyright

The head-up and head-down position of 28 healthy males were changed while changes were conducted in stroke volume, heart rate, transthoracic impedance, and systolic and diastolic blood pressure (DBP). Mean arterial pressure (MAP), pulse pressure, and total peripheral resistance were also calculated. While there were almost no changes in blood pressure in the head-down tilt, head-up tilting led to changes in DBP, heart rate, and MAP. Stroke volume and cardiac output increased with downtilt and decreased with uptilt. O.C.

A92-53740
CHANGE OF SKIN BLOOD FLOW BY BODY TILTING
KENJI KAWAKAMI, MASAMICHI SUDOH, TAKAO SHIMADA, YUTAKA MORI, MASATOSHI SHIOTA, and SACHIO IKAWA (Jikei University, Tokyo, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2053-2058. refs
Copyright

Radionuclide methods were used to study the effect of body tilt on the hemodynamics of the human body's lower limbs. While decreased skin blood flow in the head-up position was associated with a decrease of total limb flow, skin blood flow in the head-down position decreased despite the enhancement of total limb flow. The peripheral-perfusion resistance was also increased in the head-up position; regulation in the cutaneous hemodynamics may be different from that in the systemic circulation. O.C.

A92-53741
EFFECTS OF PASSIVE ANGULAR BODY MOVEMENT ON SOLEUS H-REFLEX IN HUMANS
CENYO MITARAI (Chukyo University, Toyota, Japan) and MITSUHIRO KOEDA IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2059-2063. refs
Copyright

The purpose of this experiment was to investigate influence of semicircular canal inputs on the activity of the lumbo-sacral motoneuron pool in humans. The rotating chair was used for preferred stimulation of the lateral semicircular canal, and the amplitude modification of the soleus H-reflex by rotation was observed. The results obtained from eighteen healthy young male subjects showed that the H-reflex was suppressed, without any exception, by exposing to both acceleration and deceleration. The suppression was a function of the exposure time as well as of the intensity of acceleration. From these results, it was suggested that sensory inputs from the semicircular canal exert inhibitory effect on the spinal motoneuron of lower limb; these effects are mediated through the vestibulo-reticulo-spinal tracts. Author

A92-53742
CHARACTERISTIC CHANGE OF MUSCULAR SYNERGY DURING ISOMETRIC CONTRACTION UNDER WEIGHTLESSNESS SIMULATED BY WATER IMMERSION
YASUHIRO SUGAJIMA (Chukyo University, Toyota, Japan) and GENYO MITARAI IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 2065-2069. refs
Copyright

The present study examines whether muscle relaxation under weightlessness results in changes of synergetic activities in the joint muscle groups of lower limbs during voluntary contraction. The subjects were healthy male volunteers. During water immersion (WI), electromyogram discharges became less and it was specially noticed that the rate of increase following increase of contraction force changed in each muscle compared with those without WI. It was found that large transient spikes appeared under WI. The results suggested that the synergy of muscle groups was changed by weightlessness. Author

A92-54547
MENTAL STRESS AND COGNITIVE PERFORMANCE DO NOT INCREASE OVERALL LEVEL OF CEREBRAL O2 UPTAKE IN HUMANS
PETER L. MADSEN, JES F. SCHMIDT, SOREN HOLM, HENRIK JORGENSEN, GORDON WILDSCHIODTZ, NIELS J. CHRISTENSEN, LARS FRIBERG, SISSEL VORSTRUP, and NIELS A. LASSEN (Bispebjerg Hospital; State University Hospital, Copenhagen; Copenhagen County University Hospital, Glostrup; Herlev University Hospital, Denmark) Journal of Applied Physiology (ISSN 8750-7587), vol. 73, no. 2, Aug. 1992, p. 420-426. Research supported by Danish Medical Research Council. refs
Copyright

A92-54726* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EFFECTS OF GRAVITOINERTIAL FORCE VARIATIONS ON OPTOKINETIC NYSTAGMUS AND ON PERCEPTION OF VISUAL STIMULUS ORIENTATION
GILLES CLEMENT (CNRS, Laboratoire de Physiologie Neurosensorielle, Paris, France), MILLARD F. RESCHKE, CAROL M. VERRETT, and SCOTT J. WOOD (NASA, Johnson Space Center, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 9, Sept. 1992, p. 771-777. refs
(Contract CNES-1246-520231; NAS9-18128)
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Recordings of horizontal and vertical eye movement were obtained with subjects exposed to vertical, horizontal, and oblique optokinetic stimulation during parabolic flight. When the optokinetic stimulation was vertical, the upward slow phase eye velocity increased increased during transition from high force level to free-fall, and decreased during transition from free-fall to high force level. During optokinetic stimulation in the horizontal and oblique plane, the gravitoinertial forces of parabolic flight induced changes in the velocity of the vertical component of the eye movements, and, therefore, changes in the plane of the eye movements. Some subjects also preceived modifications in the apparent orientation of the visual motion. These findings are in agreement with previous observations on the presence of a vertical nystagmus induced by changes in plane vertical acceleration. They also suggest a close interaction of reflexive eye movements induced by graviceptor inputs and visual inputs for visual stabilization during variations of gravitoinertial force level. Author

A92-54727* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EFFECTS OF MICROGRAVITY ON THE INTERACTION OF VESTIBULAR AND OPTOKINETIC NYSTAGMUS IN THE VERTICAL PLANE
GILLES CLEMENT (CNRS, Laboratoire de Physiologie Neurosensorielle, Paris, France), SCOTT J. WOOD, and MILLARD F. RESCHKE (NASA, Johnson Space Center, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 9, Sept. 1992, p. 778-784. refs
(Contract CNES-1246-520231; NAS9-18128)
Copyright

The extent to which the slow phase velocity (SPV) of nystagmus elicited by a vertical optokinetic stimulation with constant velocity could be modulated by sinusoidal angular motion in the vertical plane was investigated under normal gravity condition and during the microgravity period of parabolic flight. In normal gravity, when the angular head motion and the optokinetic stimulation were in the same direction, the peak SPV was slower than the velocity of the optokinetic display. When the head motion and the optokinetic stimulation were in opposite directions, the peak SPV was equal to the velocity of the optokinetic display. In microgravity, the peak

SPV was approximately equal to the velocity of the optokinetic display when head rotation and optokinetic stimulation were in the same direction, and was faster than the velocity of the optokinetic dispaly when head rotation and optokinetic stimulation were in opposite directions. In addition, the interaction of vestibular and optokinetic nystagmus was found to be nonlinear in microgravity, especially when the optokinetic stimulation was directed downward. These results suggest an interaction between the vestibular and the optokinetic systems modulated as a function of the gravitational state, and support the observation that visual input is more effective in reducing sensory conflict experienced in microgravity. Author

A92-54728 National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
ATTENUATION OF HUMAN CAROTID-CARDIAC VAGAL BAROREFLEX RESPONSES AFTER PHYSICAL DETRAINING
VICTOR A. CONVERTINO (NASA, Kennedy Space Center, Cocoa Beach, FL) and JANICE M. FRITSCH (NASA, Johnson Space Center, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 9, Sept. 1992, p. 785-788. refs
Copyright

Astronauts who are occupied with prelaunch schedules may have to limit their regular physical exercise routines. To assess a potential effect on blood pressure control, carotid baroreceptor-cardiac reflex responses of 16 men were evaluated before and after two weeks of exercise detraining that followed ten weeks of regular scheduled exercise (30 min/d, 4 d/week at 75 percent V(O2) max). After detraining, the baroreflex stimulus-response relationship had a reduced slope 0.4 msec/mmHg and range of response. In addition, there was a resetting of the relationship on the R-R interval axis. Both the minimum and maximum R-R interval responses to the stimulus were significantly reduced after detraining. Baseline systolic pressure did not change with detraining, and the carotid baroreceptor-cardiac response relationship did not shift on the pressure axis. These results suggest that detraining from regular exercise can compromise vagally-mediated mechanisms of blood pressure regulation. Author

A92-54729* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
CHANGES IN LEG VOLUME DURING MICROGRAVITY SIMULATION
WILLIAM E. THORNTON (NASA, Johnson Space Center, Houston, TX), VICKIE HEDGE, EUGENE COLEMAN (Houston, University, TX), JOHN J. URI (GE Government Services, Houston, TX), and THOMAS P. MOORE (Minnesota, University, Minneapolis) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 9, Sept. 1992, p. 789-794. refs
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Little published information exists regarding the magnitude and time course of cephalad fluid shift resulting from microgravity simulations. Six subjects were exposed to 150 min each at horizontal bed rest, 6-deg head-down tilt, and horizontal water immersion. Fluid shift was estimated by calculating leg volumes from eight serial girth measurements from groin to ankle before, during, and after exposure. Results were compared with data from the first 3 h of spacecraft. By the end of exposure, total leg volume for the six subjects decreased by 2.6 +/- 0.8 percent, 1.7 +/- 1.2 percent, and 4.0 +/- 1.6 percent for horizontal, head-down, and immersion, respectively. Changes had plateaued for horizontal and head-down and had slowed for immersion. Relatively more fluid was lost from the lower leg than the thigh for all three conditions, particularly head-down. During the first 3 h of spaceflight, total leg volume decreased by 8.6 percent, and relatively more fluid was lost from the thigh than the lower leg. The difference in volume changes in microgravity and simulated microgravity may be caused by the small transverse pressures still present in ground-based simulations and the extremely nonlinear compliance of tissue. Author

A92-54730
THE CHARACTERISTICS AND SIGNIFICANCE OF INTRATHORACIC AND ABDOMINAL PRESSURES DURING QIGONG (Q-G) MANEUVERING
SHU-XIA ZHANG, HONG-ZHANG GUO, BAI-SHENG JING, and SONG-FENG LIU (Air Force, Institute of Aviation Medicine, Beijing, China) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 9, Sept. 1992, p. 795-801. refs
Copyright

In order to investigate the mechanism of raising the blood pressure by the Qigong (Q-G) maneuver, the changes of esophageal and gastric pressures were determined during this maneuver, and the data were compared with those from the L-1 maneuver. Eight subjects performed the Q-G maneuver at +1 Gz; their esophageal pressures (mean +/- S.D.) were -6.7 +/- 2.1 mm Hg in the inspiratory phase and 0.1 +/- 3.7 mm Hg in the expiratory phase; intragastic pressures were 69.5 +/- 20.2 mm Hg and 63.4 +/- 22.6 mm Hg, respectively. In 22 centrifuge runs at + 4.0 to 7.5 Gz and during Q-G maneuvering, five subjects had esophageal pressures of -9.0 +/- 3.3 mm Hg in the inspiratory phase and 1.6 +/- 7.2 mm Hg in the expiratory phase, and gastric pressures of 140.6 +/- 23.2 mm Hg and 138.7 +/- 29.5 mm Hg, respectively. The results showed that, during Q-G maneuvering, even with a high-G load, the thoracic pressure remained negative or at low pressures while gastric pressures were remarkably raised. They both fluctuated little during respiration; therefore, a relatively large and constant pressure gradient between abdominal and thoracic pressures was maintained. Here lies the significant characteristic of blood pressure raising by th Q-G maneuver. Author

A92-54731
COMPARISON OF PARACHUTE LANDING INJURY INCIDENCE BETWEEN STANDARD AND LOW POROSITY PARACHUTES
JAMES P. BAGIAN (USAF, 939th Air Rescue Wing, Portland, OR) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 9, Sept. 1992, p. 802-804. refs
Copyright

This study compared the incidence of overall landing injury and landing injury by parachute type in 8706 jumps over three years between 1988 and 1990 between a standard porosity round canopy and a lower sink rate low porosity round canopy. In all cases, the low porosity parachute group experienced significantly ($p = 0.007$) fewer overall injuries and fewer injuries of every type (reductions of 77 percent in 1988, 81 percent in 1989, and 94 percent in 1990). Reduction of sink rate by even small amounts correlates with significant injury incidence reductions on the basis of reduced kinetic energy dissipation. Author

A92-54733
WOMEN IN THE FAST JET COCKPIT - AEROMEDICAL CONSIDERATIONS
TERENCE J. LYONS (USAF, Armstrong Laboratory, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 9, Sept. 1992, p. 809-818. refs
Copyright

The physical, physiologic, and medical aspects pertinent to the role of women in military aviation are reviewed on the basis of literature data for the period between 1966 and 1991. It was found that gender differences were minor: women may be more susceptible to motion sickness, radiation, and decompression sickness than men, but may be more resistant to cold water immersion and altitude sickness. It is shown that, when allowance is made for the size, strength, and fitness of each subject, gender differences in work performance, G tolerance, heat stress, and injury rate disappear. It is concluded that aeromedical selection criteria can address individual characteristics without reference to gender, with the exception of the possibility of fetal damage in the early stages of pregnancy. I.S.

A92-54734* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A COMPUTERIZED DATABANK OF DECOMPRESSION SICKNESS INCIDENCE IN ALTITUDE CHAMBERS
JOHNNY CONKIN (New York, State University, Buffalo), SHARON R. BEDAHL (NASA, Johnson Space Center, Houston, TX), and HUGH D. VAN LIEW (New York, State University, Buffalo) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 9, Sept. 1992, p. 819-824. refs
Copyright

This report describes a hypobaric decompression sickness databank (HDSD) for use with personal computers. The databank consolidates some of the decompression sickness (DCS) information that has accumulated from altitude chamber tests from 1942 to the present. The information was transcribed to a data collection form, screened for accuracy and duplication, and then added to the databank through a computer keyboard. The databank consists of two files; 63 fields contain details of the test conditions in the altitude chamber, the outcome of the test in terms of DCS and venous gas emboli, the physical characteristics of the group of subjects who underwent the test, and the denitrogenation procedures prior to decompression. The HDSD currently contains 378 records that represent 130,012 altitude exposures from 80 sources: scientific journal articles, government and contractor reports, and chapters from books. Author

A92-54949
MINOR CONSTITUENTS IN THE MARTIAN ATMOSPHERE FROM THE ISM/PHOBOS EXPERIMENT
J. ROSENQVIST, P. DROSSART, M. COMBES, T. ENCRENAZ, E. LELLOUCH (Paris, Observatoire, Meudon, France), J. P. BIBRING, S. ERARD, Y. LANGEVIN (Paris XI, Universite, Orsay, France), and E. CHASSEFIERE (CNRS, Service d'Aeronomie, Verrieres-le-Buisson, France) Icarus (ISSN 0019-1035), vol. 98, no. 2, Aug. 1992, p. 254-270. refs
Copyright

ISM has provided a great deal of information on CO and H2O constituents and surface materials on Mars. The CO mixing ratio has been observed to lie between 5 and 9 x 10 exp -4 above low-altitude regions, which is consistent with ground-based measurements. If CO is wholly responsible for the variations of the 2.35-micron feature observed over the Great Martian Volcanoes, a depleted value of the CO mixing ratio by a mean factor of 3 has been measured over these high-altitude ratios. It is noted that orography should play a major role in the existence of the CO 'hole'. However, if these spectral variations at 2.35 microns are due to a surface mineral, the fraction of the surface covered by this mineral must vary smoothly with altitude, which implies a strong interaction between the surface and the atmosphere. L.M.

A92-55068
MOUNTAIN SICKNESS
CHARLES S. HOUSTON Scientific American (ISSN 0036-8733), vol. 267, no. 4, Oct. 1992, p. 58, 60-62, 66. refs
Copyright

Altitude-related sicknesses are described that are often characterized as pneumonia but are actually high-altitude pulmonary edema and related illnesses. The affliction is shown to be related to hypoxia, so a survey of hypoxia and related altitude illnesses is conducted to yield insights into the process of acclimatization. The physiological effects and symptoms of hypoxia are listed, and methods for alleviation are given which are based generally on descent. High-altitude pulmonary edema generally occurs above about 9,000 feet and is characterized by shortness of breath, severe cough, and fever. High-altitude cerebral edema and chronic mountain sickness can occur at higher altitudes and can lead to mental confusion and increases in red blood cell count. Some pharmacological products are available to counteract these effects, but more research regarding hypoxia could lead to an enhanced understanding of physiological complications caused by high-altitude flight. C.C.S.

A92-55692*
MAGNETIC RESONANCE IMAGING AS A TOOL FOR EXTRAVEHICULAR ACTIVITY ANALYSIS
R. DICKENSON, C. LORENZ, S. PETERSON, A. STRAUSS, and J. MAIN (Vanderbilt University, Nashville, TN) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. Research supported by NASA and National Space Grant College and Fellowship Program. refs
(IAF PAPER 92-0254) Copyright

The purpose of this research is to examine the value of magnetic resonance imaging (MRI) as a means of conducting kinematic studies of the hand for the purpose of EVA capability enhancement. After imaging the subject hand using a magnetic resonance scanner, the resulting 2D slices were reconstructed into a 3D model of the proximal phalanx of the left hand. Using the coordinates of several landmark positions, one is then able to decompose the motion of the rigid body. MRI offers highly accurate measurements due to its tomographic nature without the problems associated with other imaging modalities for in vivo studies. Author

A92-55693 National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EFFECTS OF MICROGRAVITY ON RENAL STONE RISK ASSESSMENT
R. A. PIETRZYK (Krug Life Sciences, Inc., Houston, TX), C. Y. C. PAK (Texas, University, Dallas), N. M. CINTRON, and P. A. WHITSON (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 5 p. Research supported by NASA.
(Contract RTOP 199-18-11-02)
(IAF PAPER 92-0257)

Physiologic changes induced during human exposure to the microgravity environment of space may contribute to an increased potential for renal stone formation. Renal stone risk factors obtained 10 days before flight and immediately after return to earth indicated that calcium oxalate and uric acid stone-forming potential was increased after space flights of 4-10 days. These data describe the need for examining renal stone risk during in-flight phases of space missions. Because of limited availability of space and refrigerated storage on spacecraft, effective methods must be developed for collecting urine samples in-flight and for preserving (or storing) them at temperatures and under conditions commensurate with mission constraints. Author

A92-55694
BLOOD VOLUME REGULATING HORMONES RESPONSE DURING TWO SPACE RELATED SIMULATION PROTOCOLS - 4-WEEK CONFINEMENT AND HEAD-DOWN BED-REST
A. MAILLET, G. GAUQUELIN (Lyon I, Universite, France), H. C. GUNGA (Berlin, Freie Universitaet, Germany), J. O. FORTRAT (Lyon I, Universite, France), K. KIRSCH (Berlin, Freie Universitaet, Germany), A. GUELL (MEDES, Toulouse, France), CH. A. BIZOLLON (Hopital Cardiologique, Bron, France), and C. GHARIB (Lyon I, Universite, France) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. Research supported by CNES. refs
(Contract DRET-87-056; DRET-89-237)
(IAF PAPER 92-0258) Copyright

The volume regulating hormones (renin, aldosterone, arginine vasopressin and atrial natriuretic factor), electrolytes and creatinine concentrations, and the blood pressure were measured in two 4-week different experimental protocols: a 6-deg head-down bed-rest (5 subjects) and a confinement (6 subjects). We observed a significant increase (p less than 0.01 at D2 vs. D-5) of systolic blood pressure during confinement and a different level of response for some hormones, especially for arginine vasopressin (300 percent increase during confinement instead of 50 percent during bed-rest). The renin-angiotensin-aldosterone system was enhanced during confinement and head-down bed-rest. In both conditions, we obtained a similar pattern of response for blood volume regulating hormones. During confinement, two main factors were inactivity and stress activation of the sympathetic nervous system.

In bed-rest study the response is principally due to the fluid shift and blood volume adaptation but it is not possible to exclude the role of inactivity and stress. Author

A92-55695* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ACUTE LEG VOLUME CHANGES IN WEIGHTLESSNESS AND ITS SIMULATION
WILLIAM E. THORNTON (NASA, Johnson Space Center, Houston, TX), JOHN J. URI (GE Government Services; NASA, Johnson Space Center, Houston, TX), VICKIE HEDGE, EUGEN COLEMAN (Houston, University; NASA, Johnson Space Center, Houston, TX), and THOMAS P. MOORE (Minnesota, University, Minneapolis; NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 8 p. refs
(IAF PAPER 92-0259)

Leg volume changes were studied in six subjects during 150 min of horizontal, 6 deg headdown tilt and supine immersion. Results were compared to previously obtained space flight data. It is found that, at equivalent study times, the magnitude of the leg volume changes during the simulations was less than one half that seen during space flight. Relative and absolute losses from the upper leg were greater during space flight, while relative losses were greater from the lower leg during simulations. O.G.

A92-55698* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
CHANGES IN RENAL FUNCTION AND FLUID AND ELECTROLYTE REGULATION IN SPACE FLIGHT
C. S. LEACH (NASA, Johnson Space Center, Moffett Field, CA) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 3 p. refs
(IAF PAPER 92-0256)

The cephalad fluid redistribution resulting from weightlessness has a number of physiologic consequences. Plasma volume is reduced soon after weightlessness is reached, and red blood cell mass reduction follows. Plasma atrial natriuretic peptide, which inhibits aldosterone secretion, was elevated during space flight while plasma aldosterone was below preflight levels. Serum sodium was also reduced and potassium was elevated. Antidiuretic hormone (ADH) was markedly elevated at almost all measurement times in the first eight days of flight, but plasma volume did not return to preflight levels. Author

A92-55699
INFLIGHT INVESTIGATION OF FLUID SHIFT DYNAMICS WITH A NEW METHOD IN ONE COSMONAUT
H. G. HINGHOFER-SZALKAY, E. M. KOENIG, G. SAUSENG-FELLEGGER (Graz, Universitaet, Austria), V. B. NOSKOV, and A. I. GRIGOR'EV (Institute of Biomedical Problems, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 4 p. Research supported by BMFWF. refs
(IAF PAPER 92-0260) Copyright

Results of the Body Fluids experiment conducted during the Austrian-Soviet Austromir mission are reviewed. The objective of the experiment was to study fluid exchange between blood and extravascular space preflight (supine), inflight, and postflight (supine) by using lower body suction (LBNP) as a tool to induce venous pooling in the legs. The sound velocity (SV) technique was used to detect blood/plasma protein concentration changes. It is found that the LBNP-induced SV increase in blood and plasma on the 6th day in weightlessness is only slight as compared with control (1 g) conditions. This result is attributed to an adaptive change in the hemoconcentration response to lower body suction after few days in microgravity. V.L.

A92-55700* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
CARDIOVASCULAR ORTHOSTATIC FUNCTION OF SPACE SHUTTLE ASTRONAUTS DURING AND AFTER RETURN FROM ORBIT
JOHN B. CHARLES and MICHELE M. JONES (Space Biomedical Research Institute; Krug Life Sciences, Inc.; NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 8 p. refs
(IAF PAPER 92-0262) Copyright

Routine entry, landing, and seat egress after Space Shuttle flights is observed to be associated with drops in blood pressure and increases in heart rate that indicate that the cardiovascular system is performing at its maximum capacity in a large fraction (30 percent) of the study population. It is not apparent that adequate cardiovascular reserve capacity remains to accommodate unaided emergency egress after either current or extended space flights. L.M.

A92-55701* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
INVESTIGATIONS OF THE MECHANISMS BY WHICH LOWER BODY NEGATIVE PRESSURE (LBNP) IMPROVES ORTHOSTATIC RESPONSES
S. M. FORTNEY, L. STEINMANN, L. DUSSACK, M. WOOD, N. CINTRON, and P. WHITSON (NASA, Johnson Space Center; Krug International Corp., Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 12 p. refs
(IAF PAPER 92-0263)

Saline ingestion during LBNP is a counter measure proposed to improve orthostatic function during space flight. To understand the mechanism(s) responsible for this effect, body fluid, endocrine, and orthostatic responses (graded LBNP tests) were measured during bed rest (BR) and after 2 hr and 4 hr LBNP/saline treatments (-30 mm Hg and 1 liter of isotonic saline). PV (from I-125 and hematocrit measurements) decreased during BR but was restored to the pre-bed rest level (3157 +/- 161 ml) 20 hrs after both 2 hr (3109 +/- 146 ml) and 4 hr (3144 +/- 173 ml) LBNP. The heart rate response to graded LBNP tests was significantly improved after the 4 hr, but not after the 2 hr treatment. These results suggest PV expansion may be responsible for some improvement in orthostatic responses, but other mechanisms also must contribute. Author

A92-55702* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AN EVALUATION OF THE LOWER COVERAGE ANTI-G SUIT WITHOUT AN ABDOMINAL BLADDER AFTER 3 DAYS OF 7 DEG HEAD DOWN TILT
B. J. STEGMANN, R. W. KRUTZ (Krug International Corp., San Antonio, TX), R. R. BURTON (USAF, Armstrong Laboratory, Brooks AFB, TX), and C. F. SAWIN (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 5 p. Research supported by USAF. refs
(IAF PAPER 92-0264)

Twelve healthy male subjects were initially deconditioned by 3 days of 7 deg head down tilt bed rest followed by donning the reentry anti-G suit and being centrifuged using a simulated Shuttle reentry profile. For 6 of the 12 subjects, anti-G suit pressure was increased in 0.5 psig increments if eye level blood pressure dropped below 70 mmHg. The second half of the subjects had their G-suits inflated in 0.5 psig increments if they reported 50 percent peripheral light dimming. Results show that the maximum allowable pressure for either exposure was 2.5 psig, which is the operational limit of the Shuttle anti-G suit controller. O.G.

A92-55703* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
THERAPEUTIC EFFECTIVENESS OF MEDICATIONS TAKEN DURING SPACEFLIGHT
SAM L. POOL and LAKSHMI PUTCHA (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 7 p.
(IAF PAPER 92-0265) Copyright

The therapeutic effectiveness of medications during spaceflight is considered in light of extensive anecdotal and experimental evidence. Attention is given to a range of medications for space

motion sickness, sleeplessness, and physical discomfort. About 70 individual cases are reviewed in which crewmembers used such medications as: (1) scopolamine hydrobromide, dextroamphetamine sulfate, and promethazine hydrochloride for motion sickness; (2) metoclopramide hydrochloride and naloxone hydrochloride for bowel motility; and (3) aspirin and acetaminophen for headache and back pain. The effectiveness of orally ingested medications for space motion sickness is shown to be very low, while promethazine hydrochloride is effective when administered intramuscularly. The medications for pain are shown to be generally effective, and the use of sleep-inducing medications is limited by potentially detrimental performance effects. C.C.S.

A92-55704* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
RESPONSES TO GRADED LOWER BODY NEGATIVE PRESSURE AFTER SPACE FLIGHT
SUZANNE M. FORTNEY, JOHN B. CHARLES, MARGIE WOOD, and LARRY DUSSACK (Space Biomedical Research Institute; Krug International Corp.; NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 12 p. refs
(IAF PAPER 92-0266)

Lower body negative pressure tests (0 to -60 mm Hg) were administered 2-3 times preflight and 4 times postflight (L0 to L7), to evaluate the effect of space flight on orthostatic responses. This paper presents preliminary findings from the first 4 crew members who have completed this protocol. Overall the results suggest a greater orthostatic strain lasting approximately two days postflight, that may have been due to enhanced pooling of blood in body regions other than the calf. Author

A92-55705* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SALINE INGESTION DURING LOWER BODY NEGATIVE PRESSURE AS AN END-OF-MISSION COUNTERMEASURE TO POST-SPACE FLIGHT ORTHOSTATIC INTOLERANCE
JOHN B. CHARLES, MICHELE M. JONES, and SUZANNE M. FORTNEY (Space Biomedical Research Institute; Krug International Corp.; NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. refs
(IAF PAPER 92-0267) Copyright

Lower body negative pressure (LBNP) in conjunction with saline ingestion can protect astronauts against post-space flight orthostatic intolerance. LBNP was used for both treatment and testing. The treatment was 4 hours of lower body decompression at 30 mm Hg below ambient pressure. One liter of water and 8 g of salt were ingested during the first hour. The treatment was evaluated by comparing heart rate (HR) and blood pressure (BP) responses to test decompressions on the days before and after treatment. It is concluded that cardiovascular responses to step-wise decompression duplicated Skylab findings. BP was maintained, but HR responses to each step were progressively greater in-flight than preflight. After the 4-hour treatment HR responses were closer to preflight values. O.G.

A92-56197
AMERICAN SOCIETY FOR GRAVITATIONAL AND SPACE BIOLOGY, ANNUAL MEETING, 6TH, LOUISVILLE, KY, NOV. 2-5, 1990, PROGRAM AND ABSTRACTS
ASGSB Bulletin (ISSN 0898-4697), vol. 4, no. 1, Nov. 1990, 115 p. No individual items are abstracted in this volume.
Copyright

The present volume discusses calcium in plants, immune responses after spaceflight and modeling, animal growth, development, and genetics, bone/muscle physiology, and cell biology. Attention is given to controlled ecological life support systems, gravity sensing and regulatory physiology in animals, and gravity perception in plants. Topics addressed include in-flight delayed hypersensitivity responses, microgravity effects on preadult brine shrimp, the sex ratio in the offspring of 'pilot' mice, otoconial morphology in space-flown 14-d chick embryos, and functional adaptations of the hand to upper limb immobilization. Also discussed are the characteristics of light-emitting diodes for use as a phytosynthetic irradiance source for plants, effects of oxygen tensions and abscisic acid on the development of wheat embryos in vitro, alterations in muscle membrane enzymes during disuse atrophy, and the effects of microgravity on liposome formation. C.A.B.

A92-56198
AMERICAN SOCIETY FOR GRAVITATIONAL AND SPACE BIOLOGY, ANNUAL MEETING, 7TH, WASHINGTON, OCT. 17-20, 1991, PROGRAM AND ABSTRACTS
ASGSB Bulletin (ISSN 0898-4697), vol. 5, no. 1, Oct. 1991, 156 p. No individual items are abstracted in this volume.
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The present volume on gravitational and space biology discusses readaptation and recovery of skeletal muscle following spaceflight, suspension unloading, casting immobilization, and bedrest, transduction of gravity and mechanical signals in plants, animal structural systems and muscle physiology, and animal gravity sensing and neurophysiology. Attention is given to plant-controlled ecological life support systems, plant and spaceflight studies, clinostats and centrifuges, and plant growth, development, and genetics. Topics addressed include growth and satellite cell proliferation following suspension unloading, the influence of microgravity on virus protein assembly, the effects of diurnal oscillations in temperature on biological clocks in space, and a spatial analysis of muscle lesions in space-flown rats. Also discussed are vestibular nerve components of responses to pulsed linear acceleration, stimulation of root elongation and curvature by calcium, a novel approach to measuring in vivo protein synthesis, and light-emitting diodes as an alternative light source for algal systems. C.A.B.

A92-56261
A STUDY OF HUMAN BODY RESPONSE TO THORAX-BACK (+GX) LANDING IMPACT
YU-LAN WANG, ZILONG CHENG, YAFANG HAN, JIN LUO, and ZHIMING XU (Institute of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 2, 1992, p. 96-101. In Chinese. refs

In order to study human response to landing impact of spacecraft, four healthy young men were exposed to 6 to about 18 Gx for 30 to about 120 ms in supine position. Acceleration on the impact table, head, thorax, and abdomen of the human bodies, as well as ECG, EEG, blood pressure and body displacement of the subjects were recorded during the experiments. The results showed that beside shock pain in head and thorax, there were arrhythmia and increase of blood pressure and slow wave in EEG after +Gx impact. The tests were stopped owing to severe pain in the thorax that appeared at an acceleration of +26 Gx in the thorax region. It was also showed that dynamic response accelerations of human body under different conditions of the harness system (tightened or loosened) may have a difference of 60 percent. The dynamic response of different parts of the human body was found to be correlative with the impact factors. Author

A92-56263
PREVENTION AND TREATMENT OF MOTION SICKNESS INDUCED BY SWING IN HEAD-DOWN POSITION USING MAGNETIC ACUPUNCTURE-MASSAGE
BO-LUN TONG, JINGCEN PEI, XIAOXIA YAN, JIANPING WU, HEZHEN YU, and TIANWEI ZHU (Institute of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 2, 1992, p. 112-117. In Chinese. refs

The effectiveness of magnetic acupuncture massage on the prevention and treatment of motion sickness (MS) is investigated. Sixteen young men were tested in a parallel swing (0.24 Hz) to induce MS after head-down tilt (-10 deg) for 1 h in a gondola. Two tests - control and protection - were administered to each of the subjects. The motion sickness stability index (MSSI) was determined by awarding points according to both duration on the

swing and severity of the symptoms observed. An electrogastrogram (EGG) and skin temperature were also recorded. The results showed that magnetic acupuncture massage could increase the stability of MS significantly in the head-down position. The average increase of MSSI was 28.3 and the total effectiveness rate of protection was 62.5 percent. The effectiveness rate was 71.4 percent in subjects with moderate or higher stability of MS. The amplitude of EGG tended to increase and skin temperature tended to decrease when symptoms of motion sickness appeared. They can be considered as supplementary indices for evaluating MS. C.A.B.

A92-56461* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
HEMODYNAMIC RESPONSES TO SEATED AND SUPINE LOWER BODY NEGATIVE PRESSURE - COMPARISON WITH +GZ ACCELERATION
ALVESE POLESE (NASA, Ames Research Center, Moffett Field, CA; Cardiovascular Research Institute, Milan, Italy), HAROLD SANDLER, and LESLIE D. MONTGOMERY (NASA, Ames Research Center, Moffett Field, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 467-475. refs

The hemodynamic responses to LBNP in seated subjects and in subjects in supine body positions were compared and were correlated with hemodynamic changes which occurred during a simulated (by centrifugation) Shuttle reentry acceleration with a slow onset rate of 0.002 G/s and during gradual onset exposures to +3 Gz and +4 Gz. Results demonstrate that seated LBNP at a level of -40 mm Hg can serve as a static simulator for changes in the heart rate and in mean blood pressure induced by gradual onset acceleration stress occurring during Shuttle reentry. The findings also provide a rationale for using LBNP during weightlessness as a means of imposing G-loading on the circulation prior to reentry. I.S.

A92-56462
PHYSIOLOGIC VALIDATION OF A SHORT-ARM CENTRIFUGE FOR SPACE APPLICATION
R. R. BURTON and L. J. MEEKER (USAF, Armstrong Laboratory, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 476-481. refs

A short-arm centrifuge (SAC) of 5-6 ft radius may be useful in space to measure tolerances to acceleration (G) and to stimulate the cardiovascular system, thereby reducing cardiovascular decompensation that accurs in weightlessness. Relaxed rapid (1G/s onset rate, ROR) and gradual (0.1G/s onset rate, GOR) G tolerances were measured on seven men using a 5-ft radius centrifuge and compared with their G tolerances obtained on the 20-ft radius human-use centrifuge. Since the subjects were required to flex their legs to assume a squatting position on the SAC, a similar position was used on the 20 ft centrifuge called feet up, and compared with normal-seated +Gz tolerances (controls). The subjects tolerated the SAC exposures without any problems. ROR and GOR tolerances were as follows: control, 3.6 G and 4.2 G; FU, 4.5 G and 5.6 G; and SAC, 4.6 G and 6.4 G. It is concluded that a 5-ft radius centrifuge can be used to measure G tolerances. The increases in the SAC GOR tolerances over ROR tolerances indicate that the baroceptors were stimulated by the G, and the SAC exposure would be useful in preventing cardiovascular decompensation in microgravity. Author

A92-56463
A BIOMECHANICAL PERSPECTIVE ON EXERCISE COUNTERMEASURES FOR LONG TERM SPACEFLIGHT
P. R. CAVANAGH, B. L. DAVIS, and T. A. MILLER (Pennsylvania State University, University Park) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 482-485. refs

Three types of exercises that were proposed for use during Space Station flights were compared for the peak loads and the rates of change of load on the feet: (1) running while tethered on a treadmill, (2) rowing on an ergometer, and (3) stationary cycling. Results showed that peak loading rates for running, rowing, and cycling were in the ratio 34.7:1.9:1, respectively. The corresponding values for the peak foot loads were in the ratio 5.3:1:1.2. I.S.

A92-56464
MOTION SICKNESS AND EQUILIBRIUM ATAXIA
MASAHIRO TAKAHASHI, YASUHIKO TAKEI, AKIRA SAITO, YUKIHIRO OKADA, and JIN KANZAKI (Keio University, Tokyo, Japan) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 486-490. refs

In order to know the relationship between motion sickness and equilibrium ataxia, Graybiel's ataxia test battery was performed on ten normal subjects: (1) before donning goggles which reversed the optical image horizontally and vertically, (2) while wearing the goggles and walking, and (3) after walking as long as possible up to 90 min. Horizontal reversal of vision resulted in a statistically significant decrease in the score for all the closed-eyes tests and one open-eyes test performed during walking and after walking, respectively. In contrast, walking while wearing vertical reversing goggles produced a significant but very small change for one of the closed-eyes tests alone. The present study indicates that failure to detect spatial orientation, which evokes autonomic nervous symptoms as an alarm sign, produces equilibrium ataxia by impairing the top-down regulation of body balance, and that vertically reversed vision does not impair spatial orientation need to maintain upright posture or to execute locomotion. Author

A92-56465
A COMPARISON OF THE NAUSEOGENIC POTENTIAL OF LOW-FREQUENCY VERTICAL VERSUS HORIZONTAL LINEAR OSCILLATION
JOHN F. GOLDING and MARTINE KERGUELEN (RAF, Institute of Aviation Medicine, Farnborough, United Kingdom) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 491-497. refs

The aim of this study was to compare the nauseogenic potential of low-frequency linear motion in the earth-vertical versus the earth-horizontal plane, delivered through the same Z-axis of the head and body. Twelve subjects were challenged with linear motion (0.3 Hz, 1.8 m/sec per sec rms) through the same head and body Z-axis in the earth-vertical (sitting upright) versus horizontal (lying on the back), while either performing a continuous visual search task or with their eyes closed. Each subject completed the four conditions on a Latin square design with sessions spaced one week apart at the same time of day. Vertical motion was clearly more provocative than horizontal motion, and nauseogenicity of motion was exacerbated by a visual search task. Motion sickness impaired performance of the search task. Motion Sickness Susceptibility Questionnaire scores correlated with individual susceptibility to the motion challenge. Mean sickness ratings for vertical motion showed some correspondence with those predicted by mathematical models of motion sickness dose response relationships. Author

A92-56466
THE EFFECTS OF PERCEIVED MOTION ON SOUND-SOURCE LATERALIZATION
JOHN K. CULLEN, JANE COLLINS (Louisiana State University, Baton Rouge), THOMAS G. DOBIE (U.S. Navy, Naval Biodynamics Laboratory, New Orleans, LA), and PATRICK W. RAPPOLD (Louisiana State University, Baton Rouge) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 498-504. refs

Lateralization of dichotic click pairs differing in time of onset was studied under conditions of angular acceleration, optokinetic stimulation, and gaze fixation. Data obtained from 20 subjects with normal hearing indicate poorer left-right judgment performance

for small time differences, as well as shifts in subjective simultaneity, for all experimental conditions relative to control conditions. In addition, response times increased for the experimental conditions. The results suggests that real or apparent motion may affect an individual's ability to process one of the major cues for sound-source localization - binaural time difference - under conditions similar to those encountered in vehicular motion. Author

A92-56467
EFFECT OF SIMULATED AIR COMBAT MANEUVERING ON MUSCLE GLYCOGEN AND LACTATE
B. BAIN, I. JACOBS, and F. BUICK (Defence and Civil Institute of Environmental Medicine, North York, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 505-509. refs
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Muscle glycogen and muscle and blood lactate were evaluated before and after a +4.0/7.0 Gz simulated air combat maneuvering (SACM) protocol in the human centrifuge. Muscle glycogen and lactate were determined from biopass of m. vastus lateralis, and whole blood lactate was analyzed in finger-tip blood samples. G-tolerance time was 256 +/- 33 s. The decrease in glycogen concentration averaged 81 +/- 36 mmol/kg dry wt ($p = 0.07$). The rate of glycogen utilization was low, averaging 0.4 +/- 0.1 mmol/kg per sec. Muscle lactate increased significantly from 28 +/- 2 mmol/kg dry wt pre-SACM to 51 +/- 4 mmol/kg post-SACM. Post-SACM blood lactate was 4.2 +/- 0.3 mmol/L. Neither final blood nor muscle lactate values nor the difference between pre- and post-SACM muscle lactate concentrations were related to G-tolerance time. It was concluded that glycogen availability in m. vastus lateralis is not a limiting factor during exposure to headward acceleration of this type and duration. Author

A92-56468
THE EFFECTS OF HYPOXIA ON COMPONENTS OF THE HUMAN EVENT-RELATED POTENTIAL AND RELATIONSHIP TO REACTION TIME
BARRY FOWLER (York University, North York, Canada) and BARRY KELSO (Defence and Civil Institute of Environmental Medicine, North York, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 510-516. Research supported by Defence and Civil Institute of Environmental Medicine. refs
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This experiment investigated the relationship between the increase in reaction time (RT) caused by hypoxia and the P300, N200, P200, and N100 components of the event-related brain potential. Eight subjects breathed air or a low oxygen mixture (65 percent arterial oxyhemoglobin saturation), and RT was collected to visually presented stimuli at two levels of stimulus intensity while event-related potentials were recorded. A hypoxia x stimulus intensity interaction was found for RT, P300 latency, and N200 latency. P200 latency and N100 latency were unaffected by hypoxia. These results were interpreted in terms of additive factors method logic to indicate that the preprocessing stage of stimulus evaluation is slowed by hypoxia and that both P300 and N200 index this slowing. Author

A92-56469* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
IMMUNE RESPONSIVENESS AND RISK OF ILLNESS IN U.S. AIR FORCE ACADEMY CADETS DURING BASIC CADET TRAINING
DAVID J. LEE (Miami, University, FL), RICHARD T. MEEHAN, CHRISTINE ROBINSON, THOMAS R. MABRY, and MOREY L. SMITH (Colorado, University, Denver; U.S. Air Force Academy, Colorado Springs) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 517-523. refs
(Contract NAG9-170)
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It has been proposed, but not confirmed, that environmental stressors alter immune function and increase the risk of viral infection among healthy individuals. This hypothesis was evaluated by examining the relationship among stress, immune function, and illness in 96 first-year U.S. Air Force Academy cadets during orientation and four weeks later during the stressful environment of basic cadet training (BCT). Perceived stress and well-being levels of cadets were assessed via questionnaire. Immune responsiveness was analyzed by PHA-stimulated thymidine uptake in mononuclear leucocytes and by serologic evidence of reactivation of the Epstein-Barr virus (EBV). Results showed significant declines in in vitro PHA-induced lymphocyte transformation (-35 percent)and subjective well-being (-19 percent) from orientation to BCT with corresponding, significant increases in perceived stress (+32 percent). Despite significantly altered in vitro immune responsiveness, there was no serologic evidence of EBV reactivation nor was there an association between these measures and risk of illness as determined by medical chart review and self-reported symptoms. Author

A92-56470* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A REVIEW OF MICROGRAVITY SURGICAL INVESTIGATIONS
MARK R. CAMPBELL (Clifton Medical/Surgical Clinic Assoc., TX) and ROGER D. BILLICA (NASA, Johnson Space Center, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 524-528. refs
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The likelihood of performing a surgical procedure in space will increase as the Soviet Mir space station is expanded and the Space Station Freedom becomes operational. A review of previous research and hardware development, performed mostly in parabolic flight both in the Soviet Union and the U.S., reveals an interest in surgical chambers to prevent cabin atmosphere contamination. Surgical techniques appear to be no more difficult than in a 1-G environment if a restraint system is used. Minimizing the changes of wound infection from the high particle count spacecraft atmosphere is an additional concern. Additional research is necessary to delineate the clinical significance of these problems and to further develop surgical techniques in microgravity. Author

A92-56472
A SURVEY OF BLOOD LIPID LEVELS OF AIRLINE PILOT APPLICANTS
N. J. MCCALL, R. L. WICK, JR., W. L. BRAWLEY, and B. T. BERGER (American Airlines, Inc., Medical Dept., Fort Worth, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 533-537. refs
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Results are presented, in tabular and graphic form, on the levels of selected blood lipids for 14,448 airline pilot aplicants examined during the period from March 1984 through Decempber 1988. The results include data on the total cholesterol values, high-density lipoprotein (HDL) levels, and the cholesterol/HDL ratio of the subjects. It was found that the blood lipid levels cease to increase during the fifth decade of life. Factors that may play a role in this finding are discussed. I.S.

A92-56628* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
BRONCHOESOPHAGEAL AND RELATED SYSTEMS IN SPACE FLIGHT
WILLIAM THORNTON (NASA, Johnson Space Center, Houston, TX) (Japan Broncho-Esophagological Society, Annual Meeting, 42nd, Kagoshima, Japan, Oct. 12, 1990) Japan Broncho-Esophagological Society, Journal (ISSN 0029-0645), vol. 42, no. 2, 1991, p. 78-81. refs
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A review is presented of the detrimental effects of space flight on the human bronchoesophageal system emphasizing related areas such as the gastric system. In-flight symptoms are listed including congestion, nasopharyngeal irritation, epigastric sensations, anorexia, and nausea. Particular attention is given to space-related effects on eating/drinking associated with the

absence of hydrostatic pressure in the vascular system. The atmospheric characteristics of a typical space shuttle flight are given, and the reduced pressure and low humidity are related to bronchial, eye, and nose irritation. Earth and space versions of motion sickness are compared, and some critical differences are identified. It is proposed that more research is required to assess the effects of long-duration space travel on these related systems. C.C.S.

A92-56703
EXTENDED LY ALPHA EMISSION AROUND QUASARS AT Z OF MORE THAN 3.6
M. N. BREMER, A. C. FABIAN (Cambridge University Institute of Astronomy, United Kingdom), W. L. W. SARGENT (Palomar Observatory, Pasadena, CA), C. C. STEIDEL (California, University, Berkeley), A. BOKSENBERG (Royal Greenwich Observatory, Cambridge, United Kingdom), and R. M. JOHNSTONE (Cambridge University Institute of Astronomy, United Kingdom) Royal Astronomical Society, Monthly Notices (ISSN 0035-8711), vol. 258, no. 1, Sept. 1, 1992, p. 23P-27P. Research supported by SERC and Royal Society. refs
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We have detected extended Ly alpha emission around two quasars at z of about 3.6, the highest redshift at which such emission has been detected around quasars. An upper limit for extended Ly alpha emission was obtained for a third quasar at z of about 3.8. Our results show that the covering factor of cold gas at radii of 10-20 kpc from these objects is about 1 percent. We discuss the implications of such a low covering factor for theories of galaxy formation. Author

A92-56944
RIB CAGE SHAPE AND MOTION IN MICROGRAVITY
MARC ESTENNE, MASSIMO GORINI, ALAIN VAN MUYLEM, VINCENT NINANE, and MANUEL PAIVA (Erasme University Hospital, Brussels, Belgium) Journal of Applied Physiology (ISSN 8750-7587), vol. 73, no. 3, Sept. 1992, p. 946-954. Research supported by Ministere de la Politique Scientifique and Don C. Gnocchi Foundation. refs
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The effect of microgravity on the rib-cage shape and motion and the electromyographic (EMG) activity of rib-cage muscles was investigated by measuring the anteroposterior diameters of the upper and the lower rib cage, the transverse diameter of the lower rib cage, the xiphipubic distance, and the EMG parameters of the scalene and parasternal intercostal muscles in five human subjects seated in a Caravelle 6 R aircraft while it flew a 2 Gz trajectory. The results of instrumental measurements taken during the flight indicated that, during brief periods of weightlessness, the rib cage at end expiration is displaced in the cranial direction and adopts a more circular shape; the tidal expansion of the ventral rib cage is reduced, particularly in its upper portion. The phasic inspiratory EMG activity of the scalenes and parasternal intercostals decreases, while the tonic activity increases. I.S.

A92-57274
MAIN RESULTS OF SPACE BIOMEDICAL PROGRAMS IN RUSSIA
O. G. GAZENKO and A. I. GRIGOR'EV (Institute of Biomedical Problems, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 16 p. refs
(IAF PAPER 92-0887) Copyright

Recent key findings made by Russian research on human reactions to space are reviewed. Emphasis is given to vestibular function and space motion sickness, motor function, the bone system, the cardiovascular system, metabolism and its controls, gastrointestinal function, the blood system, and the immunity system. Comparisons are made with findings on rats and primates. C.D.

A92-57275* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SPACE FLIGHT AND CHANGES IN SPATIAL ORIENTATION
MILLARD F. RESCHKE, JACOB J. BLOOMBERG, DEBORAH L. HARM (NASA, Johnson Space Center, Houston, TX), and WILLIAM H. PALOSKI (Krug Life Sciences, Inc., Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 11 p. refs
(IAF PAPER 92-0888) Copyright

From a sensory point of view, space flight represents a form of stimulus rearrangement requiring modification of established terrestrial response patterns through central reinterpretation. Evidence of sensory reinterpretation is manifested as postflight modifications of eye/head coordination, locomotor patterns, postural control strategies, and illusory perceptions of self or surround motion in conjunction with head movements. Under normal preflight conditions, the head is stabilized during locomotion, but immediately postflight reduced head stability, coupled with inappropriate eye/head coordination, results in modifications of gait. Postflight postural control exhibits increased dependence on vision which compensates for inappropriate interpretation of otolith and proprioceptive inputs. Eye movements compensatory for perceived self motion, rather than actual head movements have been observed postflight. Overall, the in-flight adaptive modification of head stabilization strategies, changes in head/eye coordination, illusionary motion, and postural control are maladaptive for a return to the terrestrial environment. Appropriate countermeasures for long-duration flights will rely on preflight adaptation and in-flight training. Author

A92-57276
ACOUSTIC LOCALIZATION UNDER CONDITIONS OF MICROGRAVITY - PREPARATION OF THE EXPERIMENT AND PRELIMINARY RESULTS
C. MUELLER (Wien, Universitaet, Vienna, Austria), M. NEFEDOVA (Institute of Biomedical Problems, Moscow, Russia), M. OPITZ, and A. PERSTERER (AKG - Akustische und Kino-Geraete GmbH, Vienna, Austria) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. refs
(IAF PAPER 92-0889) Copyright

The Audimir experiment, the first investigation of the human auditory system as it adapts to microgravity, is discussed. The technical realization of the project was based on the presentation of binaurally processed signals over headphones. For the horizontal plane, no significant localization errors were found while a downward displacement was observed in median-plane elevation judgments. The second phase of the experiment proved for the first time that human dynamic orientation can be influenced by audiokinetic stimulation. C.D.

A92-57277* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
THE EFFECTS OF IN-FLIGHT TREADMILL EXERCISE ON POSTFLIGHT ORTHOSTATIC TOLERANCE
STEVEN F. SICONOLFI and JOHN B. CHARLES (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 20 p. refs
(IAF PAPER 92-0890) Copyright

In-flight aerobic exercise is thought to decrease the deconditioning effects of microgravity. Two deconditioning characteristics are the decreases in aerobic capacity (maximum O2 uptake) and an increased cardiovascular response to orthostatic stress (supine to standing). Changes in both parameters were examined after Shuttle flights of 8 to 11 days in astronauts who performed no in-flight exercise, a lower than normal volume of exercise, and a near-normal volume of exercise. The exercise regimen was a traditional continuous protocol. Maximum O2 uptake was maintained in astronauts who completed a near-normal exercise volume of in-flight exercise. Cardiovascular responses to stand test were equivocal among the groups. The use of the traditional exercise regimen as a means to maintain adequate orthostatic responses produced equivocal responses. A different exercise prescription may be more effective in maintaining both exercise capacity and orthostatic tolerance. Author

A92-57278* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SHUTTLE-FOOD CONSUMPTION, BODY COMPOSITION AND BODY WEIGHT IN WOMEN
HELEN W. LANE, SHERRIE FRYE, VICKIE KLOERIS, BARBARA RICE, STEVEN F. SICONOLFI, ELISABETH SPECTOR, and RANDALL J. GRETEBECK (NASA, Johnson Space Center; Krug Life Sciences, Inc., Houston, TX; Northern Colorado, University, Greeley, CO) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 9 p. refs
(IAF PAPER 92-0892) Copyright

An experiment is conducted to determine whether the NASA Space Shuttle food system can provide the food and fluid required to mitigate weight loss and physical decomposition in 12 female subjects for 28 days. Subjects receive only foods from the Space Shuttle system for four weeks within an 11-wk monitoring period. Dual-energy X-ray absorptiometry is employed throughout the trial period to study lean body mass, percent body fat, and energy-intake levels with attention given to differences the experimental diet and the subjects' typical diet. Percent body fat is found to change significantly with losses of less than 0.05 percent, whereas energy intake based on autonomous diet choices by the participants does not vary significantly. Lean body mass remains unchanged throughout the study in which the subjects receive a relatively low-fat and low-protein menu. The 100 items on the space shuttle list of approved food items are shown to provide a palatable dietary framework for maintaining the health of female astronauts. C.C.S.

A92-57279
AN INTRODUCTION TO MASSAGE IN THE TREATMENT OF SPACE ADAPTATION SYNDROME
ZHONG X. WANG (Middle School of Ping Li County, Shaanxi, China) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 4 p.
(IAF PAPER 92-0894) Copyright

The use of massage is studied as a physically therapeutic technique for treating space-adaptation syndrome (SAS) with attention given to both theoretical considerations and specific applications. Massage is argued to be useful for the treatment of nonidiosyncratic, idiosyncratic, and readaptation diseases associated with spaceflight. Specific physical maneuvers are described to treat such effects as: (1) the upward movements of bodily fluids; (2) joint distension and epigastric discomfort; and (3) muscular weakness related to readaptation. Massage techniques are concluded to be potentially therapeutic if incorporated into treatment programs for SAS, and references are provided for more detailed assessment of the techniques. C.C.S.

A92-57280
MEDICAL MONITORING IN LONG-TERM SPACE MISSIONS - THEORY AND EXPERIENCE
A. I. GRIGOR'EV and A. D. EGOROV (Institute of Biomedical Problems, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 13 p. refs
(IAF PAPER 92-0895) Copyright

A conceptual diagnosis model for extended space missions is described, and the state-of-the-art methods of medical monitoring onboard the Mir station are discussed. Particular attention is given to the classification of clearly defined adverse syndromes induced by microgravity effects and possible health disorders associated with equipment failures. O.G.

N92-32344# Harvard Univ., Cambridge, MA. Dept. of Psychology.
PET STUDIES OF COMPONENTS OF HIGH-LEVEL VISION
WILLIAM J. HALL 15 May 1992 3 p
(Contract N00014-91-J-1243)
(AD-A250873) Avail: CASI HC A01/MF A01

This document describes progress on the PET Studies of Components of High-Level Vision project. We have made progress primarily by testing more subjects in four PET experiments, developing new software for data analysis, and carrying out preliminary data analyses. It is premature to report the results in detail, but some intriguing trends are evident in the images, as noted in this report. GRA

N92-32434# Essex Corp., Orlando, FL.
CORRELATING VISUAL SCENE ELEMENTS WITH SIMULATOR SICKNESS INCIDENCE: HARDWARE AND SOFTWARE DEVELOPMENT Final Report, Apr. - Oct. 1991
R. S. KENNEDY, K. S. BERBAUM, and M. G. SMITH 27 Oct. 1991 20 p
(Contract N00019-91-C-0149)
(AD-A252235) Avail: CASI HC A02/MF A01

Simulator sickness occurs in a large number of Army, Navy, and Marine Corps simulators, and is most prevalent in moving-base, rotary-wing devices which employ cathode ray tube (CRT) video displays as opposed to fixed-wing, dome-display trainers with no motion base. Based on data from a factor analysis of over 1000 Navy and Marine Corps pilot simulation exposures, a new scoring procedure was applied to two helicopter simulators with similar rates of simulator sickness incidence. Based on the factor analytic scoring key, the two simulators showed slightly different sickness profiles. Preliminary work was begun to record the visual scene by video frame-by-frame decomposition and automated scoring algorithms were developed. The findings are discussed from the standpoints of (1) recommendations for future design and use of simulators, and (2) the metric advantages and other merits of the field experiment methodology to address human factors problems with simulator sickness. GRA

N92-32492# Krug Life Sciences, Inc., San Antonio, TX.
COMPARATIVE EFFECTS OF ANTIHISTAMINES ON AIRCREW PERFORMANCE OF SIMPLE AND COMPLEX TASKS UNDER SUSTAINED OPERATIONS Interim Technical Report, Jul. 1989 - Jul. 1991
THOMAS E. NESTHUS, SAMUEL G. SCHIFLETT, DOUGLAS R. EDDY (NTI, Inc., Dayton, OH.), and JEFFREY N. WHITMORE Dec. 1991 47 p
(Contract F33615-89-C-0603)
(AD-A248752; AL-TR-1991-0104) Avail: CASI HC A03/MF A01

Airborne Warning and Control System (AWACS) Weapons Director (WD) cognitive and psychomotor skills were evaluated with terfenadine (Seldane) and diphenhydramine (Benadryl) using a performance assessment battery (PAB). After nondrug Day 1 training, twelve 3 member teams were tested with Placebo on Day 2, then randomly assigned to Seldane (60 mg/12h TID), Benadryl (25 mg/4h QID), or Placebo groups on Days 3 and 4. An 8-test PAB was given at 1230 and 1330 each testing day. The Seldane and Placebo groups did not differ appreciably from each other on Days 3 or 4, but differed significantly from the Benadryl group. The group showed degraded performance for 7 variables on Day 3 and for 3 variables on Day 4 compared to the Seldane and/or Placebo groups. Subjective measures of fatigue and antihistamine symptoms supported the Day 3 Benadryl impairment. Overall results were consistent with previous research demonstrating cognitive and psychomotor task impairment with Benadryl but not with Seldane. Support for awarding medical flying waivers to non-pilot aircrew who are taking Seldane under the supervision of flight surgeons is offered. GRA

N92-32504# Naval Air Station, Pensacola, FL.
DEVELOPMENT OF THE OMPAT NEUROPSYCHOLOGICAL/PSYCHOMOTOR PERFORMANCE EVALUATION AND OMPAT DATA AND TIMING SUPPORT Annual Report, 15 Nov. 1990 - 14 Nov. 1991
KATHRYN P. WINTER 5 Dec. 1991 11 p
(Contract DA PROJ. 3M2-63002-D-995)
(AD-A250793) Avail: CASI HC A03/MF A01

The objectives of this project have been (1) to create a millisecond accuracy software timer module that could be incorporated into OMPAT and other testing programs, (2) to construct a set of automated, i.e., computerized OMPAT Level I neuropsychological and psychomotor tests with documentation that

provides a standardized, clinically relevant, and rapid method for assessment of nervous system integrity, and (3) to construct a version of UTCPAB that incorporates the software timer. GRA

N92-32539*# Pennsylvania State Univ., Hershey. Coll. of Medicine.
EFFECTS OF CSF HORMONES AND IONIC COMPOSITION ON SALT/WATER METABOLISM Final Technical Report, 1 Mar. 1981 - 31 Dec. 1992
WALTER B. SEVERS and LANNY C. KEIL 1992 32 p
(Contract NCC2-127)
(NASA-CR-190693; NAS 1.26:190693) Avail: CASI HC A03/MF A01

This collaborative agreement between Drs. Severs and Keil began in 1981, arising from a continuing interest in the issue of what, exactly, are the consequences of headward fluid shifts during manned spaceflight. Such shifts were recognized early by both U.S. and Soviet Scientists because of signs and symptoms referable to the head. Some of these include disturbed vision, puffiness in the face and periorbital areas, headache, vestibular dysfunction and distended jugular veins. We posited that the fluid shift had an immediate effect on the brain, and a long-term action requiring a neural interpretation of the flight environment. This would re-adjust both efferent neural as well as hormonal mechanisms to sustain cardiovascular and fluid/electrolyte balance consonent with survival in microgravity. Work along these lines is summarized. Author

N92-32663# Polish Academy of Sciences, Warsaw. Inst. Podstawowych Problemow Techniki.
BONE AS A LIQUID-FILLED DIPHASE POROUS MEDIUM [KOSC JAKO WYPELNIONY PLYNEM DWUFAZOWY OSRODEK POROWATY]
R. UKLEJEWSKI (Polish Academy of Sciences, Poznan.) 1992 66 p In POLISH
(ISSN 0208-5658)
Avail: CASI HC A04/MF A01

The purpose of the present paper (which is the initial part of a more comprehensive work on the properties of electromechanical effects of compact and long bones) is to convince the readers (both technical and medical workers) that the basic, natural biomechanical model of both compact and spongy bones is the diphase liquid-filled porous medium, both the solid and liquid phases being, of course, multicomponent (we do not deny that the single-phase model may be useful in many detailed problems of bone biomechanics). Unlike porous technological materials, the bone is a biological porous solid which has, under in vivo conditions, an interesting property of adapting its inner structure and shape under the influence of mechanical loads. Author

N92-32816# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
DCIEM/CENTRAL MEDICAL BOARD AIRCREW ECG PROGRAM: RECOMMENDATIONS FOR RESTRUCTURING Annual Report, 1989
GARY W. GRAY Aug. 1990 17 p
(DCIEM-90-47; CTN-92-60353) Avail: CASI HC A03/MF A01

This report summarizes the results of the Canadian Forces electrocardiogram (ECG) program in 1989. A total of 4810 ECGs were interpreted and coded at the Canadian Medical Board. Of 1767 ECGs on aircrew candidates, only 4 showed abnormalities incompatible with initial aircrew selection. Among 3043 ECGs on serving aircrew, only 14 showed abnormalities incompatible with flying duties, and 13 of these had been previously documented. There was one new myocardial infarction which had been already detected clinically. Recommendations were made for a restructuring of the ECG program which will result in an approximately 40 percent reduction in the number of routine aircrew ECGs. For experienced aircrew, it is recommended that the ECG become part of an expanded cardiovascular risk evaluation carried out every four years to the age of 40 then biannually. Aircrew candidates should continue to have an initial ECG, but this should be done only on academically successful candidates during screening at the Central Medical Board. Author (CISTI)

N92-32916# Human Engineering Labs., Aberdeen Proving Ground, MD.
MODELING THE EAR'S RESPONSE TO INTENSE IMPULSES AND THE DEVELOPMENT OF IMPROVED DAMAGE RISK CRITERIA Final Report
G. R. PRICE May 1992 8 p
(Contract DA PROJ. 1L1-61102-B-74-A)
(AD-A252365; HEL-TN-5-92) Avail: CASI HC A02/MF A01

Research indicates that traditional measures fail to distinguish hazardous from intense impulses accurately. This failure may be due to increased complexities in the ear's response at such high sound pressure levels. Therefore, to gain insight into the problem, we have been developing a mathematical model of the ear that reproduces the response of the ear from free field pressures to basilar membrane displacements and calculates the hazard (modeled as mechanical stress). This model is conformal with the structure of the ear and includes the spectral tuning of the external and middle ears, a non-linear stapes, and a changing susceptibility along the cochlear partition. The model can be used to calculate a hazard index for virtually any impulse and although work is still continuing on the development of the model, it is thus far able to explain the hearing loss data better than any other system. If the model were incorporated into an integrated circuit/meter, it would have the virtues of being complex enough to rate hazard accurately, be simple to use, and because it is theoretically based, be useful in suggesting design changes for impulse-producing sources as well as more effective designs for hearing protectors. GRA

N92-32942# Naval Health Research Center, San Diego, CA.
A CAUSAL ANALYSIS OF INTERRELATIONSHIPS AMONG EXERCISE, PHYSICAL FITNESS, AND WELL-BEING IN US NAVY PERSONNEL Interim Report
RITA S. DYTELL, LINDA K. TRENT, and TERRY L. CONWAY Aug. 1991 27 p
(Contract NR PROJ. MR0-095)
(AD-A252719; NHRC-91-27) Avail: CASI HC A03/MF A01

The relationships among physical fitness, physical exercise, and health outcomes were examined among 4,272 U.S. Navy personnel who completed the following: (1) a physical fitness test; (2) Wallston and Wallston's Multidimensional Health Locus of Control Scale (MHLOC); (3) eight items tapping health values; (4) five dimensions of health care behaviors; and (5) seven measures of mental and physical health outcomes. Regression analyses revealed that physical fitness was a better predictor than exercise of health outcomes among women. Fitness among both males and females was predicted first by the combination of Internal Health Locus of Control and high Health Values and second by exercise. It appears that certain health care behaviors (prevention activities, eating habits, substance use) are associated with exercise activities which, in turn, affect physical fitness. Fitness tends to mediate the relationship between exercise and well-being in females, while both exercise and fitness lead directly to positive health consequences in males. GRA

N92-33032* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
DEVICE FOR REMOVING FOREIGN OBJECTS FROM ANATOMIC ORGANS Patent
EARL D. ANGULO, inventor (to NASA) 28 Jul. 1992 10 p
Filed 19 Mar. 1991 Supersedes N91-28727 (29 - 20, p 3380)
(NASA-CASE-GSC-13306-1; US-PATENT-5,133,721;
US-PATENT-APPL-SN-674828; US-PATENT-CLASS-606-106;
US-PATENT-CLASS-148-402; US-PATENT-CLASS-606-78;
US-PATENT-CLASS-606-127; INT-PATENT-CLASS-A61M-1/00)
Avail: US Patent and Trademark Office

A device is disclosed for removing foreign objects from anatomic organs such as the ear canal or throat. It has a housing shaped like a flashlight, an electrical power source such as a battery or AC power from a wall socket, and a tip extending from the housing. The tip has at least one wire loop made from a shape-memory-effect alloy, such as Nitinol, switchably connected to the electrical power source such that when electric current flows through the wire loop the wire loop heats up and returns to

a previously programmed shape such as a curet or tweezers so as to facilitate removal of the foreign object.
Official Gazette of the U.S. Patent and Trademark Office

N92-33254# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
MUSCULAR STRENGTH GAINS AND SENSORY PERCEPTION CHANGES: A COMPARISON OF ELECTRICAL AND COMBINED ELECTRICAL/MAGNETIC STIMULATION M.S. Thesis
ROBERT S. WAINNER 10 Apr. 1992 142 p
(AD-A252609; AFIT/CI/CIA-92-013) Avail: CASI HC A07/MF A01

The purpose of this study was to compare the strengthening effect and sensory perception (pain and perceived contraction intensity) associated with electrical (NMES) and combined electrical/magnetic (PMEF) stimulation on healthy subjects. Subjects were randomly assigned to either an NMES Group (N = 21) or a PMEF (N = 19) Group. All subjects were blind to group assignment and their opposite limb was used as the control. Subjects completed a familiarization session and were tested the following day to determine the peak torque of the quadriceps femoris muscles of both limbs. The NMES group and PMEF group underwent training that consisted of ten, ten-second induced contractions, repeated three times per week. GRA

N92-33464# State Univ. Hospital, Ballerup (Denmark). Inst. of Aerospace Medicine.
TELESCIENCE IN HUMAN PHYSIOLOGY
NIELS FOLDAGER, NIGEL WOOTTON (European Space Agency. European Space Research and Technology Center, ESTEC, Noordwijk, Netherlands), and F. BONDE-PETERSEN (European Space Agency, Cologne, Germany, F.R.) *In* ESA, Telescience for Space Experimentation in the Fields of Space Science, Life, Materials and Fluid Sciences and Earth and Environmental Sciences p 49-52 Mar. 1992
Copyright Avail: CASI HC A01/MF A02; ESA, EPD, ESTEC, Noordwijk, Netherlands, HC

To represent human physiology, the ESA telescience team selected a bicycle exercise test as their first experiment for telescience operation. The aim was to test if a ground based Principle Investigator (PI) could make good quality experiments on subjects located in space and to evaluate the man machine interfaces and teletools provided. The experiment was integrated in hyperbaric chambers for a 72 day 300 m diving simulation and a 30 day isolation study for the European manned space infrastructure. Varying delays and disturbances were introduced on the communication links. The exercise tests required full use of the telescience tools: command links for control of the ergometer bicycle and the camera, audio and video links, and transmission of data packages and physiological waveforms. The PI coped well with link disturbances and good quality physiological data were obtained. Telescience proved to be feasible in this kind of experiment and a promising tool for space experimentation. ESA

N92-33650# Technische Univ., Berlin (Germany). Fachbereich Elektrotechnik.
VIDEO OCULOGRAPHIC: REGISTRATION OF EYE MOVEMENTS IN THREE DEGREES OF FREEDOM FOR RESEARCH AND MEDICAL DIAGNOSIS OF THE EQUILIBRIUM SYSTEM Ph.D. Thesis [VIDEO-OKULOGRAPHIE: REGISTRIERUNG VON AUGENBEWEGUNGEN IN DREI FREIHEITSGRADEN ZUR ERFORSCHUNG UND MEDIZINISCHEN DIAGNOSTIK DES GLEICHGEWICHTSSYSTEMS]
WINFRIED TEIWES 1991 162 p In GERMAN
(ETN-92-92128) Avail: CASI HC A08/MF A02

The Video OculoGraphic (VOG) method is presented, as a way of registering eye movements in three dimensions. It allows a dynamic registration of eye movements. The algorithm used and the implementation are described. VOG is compared with other video based processes for eye movement registration. It is shown that eye observation is not possible using other quantitative methods. Experiments are carried out, with a view to examining the dynamic behavior of eye torsion in short time weightlessness and in high gravity conditions. The results emphasize the significance of eye torsion and of this measurement method for clinical diagnosis. ESA

N92-33657*# *George Washington Univ., Washington, DC.*
PUBLICATIONS OF THE SPACE PHYSIOLOGY AND COUNTERMEASURES PROGRAM, REGULATORY PHYSIOLOGY DISCIPLINE: 1980 - 1990
JANICE WALLACE-ROBINSON, KATHERINE J. DICKSON, ELIZABETH HESS, and JANET V. POWERS Sep. 1992 105 p (Contract NASW-4324)
(NASA-CR-4469; NAS 1.26:4469) Avail: CASI HC A06/MF A02

A 10-year cumulative bibliography of publications resulting from research supported by the Regulatory Physiology discipline of the Space Physiology and Countermeasures Program of NASA's Life Sciences Division is provided. Primary subjects included in this bibliography are circadian rhythms, endocrinology, fluid and electrolyte regulation, hematology, immunology, metabolism and nutrition, temperature regulation, and general regulatory physiology. General physiology references are also included. Principal investigators whose research tasks resulted in publication are identified by asterisk. Publications are identified by a record number corresponding with their entry in the Life Sciences Bibliographic Database, maintained at the George Washington University.
Author

N92-33825*# Old Dominion Univ., Norfolk, VA. Dept. of Electrical and Computer Engineering.
SIGNAL PROCESSING METHODOLOGIES FOR AN ACOUSTIC FETAL HEART RATE MONITOR Final Report, 1 Jan. 1988 - 30 Sep. 1991
ROBERT A. PRETLOW, III and JOHN W. STOUGHTON Sep. 1992 105 p Original contains color illustrations
(Contract NCC1-120)
(NASA-CR-190828; NAS 1.26:190828) Avail: CASI HC A06/MF A02; 16 functional color pages

Research and development is presented of real time signal processing methodologies for the detection of fetal heart tones within a noise-contaminated signal from a passive acoustic sensor. A linear predictor algorithm is utilized for detection of the heart tone event and additional processing derives heart rate. The linear predictor is adaptively 'trained' in a least mean square error sense on generic fetal heart tones recorded from patients. A real time monitor system is described which outputs to a strip chart recorder for plotting the time history of the fetal heart rate. The system is validated in the context of the fetal nonstress test. Comparisons are made with ultrasonic nonstress tests on a series of patients. Comparative data provides favorable indications of the feasibility of the acoustic monitor for clinical use. Author

N92-33908# National Aerospace Medical Centre, Soesterberg (Netherlands). Afdel. Onderzoek en Ontwikkeling.
RADIATION EXPOSURE OF CIVIL AIR CARRIER CREWMEMBERS [STRALINGSBELASTING VAN VLIEGEND PERSONEEL IN DE BURGERLUCHTVAART]
M. SIMONS Oct. 1991 40 p In DUTCH
(NLRGC/B-1-4/91; ETN-92-92054) Avail: CASI HC A03/MF A01

The available knowledge on radiation exposure of civil aircraft crew members is reviewed. The mean additional radiation exposure of Dutch crew operating on intercontinental routes is estimated to be 3 to 6 mSv per annum, which after 20 years means an estimated risk of 2 to 5 in 1000 to die of occupational radiation related cancer, in addition to the normal expectation for the Dutch population that 250 to 300 in 1000 would die of cancer from causes unrelated to occupational radiation exposure. With respect to the regulatory aspects of radiation protection, it is recommended to consider these crew members as a special category. Possible measures for such a category are discussed. It is recommended that a commission be appointed in charge of the development and evaluation of directives for civil aircraft crews. ESA

N92-33927# Chicago Univ., IL. Dept. of Medicine.
PHASE-SHIFTING EFFECT OF LIGHT AND EXERCISE ON THE HUMAN CIRCADIAN CLOCK Annual Report, 1 Mar. 1991 - 29 Feb. 1992
EVE VANCAUTER 29 Feb. 1992 12 p
(Contract AF-AFOSR-0222-90)
(AD-A253012; AFOSR-92-0665TR) Avail: CASI HC A03/MF A01

In animals, the major environmental signal responsible for the entrainment of circadian rhythmicity to external time is the light-dark cycle. While for many years, it was thought that light did not play an important role in synchronizing human rhythms, and that social cues were the primary entraining agent, extensive evidence obtained during the past decade using light of greater intensity than in earlier studies has indicated that the light-dark cycle is also a major zeitgeber for human circadian rhythmicity. The evolution of concepts regarding zeitgebers for non-human mammalian rhythms ran in many ways opposite to that occurring in the field of human rhythms. Indeed, social and/or behavioral cues were long thought to be ineffective as zeitgebers in rodents and other mammals, but evidence has accumulated over the past few years to indicate that behavioral changes are indeed capable of inducing shifts in circadian rhythms. Specifically, stimuli which cause an alteration of the rest activity cycle, either by eliciting activity (i.e., locomotor activity in rodent studies) during the normal rest period or by preventing activity during the normal active period, result in phase shifts of circadian rhythms. These findings implied that physical activity during the usual rest period (i.e., nighttime) as well as sleep occurring during the normal active period (i.e., daytime) could alter the phase of human rhythms. GRA

N92-33928# Harvard Univ., Cambridge, MA.
COOPERATIVITY AND 3-D REPRESENTATION Annual Report, 1 Feb. 1991 - 1 Jan. 1992
PATRICK CAVANAGH 25 May 1992 5 p
(Contract AF-AFOSR-0169-91)
(AD-A253015; AFOSR-92-0652TR) Avail: CASI HC A01/MF A01

Recent evidence indicates that the early stages in visual processing may be broken into several parallel streams that are specialized for the analysis of different visual attributes. A contour localization task showed that all attributes can contribute equally to border localization - no particular attribute dominated position decisions. The position decision appeared to be determined in a common representation. In contrast to this common analysis, a study of visual persistence showed that motion-defined shapes have a visual persistence which lasts longer than, and appears to be independent of, the persistence for luminance-defined shapes. Because of the involvement of motion, the site of the persistence phenomenon must be cortical. A series of experiments on transparency perception showed that transparency is analyzed rapidly (within 60 msec) and influences early levels of visual processing. We have also investigated the early stages that lead from the initial 2-D representation to object recognition. Visual priming studies have been completed which suggest that object recognition begins, not with the construction of a 3-D model, but with a crude match of 2-D views to internal prototypes. The prototype that has the best match then guides the construction of an internal 3-D model. GRA

N92-34103# International Centre for Theoretical Physics, Trieste (Italy).
DEEP HEAT MUSCLE TREATMENT: A MATHEMATICAL MODEL, 1
A. OGULU and A. R. BESTMAN (Port Harcourt Univ., Nigeria) Mar. 1992 20 p
(DE92-634084; IC-92/43) Avail: CASI HC A03/MF A01

The flow of blood during deep heat muscle treatment is studied. We model the blood vessel as a long tube in circular section whose radius varied slowly. Under the Boussinesq approximation, we seek asymptotic series expansions for the velocity components, temperature and pressure about a small parameter, (epsilon), characterizing the radius variation. The study reveals mathematically why physicians recommend a hot bath for cuts and physiotherapists use ice packs for bruises. DOE

N92-34104# International Centre for Theoretical Physics, Trieste (Italy).
DEEP HEAT MUSCLE TREATMENT: A MATHEMATICAL MODEL, 2
A. OGULU and A. R. BESTMAN (Port Harcourt Univ., Nigeria) Mar. 1992 16 p
(DE92-634085; IC-92/44) Avail: CASI HC A03/MF A01

In this paper the effect of viscosity variation on the flow of blood during deep heat muscle treatment is studied. Two methods, an asymptotic series expansion technique and a perturbation technique, are employed to obtain the temperature distribution. The results are compared with the problem of Part 1. A novel development in this part of the study is the combined asymptotic patching and matching technique. DOE

N92-34154*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
TRACK STRUCTURE MODEL OF CELL DAMAGE IN SPACE FLIGHT
ROBERT KATZ (Nebraska Univ., Lincoln.), FRANCIS A. CUCINOTTA, JOHN W. WILSON, JUDY L. SHINN, and DUC M. NGO (Old Dominion Univ., Norfolk, VA.) Oct. 1992 32 p
(Contract RTOP 199-04-16-11)
(NASA-TP-3235; L-17058; NAS 1.60:3235) Avail: CASI HC A03/MF A01

The phenomenological track-structure model of cell damage is discussed. A description of the application of the track-structure model with the NASA Langley transport code for laboratory and space radiation is given. Comparisons to experimental results for cell survival during exposure to monoenergetic, heavy-ion beams are made. The model is also applied to predict cell damage rates and relative biological effectiveness for deep-space exposures. Author

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BEHAVIORAL SCIENCES

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

A92-53996* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
PILOT DISORIENTATION DURING AIRCRAFT CATAPULT LAUNCHINGS AT NIGHT - HISTORICAL AND EXPERIMENTAL PERSPECTIVES
MALCOLM M. COHEN (NASA, Ames Research Center, Moffett Field, CA) Aeromedical & Training Digest, vol. 6, no. 3, July 1992, 4 p. refs
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A review is presented of the investigations conducted into, and the recommendations made to avoid fatal A-7 Corsair II aircraft accidents during night carrier launchings in which the aircraft was apparently flown into the water. The investigating boards conjectured that the pilots were distracted from their normal cockpit procedures and that the distraction was of an insidious nature not previously experienced or expected in the night catapult/departure environment. A conference to discuss these accidents focused on aerodynamic and human factors analyses of the problem, with the goal of producing several recommendations for its resolution. R.E.P.

A92-54216
SELECTING PERFORMANCE MEASURES - 'OBJECTIVE' VERSUS 'SUBJECTIVE' MEASUREMENT
FREDERICK A. MUCKLER and SALLY A. SEVEN Human Factors (ISSN 0018-7208), vol. 34, no. 4, Aug. 1992, p. 441-455. refs
Copyright

The distinction between 'objective' and 'subjective' measurement is neither meaningful nor useful in human

performance studies. All measurement in science and technology is necessarily filled with subjective elements, whether in selecting measures or in collecting, analyzing, or interpreting data. Empirical examples taken from several domains related to human factors show instances in which self-report (subjective) measures may be essential. A model process is suggested for selecting performance measures. Author

A92-54732
PROFESSIONAL PILOTS' EVALUATION OF THE EXTENT, CAUSES, AND REDUCTION OF ALCOHOL USE IN AVIATION
LEONARD E. ROSS and SUSAN M. ROSS (Wisconsin, University, Madison) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 9, Sept. 1992, p. 805-808. refs
(Contract NIH-AA-6093)
Copyright

Pilots holding the ATP rating were surveyed to obtain judgments concerning the seriousness of the alcohol problem in various areas of aviation, the reasons for alcohol use, and the probable effectiveness of strategies intended to reduce alcohol use in aviation. Alcohol use was judged to be a more serious problem in general aviation than in corporate, charter, regional, and major airline activities. Respondents identified the individual's inability to control alcohol use as a primary reason for drinking and flying, and they endorsed remedies that are directed toward those individuals who are seen as the source of the problem. Other factors considered important causes of drinking and flying included pilots' beliefs that they can compensate for alcohol's effects and their lack of knowledge about the rate of decrease in blood alcohol concentration that occurs as a function of time and amount consumed. Author

A92-54735
A REVIEW OF MILITARY PILOT SELECTION
GORDON J. TURNBULL (Princess Alexandra Hospital, Wroughton, United Kingdom) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 9, Sept. 1992, p. 825-830. refs
Copyright

Procedures used for selecting candidates for training as military pilots are reviewed with particular attention given to new developments in the selection methods. The most significant of these developments is the linkage between the computer technology and the aptitude tests. Four variables are suggested for use in predicting scores in the basic flying training stage: the preservice experience; the pilot index (i.e., the pilot test battery score); the score at first selection, including aptitude test and interview elements; and age. I.S.

A92-54736
FEAR OF FLYING IN CIVIL AVIATION PERSONNEL
ATLE DYREGROV (Center for Crisis Psychology, Bergen, Norway), ANDERS SKOGSTAD, ODD H. HELLESOY (Research Center for Occupational Safety and Health, Bergen, Norway), and LIV HAUGLI (Scandinavian Airlines System, Dept. of Occupational Safety and Health, Oslo, Norway) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 9, Sept. 1992, p. 831-838. refs
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Included in a multifaceted questionnaire concerning the work environment within a commercial airline were questions on flight anxiety and exposure for critical incidents. A total of 1147 respondents were included in the sample. Results show that 9.2 percent of the aircrew members feel anxious or afraid of flying monthly or more often. The cockpit crewmembers were less anxious than the cabin crewmembers, and female cabin crewmembers were more anxious than male. Aircrew who had experienced critical situations and had not sufficiently worked through their experiences, reported more anxiety than those with adequate work-through. It is recommended that the cabin crewmembers be provided with better information on how the flight deck operates, and that more stable work crews and cotraining of cabin and cockpit crewmembers be facilitated. A formal debriefing routine after critical incidents is advised. Personnel with flight anxiety should be offered help to reduce their fear level. Author

A92-55070
EXPERIENCING AND PERCEIVING VISUAL SURFACES
KEN NAKAYAMA (Harvard University, Cambridge, MA) and SHINSUKE SHIMOJO (Tokyo, University, Japan) Science (ISSN 0036-8075), vol. 257, no. 5075, Sept. 4, 1992, p. 1357-1363. Research supported by MOESC. refs
(Contract AF-AFOSR-83-0320)
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A theoretical framework is proposed to understand binocular visual surface perception based on the idea of a mobile observer sampling images from random vantage points in space. Application of the generic sampling principle indicates that the visual system acts as if it were viewing surface layouts from generic not accidental vantage points. Through the observer's experience of optical sampling, which can be characterized geometrically, the visual system makes associative connections between images and surfaces, passively internalizing the conditional probabilities of image sampling from surfaces. This in turn enables the visual system to determine which surface a given image most strongly indicates. Thus, visual surface perception can be considered as inverse ecological optics based on learning through ecological optics. As such, it is formally equivalent to a degenerate form of Bayesian inference where prior probabilities are neglected. Author

A92-55683
INTERPERSONAL ISSUES AFFECTING INTERNATIONAL CREWS ON LONG DURATION SPACE MISSIONS
NICK KANAS (California, University, San Francisco) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 7 p. refs
(IAF PAPER 92-0243)

It is noted that, in future long-duration space missions involving international crews, a number of interpersonal issues can be isolated that will affect crew member interactions and performance. These issues include decreased cohesiveness over time, interpersonal tension, reactions to different leadership roles, cultural disparities, and commonality of language and dialect. It is suggested that, to deal with these issues, crews should be selected for mature social skills, interpersonal compatibility, and facility in a common language. L.M.

A92-55684
CREW RESOURCE MANAGEMENT TRAINING CONCEPTS FOR INTERNATIONAL SPACE STATION MISSION APPLICATIONS
E. A. THOMPSON and B. R. MCDONALD (Hernandez Engineering, Inc., Denver, CO) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. refs
(IAF PAPER 92-0244) Copyright

A crew resource management (CRM) training concept is discussed which addresses five learning units: crew communications, behavior styles, stress management, situation awareness, and mission management. Emphasis is placed on the ability of the flight crew to function as a team autonomous from the ground to perform the mission. The mission control team's performances are also examined. It is noted that team members require an academic foundation in fundamental CRM principles, practice and feedback, as well as ongoing reinforcement to institutionalize effective CRM performance. L.M.

A92-55697* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
CREW BEHAVIOR AND PERFORMANCE IN SPACE ANALOG ENVIRONMENTS
BARBARA G. KANKI (NASA, Ames Research Center, Moffett Field, CA) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 9 p. refs
(IAF PAPER 92-0251)

The objectives and the current status of the Crew Factors

research program conducted at NASA-Ames Research Center are reviewed. The principal objectives of the program are to determine the effects of a broad class of input variables on crew performance and to provide guidance with respect to the design and management of crews assigned to future space missions. A wide range of research environments are utilized, including controlled experimental settings, high fidelity full mission simulator facilities, and fully operational field environments. Key group processes are identified, and preliminary data are presented on the effect of crew size, type, and structure on team performance. V.L.

A92-55724
INTERNATIONAL CREW SELECTION AND TRAINING FOR LONG-TERM MISSIONS
A. ALEKSANDROV (NPO Energiia, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 5 p.
(IAF PAPER 92-0294) Copyright

The selection and training of 'cosmonaut researchers' for long-term space station missions is discussed, with special attention given to the training and selection of members of international crews. It is suggested that all cosmonaut researchers should know the theory of all facilities to be used during space flight and be trained in using the facilities on the transportation vehicle and the orbital station and in performing scientific experiments; they should also undergo training in low-pressure chamber and training for the activities after splashdown. The paper lists particular systems of which a foreign cosmonaut researcher for a space station mission should have the knowledge and skills to operate; the fields of education from which these crew members might be selected; and the medical tests that should be passed by prospective crew members. At present, two candidates have started training at the Yu. A. Gagarin Cosmonauts Training Center. I.S.

A92-55812
THE INFLUENCE OF MOTIVATION AT 'HANDS ON' PROGRAMS
HANS H. VON MULDAU (Privates Forschungsinstitut fuer Androidentechnik, Rossdorf, Germany) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p.
(IAF PAPER 92-0477) Copyright

The motivational aspects of education and academic work are examined, and 'hands-on' education is argued to be an effective motivational tool for pedagogical applications. Methods of learning are reviewed with attention given to standards of values in distinct cultural systems, and educational techniques are examined with respect to the use of motivational factors. It is shown that fault tolerance is important in teaching, and specific interactional techniques are given for dealing with faults in learning. The importance of learning aids is established, and the concept of hands-on programs is argued to be useful. Hands-on education is defined as incorporating active participation in projects/techniques into traditional academic treatments of theoretical concepts. Hands-on education is theorized to be efficacious and generally underutilized. C.C.S.

A92-56060
AN EXPERIMENT ON PILOT'S VISUAL CUES IN LOW ALTITUDE HELICOPTER FLIGHT
HIROYASU KAWAHARA, AKIRA WATANABE, KEIJI TANAKA, KAORU WAKAIRO, and KOHEI FUNABIKI (National Aerospace Laboratory, Chofu, Japan) IN: Aircraft Symposium, 29th, Gifu, Japan, Oct. 7-9, 1991, Proceedings. Tokyo, Japan Society for Aeronautical and Space Sciences, 1991, p. 266-269. In Japanese. refs

In order to obtain technical data to be utilized for preventing helicopter accidents caused by human pilots, a flight experiment was conducted by National Aerospace Laboratory, as a part of the urgent research on safety of helicopter operations by the Science and Technology Agency. This paper describes the flight research on pilot's visual cues, which has three themes: visual cues during dropping dusting-powder, identification of cables, and visual cues during hovering and forward flights. Human visual scanning behavior was monitored by an eye-mark-recorder. The results revealed human regular scanning behavior and low ability to identify cables. Author

A92-56268
REVIEW AND REVELATION OF ASTRONAUTS SELECTION
DE-HAN WANG (Institute of Space Medico-Engineering, Beijing, China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 2, 1992, p. 145-150. In Chinese. refs

An overview on work related to the selection of astronauts is presented. Topics addressed include the establishment and requirements of an astronaut selection system, candidate evaluation and elimination, and selection procedures. It is contended that a comprehensive selection system should be established, with particular attention paid to the selection of cardiovascular and vestibular functions, as well as psychological and psychiatric conditions. Latent functional disturbances should be discovered by advanced techniques. Strict evaluation criteria should be established, and the candidate pool should be extended. C.A.B.

A92-56471
COMPULSIVE PERSONALITY TRAITS AFFECTING AERONAUTICAL ADAPTABILITY IN A NAVAL AVIATOR - A CASE REPORT
F. H. JENKINS and JAMES C. BAGGETT (U.S. Navy, Naval Aerospace Medical Institute, Pensacola, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, no. 6, June 1992, p. 529-532. refs
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This is a case report of a male naval aviator who demonstrated compulsive personality traits which adversely affected the performance of his duties as a pilot trainee, and later, as a naval flight officer. The Diagnostic and Statistical Manual of the American Psychiatric Association (DSM-III-R) uses the term obsessive-compulsive to describe two conditions. A review of terminology is undertaken to present the reader with the distinguishing features of the personality disorder versus the anxiety disorder. The anxiety disorder, obsessive-compulsive disorder, is incompatible with safe performance of aviation duties. Obsessive-compulsive personality, on the other hand, describes a point on a continuum where useful, adaptive compulsive traits may become abnormally exaggerated and maladaptive, thus interfering with the aviator's normal routine, occupational functioning, relationships with others, and aviation safety. Author

A92-56951
UNDERSTANDING THE RELATIONS BETWEEN SELECTION FACTORS AND PILOT TRAINING PERFORMANCE - DOES THE CRITERION MAKE A DIFFERENCE?
THOMAS R. CARRETTA (USAF, Armstrong Laboratory, Brooks AFB, TX) International Journal of Aviation Psychology (ISSN 1050-8414), vol. 2, no. 2, 1992, p. 95-105. refs
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UPT (undergraduate pilot training) rankings generated from a training evaluation algorithm have been shown to be closely related to advanced training recommendations for fighter vs. nonfighter aircraft. This suggests that the ranking algorithm is a reasonable indicator of pilot candidate quality because fighter aircraft assignments are considered more prestigious than nonfighter assignments. It is noted that when the ranking algorithm was modified to include UPT eliminees, however, it showed little utility in adding to the understanding of the relation between preselection personnel test scores and training performance. For pilot candidate selection the training criterion used to estimate the regression weights for the selection equation was found to have little impact on the ranking of the applicants once the predictors were held constant. L.M.

A92-56952
DICHOTIC LISTENING AND PSYCHOMOTOR TASK PERFORMANCE AS PREDICTORS OF NAVAL PRIMARY FLIGHT-TRAINING CRITERIA
HAROLD D. DELANEY (New Mexico, University, Albuquerque) International Journal of Aviation Psychology (ISSN 1050-8414), *vol. 2, no. 2, 1992, p. 107-120. Research supported by U.S.* Navy. refs
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A statistical evaluation of the automated dichotic listening task (DLT) and psychomotor tasks (PMTs) indicated that both contributed to the prediction of primary flight-training criteria. The DLT and PMTs were performed by 677 student naval aviators after completing the academic portion of naval flight training and while awaiting the flight portion of primary training. The results obtained suggest that assessing concurrent psychomotor tracking and DLT performance may be a particularly appropriate way to predict performance in naval flight training. L.M.

A92-56954
REQUIREMENTS FOR FUTURE RESEARCH IN FLIGHT SIMULATION TRAINING - GUIDANCE BASED ON A META-ANALYTIC REVIEW
ROBERT T. HAYS, JOHN W. JACOBS, CAROLYN PRINCE, and EDUARDO SALAS (U.S. Navy, Naval Training Systems Center, Orlando, FL) International Journal of Aviation Psychology (ISSN 1050-8414), vol. 2, no. 2, 1992, p. 143-158. Research supported by Oak Ridge Associated Universities. refs
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Traditional narrative reviews of aviation training research have produced inconsistent conclusions and little specific guidance for training design. A quantitative review approach, referred to as meta-analysis, was applied to transfer of training experiments that included sufficient information for the statistical analysis. From a total of 247 journal articles and technical reports, only 26 *experiments (19 involving jet aircraft and 7 involving helicopters)* were included in the final meta-analysis. Drawing on the meta-analytic review, this report outlines an agenda for future research and provides guidelines for reporting research results. Author

A92-57135* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
PAYLOAD TRAINING FOR THE SPACE STATION ERA
CAROLYN S. GRINER, CHARLES M. LEWIS, and KENNETH A. SMITH (NASA, Marshall Space Flight Center, Huntsville, AL) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 8 p. refs
(IAF PAPER 92-0706)

Training astronaut and ground controllers for payload operations onboard Space Station Freedom presents challenges not found in precursor programs such as Skylab and Spacelab. The evolution from current Spacelab payload training concepts is discussed, and the proposed SSF payload training approach is presented along with development strategies and recommendations. Author

A92-57150
PREPARATION FOR TRAINING OF FUTURE EUROPEAN ASTRONAUTS
K. DAMIAN, H. AREND, and O. CHIARENZA (ESA, European Astronauts Centre, Cologne, Germany) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 9 p.
(IAF PAPER 92-0722) Copyright

The European astronauts' training program and the European part of the coordinated training program for Space Station Freedom are presented. The overall astronaut training flow, covering Basic Training, Specialized Training, Mission Training, and Proficiency Maintenance, is outlined, and the structure and major contents of the training phases and blocks are explained. Within the framework of the International Space Station Freedom Program, ESA is to conduct Basic Training for its astronauts and provide Attached Laboratory element-specific training and training on European payloads, during both the specialized and mission training phases. The European astronauts' training facilities are to comprise classroom and computer-aided instruction facilities, element-specific, and generic training facilities. P.D.

N92-32569# Michigan Univ., Ann Arbor. Technical *Communication Program.*
HUMAN LEARNING OF SCHEMAS FROM EXPLANATIONS IN PRACTICAL ELECTRONICS Interim Report
DAVID E. KIERAS 4 Dec. 1991 48 p
(Contract N00014-88-K-0133)
(AD-A247429; TR-91/ONR-34) Avail: CASI HC A03/MF A01

Training materials in practical electronics appear to follow a building blocks approach in which common simple circuits are presented and then combined into more complex circuits. Each circuit is presented in the form of a circuit diagram and an explanation of how the circuit works in terms of a causal chain of events. Such materials suggest that teaming electronics consists *of learning schemas for the building block circuits; complex circuits* can then be understood as combinations of these simpler schematic circuits. The process of teaming appears to be based on extracting schemas from the explanations. This report presents human experimental results based on earlier artificial intelligence work. In this project, engineering students learned building block circuits and then learned complex circuits; the time required to understand the explanations and answer questions about the circuit behavior were compared to an AI system that learned from explanations and a model of question-answering. Generally, learning the schematic building block circuits facilitated performance, and the AI system and question-answering model could predict the amount of facilitation. However, the benefit of learning circuit schemas under these conditions was surprisingly mild. GRA

N92-32660# White House Military Office, Falls Church, VA. Office *of Emergency Operations.*
TOWARD ADVANCED HUMAN RELIABILITY PROGRAMS. STRUCTURAL DEVELOPMENT CONSIDERATIONS AND OPTIONS FOR EXTREME RISK ENVIRONMENTS Report, Oct. 1990 - Jun. 1991
RICHARD C. NELSON May 1992 107 p
(AD-A250786) Avail: CASI HC A06/MF A02

Operational populations exposed to extreme risk environments (EREs) might expect to sustain substantial losses, yet must be able to be relied upon to complete their mission or missions regardless. Existing human (personnel) reliability programs are inadequate to assure that personnel capable of meeting both the necessary security and operational requirements are available for response to such conditions. This study explores a number of issues to consider in building a robust human reliability program (HRP) structure capable of supporting single to multiple operational populations, scenarios, and missions, using any of several program structure formats. The HRP structure format may be used within a single agency or government-wide. GRA

N92-32817# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
INSTRUMENT SCANNING AND SUBJECTIVE WORKLOAD WITH THE PERIPHERAL VISION HORIZON DISPLAY Final report
DONALD HAMELUCK and PAUL STAGER Jun. 1989 132 p
(Contract W7711-7-7004/01-SE)
(CTN-92-60359) Copyright Avail: CASI HC A07/MF A02

The Peripheral Vision Horizon Display (PVHD) is an expanded *artificial horizon line which is produced by sweeping the beam of* a red laser across the instrument panel in front of the pilot. The PVHD is intended to provide the pilot with visual orientation information through peripheral vision without the need to look directly at the attitude indicator (AI) display. The present study examined the effect of the PVHD on the instrument scanning behavior of pilots during two types of instrumented approaches. The effect of PVHD on subjective workload was also examined to test the hypothesis that the PVHD would reduce the experience

of workload during the approaches. Two of the four pilots showed a change in their scanning behavior which could be interpreted as a decrease in the visual workload involved in scanning the AI. However, it appeared that the PVHD increased the subjective workload. It is argued that workload was increased because the PVHD reflected off certain instruments and that it distracted the pilots from their normal scanning pattern by attracting attention to small attitude changes. It is noted that the results obtained in this study might be partially due to pilot inexperience with the PVHD. It was concluded that the PVHD would be most useful when flight operations require the pilot to look outside the cockpit and stable orientation cues such as the earth's horizon are not visible.
Author (CISTI)

N92-32990# Allen Corp. of America, Alexandria, VA.
FEASIBILITY STUDY FOR PREDICTING HUMAN RELIABILITY GROWTH THROUGH TRAINING AND PRACTICE Final Report, Dec. 1989 - Dec. 1990
JOHN C. LOWRY, VIRGINIA A. RAPPOLD, and MICHAEL M. COPENHAVER May 1992 209 p
(AD-A252371; ARI-RN-92-39) Avail: CASI HC A10/MF A01

This report examines the feasibility of developing a stand alone, quantitative Human Reliability Growth Model (HRGM) that predicts the impact of training variables on a soldier's performance. Such a model would incorporate learning curve fitting techniques to predict the impact of training variables on performance and would be based on empirical data from behavioral and social science literature and available government data bases. This report describes the effort to collect empirical data on the effects of learning and practice on human performance. In addition, the report contains a review of the theoretical literature involving human learning and practice in which the nature and application of learning curves and curve fitting techniques are derived and summarized. The results of this effort reveal that, out of approximately 3,000 research titles and abstracts reviewed, only 27 articles meet minimal criteria for use in developing the HRGM. It was concluded that, although a theoretical basis for developing an HRGM exists, the data could not support its development. GRA

N92-33390# Washington Univ., Seattle. Dept. of Psychology.
COMPUTERIZED ASSESSMENT OF INDIVIDUAL DIFFERENCES Final Report, 1 Oct. 1987 - 30 Jan. 1991
EARL B. HUNT 29 Aug. 1991 35 p
(Contract N00014-86-C-0065)
(AD-A252801) Avail: CASI HC A03/MF A01

Co-ordinating ability is the ability to integrate information from several domains in order to accomplish a single task. An example is integrating verbal instructions with visual perception of scenes. We have found that coordinating ability in linguistic and perceptual tasks is an ability that is over and above the ability to deal with linguistic or perceptual tasks alone. A related study analyzed orienting ability, i.e., the ability to locate oneself in large-scale space. Orienting requires the integration of information from a succession of visual scenes. This ability was shown to depend upon the ability to form and unite surveyor's representations of different scenes, given the information in a ground plane view. Orienting ability was studied by contrasting the abilities of college students (novices) and sports orienteers, including international competitors. GRA

N92-33433# Universal Energy Systems, Inc., Dayton, OH.
PERSONALITY THEORY FOR AIRCREW SELECTION AND CLASSIFICATION Final Report, Nov. 1990 - Nov. 1991
LARRY A. PEDERSEN, KARLA E. ALLAN, FRANCIS J. LAUE, JAMES R. JOHNSON, and FREDERICK M. SIEM May 1992 49 p
(Contract F41689-86-D-0052)
(AD-A253045; AL-TR-1992-0021) Avail: CASI HC A03/MF A01

Growing acceptance of a taxonomy of personality traits developed by the Air Force in the late 1950's (Tupes and Christal, 1961) has prompted a reexamination of the utility of personality measures for aircrew selection and classification research. Candidate theories are identified and then evaluated according both to general scientific criteria and to specific operational criteria (e.g., Hall and Lindzey, 1978; Imhoff and Levine, 1981). The Five Factor Model (Goldberg, 1990; McCrae and Costa, 1985; Tupes and Christal, 1961) is selected as the most suitable framework for guiding future Air Force research in the personality domain. Example items to measure relevant characteristics are proposed, as are directions for future research. GRA

N92-33588# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
FATIGUE EFFECTS ON GROUP PERFORMANCE, GROUP DYNAMICS, AND LEADERSHIP
EMOKE JOZSVAI and RON HESLEGRAVE Nov. 1991 44 p
(DCIEM-91-70; CTN-92-60568) Avail: CASI HC A03/MF A01

Three groups of four subjects were exposed to 64 hours of sleep deprivation. Group problem solving, group dynamics, cognitive abilities, and subjective well-being were assessed over eleven 15 minute sessions during which each group had to solve a syllogism. The speed of group problem solving did not change as a function of sleep deprivation. However, subjects did not contribute equally to the solution of the syllogisms. Behavioral observations revealed that within each group, one or two subjects rotated task leadership in verbal syllogism problem solving. Neither individual cognitive abilities nor individual states of well-being were systematically related to the allocation of individual group problem solving efforts. Regarding group interactions, intra-group hostility remained low and the group atmosphere was positive throughout the experiment. These results suggest that group performance of complex cognitive tasks can be maintained under conditions of extreme fatigue even though individual abilities and well being have been severely degraded. The data suggest that the maintenance of group performance is dependent both on some group members becoming task leaders and on a positive group atmosphere, which allows non-leaders to temporarily assume task leadership when task leaders are incapacitated. Author (CISTI)

N92-33856# National Space Development Agency, Tokyo (Japan). Space Station Program Dept.
JEM DEVELOPMENT STATUS AND PLAN FOR JEM CREW TRAINING
KAZUHIKO YONEYAMA *In* Science and Technology Agency, The 14th Space Station Utilization Workshop in Japan p 31-47 21 Jan. 1992 In JAPANESE
Avail: CASI HC A03/MF A02

The outline, the operation plan, and the development schedule of JEM (Japanese Experiment Module) are described. The status of JEM crew training is also outlined. The following topics are addressed: conceptual drawings of the JEM; characteristics of JEM; structure of JEM pressurized module; equipment layout on exposed facilities; fundamental issues for space station operation; conceptual drawings of JEM operation system; major JEM development and operation schedule; description of Japanese space station crew; the process from space station crew selection to their getting aboard the station; selection criteria of JEM crew; Japanese astronaut education and training schedule; details of JEM crew training; and participation in Mission Specialist (MS) training. Author (NASDA)

N92-33886*# Wyle Labs., Inc., El Segundo, CA.
EVALUATION OF HUMAN RESPONSE TO STRUCTURAL VIBRATION INDUCED BY SONIC BOOM
L. C. SUTHERLAND and J. CZECH *In* NASA. Langley Research Center, High-Speed Research: Sonic Boom, Volume 1 p 171-195 Oct. 1992
Avail: CASI HC A03/MF A03

This paper addresses the topic of building vibration response to sonic boom and the evaluation of the associated human response to this vibration. The paper reexamines some of the issues addressed in the previous extensive coverage of the topic, primarily by NASA, and attempts to offer a fresh viewpoint for some of the problems that may assist in reassessing the potential impact of sonic boom over populated areas. The topics addressed are: (1) human response to vibration; (2) criteria for, and acoustic

signature of rattle; (3) structural response to shaped booms, including definition of two new descriptors for assessing the structural response to sonic boom; and (4) a detailed review of the previous NASA/FAA Sonic Boom Test Program involving structural response measurements at Edwards AFB and an initial estimate of structural response to sonic booms from possible high speed civil transport configurations. Finally, these estimated vibration responses are shown to be substantially greater than the human response and rattle criteria developed earlier. Author

N92-34076# California Univ., Berkeley. Lawrence Berkeley Lab.
QUANTUM CONCEPTION OF MAN
H. P. STAPP Apr. 1992 12 p Presented at the 3rd UNESCO Science and Culture Forum: Toward Eco-Ethics-Alternative Visions of Culture, Science, Technology and Nature, Belem, Brazil, 5-10 Apr. 1992
(Contract DE-AC03-76SF-00098)
(DE92-017080; LBL-32043; CONF-9204173-1) Avail: CASI HC A03/MF A01

This report discusses the quantum processes of the brain and the relationship that this process has on man's behavior. DOE

N92-34184# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA.
META ANALYSIS OF AIRCRAFT PILOT SELECTION MEASURES
DAVID R. HUNTER and EUGENE F. BURKE Jun. 1992 40 p
(AD-A253387; ARI-RN-92-51) Avail: CASI HC A03/MF A01

For this research, the meta-analytic procedures described by earlier researchers were applied to a database of 476 correlations based on an overlapping sample of 432,324 cases. These correlations were obtained from a review of the research literature on aircrew selection published from 1920 to 1990. Over 200 studies that dealt with aircrew selection were identified. Of that number, 69 reported correlations between some independent measure and a pilot training performance criterion. Analyses were conducted of the overall aggregated set of correlations and subsets selected on the basis of date of study, type of predictor measure, type of aircraft, and sample characteristics. These analyses showed a decline in the mean validity correlations obtained over the previous 50 years. In addition, differences in the mean correlations were observed among the various types of predictor measures. In general, job sample measures were the best predictors of performance, followed by psychomotor coordination and biographical inventories. Possible applications of the results in the interpretation of previous research and in the design of future research are discussed. GRA

N92-34234*# Virginia Univ., Charlottesville. Dept. of Psychology.
PERCEPTUAL ADAPTATION IN THE USE OF NIGHT VISION GOGGLES Final Technical Report, Jun. 1991 - May 1992
FRANK H. DURGIN and DENNIS R. PROFFITT May 1992 21 p
(Contract NAG2-721)
(NASA-CR-190572; NAS 1.26:190572) Avail: CASI HC A03/MF A01

The image intensification (I sup 2) systems studied for this report were the biocular AN/PVS-7(NVG) and the binocular AN/AVS-6(ANVIS). Both are quite impressive for purposes of revealing the structure of the environment in a fairly straightforward way in extremely low-light conditions. But these systems represent an unusual viewing medium. The perceptual information available through I sup 2 systems is different in a variety of ways from the typical input of everyday vision, and extensive training and practice is required for optimal use. Using this sort of system involves a kind of perceptual skill learning, but is may also involve visual adaptations that are not simply an extension of normal vision. For example, the visual noise evident in the goggles in very low-light conditions results in unusual statistical properties in visual input. Because we had recently discovered a strong and enduring aftereffect of perceived texture density which seemed to be sensitive to precisely the sorts of statistical distortions introduced by I sup 2 systems, it occurred to use that visual noise of this sort might be a very adapting stimulus for texture density and produce an aftereffect that extended into normal vision once the goggles were removed. We have not found any experimental evidence that I sup 2 systems produce texture density aftereffects. The nature of the texture density aftereffect is briefly explained, followed by an accounting of our studies of I sup 2 systems and our most recent work on the texture density aftereffect. A test for spatial frequency adaptation after exposure to NVG's is also reported, as is a study of perceived depth from motion (motion parallax) while wearing the biocular goggles. We conclude with a summary of our findings. Author

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

A92-53620
COLLISION AVOIDANCE FOR MANIPULATORS USING VIRTUAL HINGES
OSAMU OKAMOTO, YOSHIAKI OHKAMI, TAKASHI KIDA, and ISAO YAMAGUCHI (National Aerospace Laboratory, Chofu, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 1211-1216. refs
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A new method for collision avoidance is proposed for manipulator trajectory control. The method is based on the unified matrix approach used in the formulation of multibody system dynamics, and also on the introduction of 'virtual' hinges that restrict to a manipulator tip motion to a desired motion and prevent the arms from collision with obstacle(s). This algorithm can be applied not only to digital simulation of a system in order to evaluate the path generator and controller performance but also to generation of the real time control law. Some numerical results are shown for illustration as applied to the 4 arm manipulator and one obstacle. Author

A92-53621
MISSION-FUNCTION CONTROL OF A SPACE MANIPULATOR FOR CAPTURE OF A MOVING OBJECT
HIRONORI FUJII, TSUTOMU MURAYAMA, and KAZUNARI NAKAJIMA (Tokyo Metropolitan Institute of Technology, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 1217-1222. refs
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The control problem presently treated involves the capture of an object, which may be a drift in space, by a space manipulator that is mounted on a space structure; for the sake of simplicity. Only planar motion is treated. The mission-function control algorithm, which has its basis in the Liapunov method for nonlinear dynamical systems, is employed. Numerical simulation results indicate excellent control-algorithm performance in this microgravity object-capture task. O.C.

A92-53622
DEVELOPMENT OF A 6 DOF HAND CONTROLLER
SHINICHI TAKARADA (Hitachi, Ltd., Space Systems Div., Yokohama, Japan), TARO IWAMOTO (Hitachi, Ltd., Mechanical Engineering Research Laboratory, Tsuchiura, Japan), KENJIROU KUMAMOTO, and NAOYA EZAWA (Hitachi, Ltd., Space Systems Div., Yokohama, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990,

Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 1223-1228. refs
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NASA's Space Station Freedom will employ a six-degree-of-freedom 'hand controller' (H/C) for operations requiring exceptional dexterity in virtue of working envelope, safety, or system-resources criticality. The H/C employs a terminal motion-corresponding control scheme, in conjunction with resolved-motion control. High design commonality in the H/C's joints yields enhanced cost effectiveness for the design. O.C.

A92-53623
ROBOTS FOR SPACE EXPERIMENTS
KOHTARO MATSUMOTO and SEISIROH KIBE (National Aerospace Laboratory, Chofu, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 1229-1234. refs
Copyright

An account is given of the configuration and projected performance of a robotic space-experiments facility that is based on near-term technologies and may enter operation after 2003, in conjunction with the JEM module associated with NASA's Space Station Freedom. The most significant considerations in the design of these robotic systems are (1) the lack of task-repeatability for which industrial robots are produced, and (2) the critical importance of AI in the requisite autonomous analyses of experiment results. O.C.

A92-53624
A CONCEPT ON DOCKING MECHANISM FOR IN-ORBIT SERVICING
HIDEHIKO MITSUMA, EIICHI ENDO (NASDA, Tsukuba Space Center, Japan), TORU GYOGI, YOKO WATABE, MASAO AKIYAMA, and HIDEKI NAKAJIMA (Nissan Motor Co., Ltd., Aerospace Div., Tokyo, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 1235-1242. Research supported by NASDA. refs
Copyright

A robotic autonomous docking mechanism will be developed in Japan for NASA's Space Station Freedom which will possess the greatest degree of docking and berthing operational flexibility, on the basis of a 'modular mechanisms' concept. This concept involves the distribution of operational capabilities among such modular mechanical elements as a boom mechanism, a structural latch mechanism, an umbilical connection mechanism, and a suite of sensors and controllers. An analysis has been conducted of these modular elements. O.C.

A92-53625
RESEARCH AND DEVELOPMENT OF A TELE-ROBOT FOR SPACE USE
YOSHITUGU TODA, TOSHIAKI IWATA, and KAZUO MACHIDA (Electro-Technical Laboratory, Tsukuba, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 1243-1246.
Copyright

An account is given of the development status for an EVA-oriented telerobotic system; work has progressed to the fabrication of several kinds of actuators which are suitable for the vacuum conditions of space. A master/slave manipulator system that is enhanced by a real-time graphics simulator has also beed devised, together with an active-compliance end-effector capable of compensating for a free-flying teleoperator's position errors. The planar, free-flying telerobot is currently under construction. O.C.

A92-53665
WASTE WATER PURIFICATION METHOD USING VAPOR COMPRESSION DISTILLER
KOJI OTSUBO, TOSHIHARU TANEMURA, KEIJI NITTA, MITSUO OGUCHI (National Aerospace Laboratory, Chofu, Japan), HIROSHI KASHIWAGI, and YOSHIO SAWADA (Sasakura Engineering Co., Ltd., Osaka, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 1547-1554. refs
Copyright

A vapor-compression distiller which uses centrifugal force to separate vapor from liquid is presently considered as a water-recycling system for manned spacecraft. Preliminary performance capability data for such a device were obtained experimentally. It is found that a blower must be adapted to enhance system efficiency, and that both the distillate and the condensed waste water must avoid gas/liquid mixed phases. A suitable method for the cleaning of the inner drum surface must also be devised. O.C.

A92-53666
EVALUATION FOR WASTE WATER PURIFICATION USING THERMOPERVAPORATION METHOD
TOSHIHARU TANEMURA, KOJI OTSUBO, KEIJI NITTA, MITSUO OGUCHI (National Aerospace Laboratory, Chofu, Japan), AKIRA ASHIDA, KENJI MITANI, and NOBUO HAMANO (Hitachi, Ltd., Tokyo, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 1555-1560. refs
Copyright

The thermopervaporation method for recovering purified water from waste water in a manned spacecraft recycling system involves a high molecular weight polymer membrane to induce water vapor. An account is given of the design features and operational characteristics of a laboratory thermopervaporator, as well as the results of a month-long test. It is established that modifications must be made to the membrane element's flowpath shape. O.C.

A92-53667
ADVANCED EXPERIMENTAL MODEL OF WATER DISTILLATION SYSTEM
KENJI MITANI, NOBUO HAMANO, AKIRA ASHIDA (Hitachi, Ltd., Space Systems Div., Yokohama, Japan), HIDEAKI KUROKAWA, TOSHIO SAWA (Hitachi, Ltd., Energy Research Laboratory, Japan), KOJI OTSUBO, TOSHIHARU TANEMURA, KEIJI NITTA, and MITSUO OGUCHI (National Aerospace Laboratory, Chofu, Japan) IN: International Symposium on Space Technology and Science, 17th, Tokyo, Japan, May 20-25, 1990, Proceedings. Vol. 2. Tokyo, AGNE Publishing, Inc., 1990, p. 1561-1564. refs
Copyright

An advanced, thermopervaporation method-based water distiller has been developed which is built up from hollow-fiber modules and achieves exceptionally great compaction. The permeation rate and electrical conductivity values established for the treated water volume are judged to support the feasibility of such a system's use in manned spacecraft. Treated-water purity is found to be sufficiently high for any experimental use currently envisioned, despite a power consumption of less than 1 kW. O.C.

A92-54215
TEST AND EVALUATION METRICS FOR USE IN SUSTAINED ACCELERATION RESEARCH
KATHY A. MCCLOSKEY (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH), LLOYD D. TRIPP (Systems Research Laboratories, Inc., Dayton, OH), TAMARA L. CHELETTE, and STEPHEN E. POPPER (USAF, Armstrong Laboratory, Wright-Patterson AFB, OH) Human Factors (ISSN 0018-7208), vol. 34, no. 4, Aug. 1992, p. 409-428. refs
Copyright

This paper reviews three models that historically have been used to explain and describe the effects of greater than 1 g forces on humans: the hydrostatic column model, the blood oxygen saturation model, and the neurological model. Metrics are outlined that relate to each of the three models and a unified model based on integration of those models is presented. The match between ground-based centrifuges and aircraft is examined, as is transfer

of results from the centrifuge to the aircraft. The feasibility of using physiological, subjective, and performance metrics in the aircraft is examined. Author

A92-54217
ESTABLISHING HUMAN FACTORS CRITERIA FOR SPACE CONTROL SYSTEMS
SAMUEL G. CHARLTON (USAF, Operational Test and Evaluation Center, Kirtland AFB, NM) Human Factors (ISSN 0018-7208), vol. 34, no. 4, Aug. 1992, p. 485-501. refs
Copyright

This paper describes the development of a human factors methodology and its application to the operational test and evaluation of space control systems. The method uses a correlation approach to link human factors measures to the mission effectiveness of space control systems. Experiment 1 describes an initial wide-spectrum attempt to identify human factors predictors of system performance. Based on the results of Experiment 1, the human factors measures and analysis method were refined and applied in the test of an operational satellite control system in Experiment 2. Experiment 3 applied the same methodology to a different satellite control system in order to determine the generalizability of the approach. The methodology worked with more than one system and was robust with respect to changes in personnel and location. The methodology was sensitive to changes in software, hardware, and procedures, and it yielded data that correctly reflected those changes. Author

A92-54280* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
GAS EXCHANGE IN NASA'S BIOMASS PRODUCTION CHAMBER - A PREPROTOTYPE CLOSED HUMAN LIFE SUPPORT SYSTEM
KENNETH A. COREY (Massachusetts, University, Amherst) and RAYMOND M. WHEELER (NASA, Kennedy Space Center, Cocoa Beach, FL) BioScience (ISSN 0006-3568), vol. 42, no. 7, July-Aug. 1992, p. 503-509. refs
Copyright

The unique capabilities of the NASA biomass production chamber for monitoring and evaluating gas exchange rates are examined. Special emphasis is given to results with wheat and soybeans. The potential of the chamber as a preprototype of a closed human life support system is considered. C.D.

A92-54281
PHOTOSYNTHESIS AS A BASIS FOR LIFE SUPPORT ON EARTH AND IN SPACE - PHOTOSYNTHESIS AND TRANSPIRATION IN ENCLOSED SPACES
ARTHUR W. GALSTON (Yale University, New Haven, CT) BioScience (ISSN 0006-3568), vol. 42, no. 7, July-Aug. 1992, p. 490-493. refs
Copyright

The role of plants in the NASA CELSS (Closed Ecological Life Support System) program is discussed. It is shown how plants' ability to furnish food, oxygen, and pure water from human wastes can help make CELSS a paradigm for planet earth. The organization and operation of the CELSS program is described. C.D.

A92-54282* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
DESIGN OF A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM - REGENERATIVE TECHNOLOGIES ARE NECESSARY FOR IMPLEMENTATION IN A LUNAR BASE CELSS
STEVEN H. SCHWARTZKOPF (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA) BioScience (ISSN 0006-3568), vol. 42, no. 7, July-Aug. 1992, p. 526-5354. refs
(Contract NAS9-18069)
Copyright

Issues involved in designing a life support system for a new era of space exploration are outlined. A conceptual design is described for a controlled ecological life support system developed for a lunar base. In situ resource utilization for such a system is examined. C.D.

A92-54625
ENHANCED HUD SYMBOLOGY ASSOCIATED WITH RECOVERY FROM UNUSUAL ATTITUDES
JOHN E. DEATON, MICHAEL BARNES (U.S. Navy, Naval Air Development Center, Warminster, PA), JONATHAN KERN, and DOUGLAS WRIGHT (VEDA, Inc., Warminster, PA) Cockpit (ISSN 0742-1508), Apr.-June 1992, p. 4-12. refs
Copyright

A study is presented that examines the degree of spatial awareness obtained utilizing what is called an 'Augie Arrow'; this can be displayed as either a 'nearest horizon pointer' or an 'up arrow' indicator. A second issue investigated concerned the usefulness of analog dials, versus digital readouts of altitude and airspeed, as an aid to recovery. It is suggested that the Augie Arrow may improve recovery from unusual attitudes. R.E.P.

A92-55155#
DEVELOPMENT OF FREE-FLYING SPACE TELEROBOT, GROUND EXPERIMENTS ON 2-DIMENSIONAL FLAT TEST BED
YOSHITUGU TODA, TOSHIAKI IWATA, KAZUO MACHIDA (Electrotechnical Laboratory, Tsukuba, Japan), AKIKO OTUKA, HIDETOSHI TORIU, YASUO SHINOMIYA (Toshiba Corp., Komukai Works, Kawasaki, Japan), YASUSI FUKUDA, MAKOTO ASAKURA, and NOBUTO MATUHIRA (Toshiba Corp., Research and Development Center, Kawasaki, Japan) IN: AIAA Guidance, Navigation and Control Conference, Hilton Head Island, SC, Aug. 10-12, 1992, Technical Papers. Pt. 1. Washington, American Institute of Aeronautics and Astronautics, 1992, p. 33-39. refs
(AIAA PAPER 92-4308) Copyright

This paper describes an ongoing development program for a free-flying space telerobot that can take the place of a human astronaut in extravehicular activities. An inertial navigation system with a linearized control system for maneuvering is adopted. Sensory-feedback techniques are employed for manipulating and handling objects, such as in: (1) arm slew motion with inertial sensors; (2) tracking of grapple fixtures of a target with a vision sensor system; and (3) gently catching and handling targets. The paper gives ground experimental model that works under microgravity conditions on a 2D bed with an air-bearing system. Author

A92-55488
A NEW APPROACH TO SPACECRAFT CREW SYSTEM OPERATIONS
W. J. OCKELS (ESTEC, Noordwijk, Netherlands) ESA Journal (ISSN 0379-2285), vol. 16, no. 2, 1992, p. 233-236.
Copyright

A new methodology to the crew interface which improves the crew's effectiveness, has built-in protection against human error, and drastically reduces training requirements, has been demonstrated utilizing the ESTEC Crew Workstation Testbed. The testbed is based on an interactive system that includes a 'live functional diagram' display showing system status and responses to commands. The subsystem employed for the research is the cabin air pressure system of the Space Shuttle. R.E.P.

A92-55535
OPTIMAL MOTION PLANNING FOR SPACE ROBOTS
C. S. SALLABERGER and G. M. T. D'ELEUTERIO (Toronto, University, Canada) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 11 p. Research supported by NSERC. refs
(IAF PAPER 92-0040) Copyright

A motion planning technique for space robotic systems is developed and applied to both articulated robotic manipulators and mobile space robots. The algorithm employs randomization and dynamic programming methods. This algorithm is utilized to prescribe the geometry of the path from an initial robot location

to a desired goal location as well as to specify the trajectory in time along the path. R.E.P.

A92-55685* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
MICROGRAVITY HUMAN FACTORS WORKSTATION DEVELOPMENT
MIHRIBAN WHITMORE, ROBERT P. WILMINGTON, RANDY B. MORRIS (Lockheed Engineering and Sciences Co., Houston, TX), and DEAN G. JENSEN (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 7 p. refs
(IAF PAPER 92-0245) Copyright

Microgravity evaluations of workstation hardware as well as its system components were found to be very useful for determining the expected needs of the Space Station crew and for refining overall workstation design. Research at the Johnson Space Center has been carried out to provide optimal workstation design and human interface. The research included evaluations of hand controller configurations for robots and free flyers, the identification of cursor control device requirements, and the examination of anthropometric issues of workstation design such as reach, viewing distance, and head clearance. L.M.

A92-55686
SENSORY SUBSTITUTION OF FORCE FEEDBACK FOR THE HUMAN-MACHINE INTERFACE IN SPACE TELEOPERATION
M. J. MASSIMINO and T. B. SHERIDAN (MIT, Cambridge, MA) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. refs
(IAF PAPER 92-0246) Copyright

An experimental study was conducted on the capabilities of sensory substitution for force feedback, presented to the operator of a space teleoperation system, through the tactile and auditory senses, with and without a time delay. The motivation and contributions of this study are outlined. The auditory and vibrotactile displays of force that were used as the sensory substitution display of force are described. Performance was improved by using either the auditory or vibrotactile display to represent basic force information. Further, the auditory and vibrotactile displays compared favorably to traditional force feedback (force reflection). Tasks conducted with a three second time delay determined that both of the sensory substitution displays significantly improved performance, and provided force information to the human operator without instabilities. When the operator's view was obstructed, the manipulation tasks were completed successfully both with and without a time delay while the subjects used either of the sensory substitution displays as the only source of feedback. Conclusions on the usefulness of sensory substitution for force feedback are also included. Author

A92-55691
COGNITIVE ENGINEERING AS A TOOL TO DESIGN HUMAN-COMPUTER INTERFACES IN COMPLEX ENVIRONMENTS
P. SALEMBIER (Conservatoire National des Arts et Metiers, Paris, France), B. PAVARD (Matra Espace, S.A., Toulouse, France), H. BENCHEKROUN, E. DE MEDEIROS (Conservatoire National des Arts et Metiers, Paris, France), and J. P. DENIER (Matra Espace, S.A., Toulouse, France) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. refs
(IAF PAPER 92-0253) Copyright

An effort is being made to develop a general methodology based on cognitive simulation for the design of cognitive tools for complex, dynamic, multiagent systems. Two practical applications of this methodology are described: (1) a communication aid tool for the diagnosis and resolution of hospital emergency calls, and (2) a problem-solving aid tool for troubleshooting computer-related technical problems by telephone. L.M.

A92-55696* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
WE CAN'T EXPLORE SPACE WITHOUT IT - COMMON HUMAN SPACE NEEDS FOR EXPLORATION SPACEFLIGHT
K. R. DAUES and H. O. ERWIN (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 16 p. refs
(IAF PAPER 92-0247)

An overview is conducted of physiological, psychological, and human-interface requirements for manned spaceflight programs to establish common criteria. Attention is given to the comfort levels relevant to human support in exploration mission spacecraft and planetary habitats, and three comfort levels (CLs) are established. The levels include: (1) CL-1 for basic crew life support; (2) CL-2 for enabling the nominal completion of mission science; and (3) CL-3 which provides for enhanced life support and user-friendly interface systems. CL-2 support systems can include systems for EVA, workstations, and activity centers for repairs and enhanced utilization of payload and human/machine integration. CL-3 supports can be useful for maintaining crew psychological and physiological health as well as the design of comfortable and earthlike surroundings. While all missions require CL-1 commonality, CL-2 commonality is required only for EVA systems, display nomenclature, and restraint designs. C.C.S.

A92-55708* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
POTABLE WATER SUPPLY IN U.S. MANNED SPACE MISSIONS
RICHARD L. SAUER (NASA, Johnson Space Center, Houston, TX) and JOHN E. STRAUB, II (Krug International Corp., Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 18 p. refs
(IAF PAPER 92-0271) Copyright

A historical review of potable water supply systems used in the U.S. manned flight program is presented. This review provides a general understanding of the unusual challenges these systems have presented to the designers and operators of the related flight hardware. The presentation concludes with the projection of how water supply should be provided in future space missions - extended duration earth-orbital and interplanetary missions and lunar and Mars habitation bases - and the challenges to the biomedical community that providing these systems can present. Author

A92-55709
BIOMEDICAL CHALLENGES IN THE DEVELOPMENT OF A CLOSED ECLSS FOR SPACE STATION
L. A. ATEN and WILLIAM J. CRUMP (Alabama, University, Huntsville) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 11 p. refs
(IAF PAPER 92-0272) Copyright

A review is presented of the work on biomedical issues pertinent to a life support system that can be safely utilized by humans on Space Station and afterwards developed for employment in further space colonization and exploration. One of the important issues is understanding the microbial ecology in a closed system. Challenges will also occur in the area of environmental medicine, to determine the constituents of recycled water, as little knowledge is available in this field. R.E.P.

A92-55710
ECOLAB - BIOMODULE FOR EXPERIMENTAL LIFE-SUPPORT SYSTEMS INVESTIGATION UNDER MICROGRAVITY
I. I. GITEL'SON, S. I. BARTSEV, V. V. MEZHEVIKIN, and V. V. OKHONIN (Russian Academy of Sciences, Biophysics Institute, Krasnoyarsk, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 9 p. refs
(IAF PAPER 92-0273) Copyright

Several versions of a biological life-support system (BLSS) designed by the Biophysics Institute (Krasnoyarsk, Russia) are evaluated, including BLSS based on microalgae, hydrogen-oxidizing bacteria, higher plants, and their combinations. The functioning of

these systems and the weight and energetics considerations that would make these systems suitable for long-term space missions are discussed. Special attention is given to problems related to the need of alternating light and dark periods on LEOs. I.S.

A92-55713* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
MICROBIOLOGICAL CHALLENGES OF SPACE HABITATION
D. L. PIERSON and S. K. MISHRA (NASA, Johnson Space Center; Krug International Corp., Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 8 p. refs
(IAF PAPER 92-0276) Copyright

The effects of space flight on the growth and pathogenicity of microorganisms and on the human immune response are reviewed giving attention to the implications for spacecraft design. The major sources of microbes within space habitats on long-duration missions are listed including food, crewmembers, and payloads. Many of the microorganisms are shown to be airborne suggesting that effective air-filtration techniques are required for the designs of the Space Station and other vehicles. It is shown that microbial growth rates generally increase during space flight, and space flight is thought to attenuate the human immune response. Some beneficial roles for microbes are identified demonstrating the need for careful control, application, and monitoring of microorganisms in the long-duration spaceflight environment. C.C.S.

A92-55714
THE ACTUAL PROBLEMS OF MICROBIOLOGICAL CONTROL IN REGENERATIVE LIFE SUPPORT SYSTEMS EXPLORATION
A. N. VIKTOROV and V. K. IL'IN (Institute of Biomedical Problems, Moscow, Russia) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 7 p. refs
(IAF PAPER 92-0277) Copyright

A conceptual approach to the problems of microbial control in regenerative life-support systems (RLSSs) is developed in this survey of the types and nature of microbes that appear and develop on space missions. Regeneration technologies for water and air are shown to present possible formation zones for aerobic and anaerobic microbial pathogens, and other potential microbial vehicles include food supplies and the human body. Microbial characteristics are listed for fecal microflora, crewmember biotops, and expected contamination levels. All materials for the space vehicle are also capable of contamination before liftoff. Microbiological control is therefore shown to be necessary for all manned spaceflights, with decontamination procedures required for H2O, breathable air, food, and general areas of human contact. Sterilization procedures are required for substrates before they are admitted or readmitted into the RLSS. Chemical- and filtration-based techniques for microbiological are argued to be inefficacious, and decontamination technologies are shown to be critical for certain deadly fungi and bacteria. C.C.S.

A92-55715
THE SUIT ENCLOSURES OF THREE EVA SPACE SUITS - US EMU, SOVIET ORLAN-DMA, EUROPEAN CONCEPT
Y. OLLIVIER, X. LABOURDETTE, and D. HORNET (Dassault Aviation, Saint-Cloud, France) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 9 p. refs
(IAF PAPER 92-0279) Copyright

This comparative study contrasts three spacesuit designs with attention given to their requirements and performances for performing EVA. The three suits are based on a hybrid concept with hard torsos fixed to life-support components and the limb attachments, and mobility is provided by pressure-tight bearings and 1-DOF joints. The architectures and entry concepts are described for the U.S. Extravehicular Mobility Unit (EMU), the Orlan DMA suit, and a design by ESA. The arm-joint and waist rotation/flexure treatments are examined, and the issues of sizeability and safety are evaluated. The primary design constraints that guide spacesuit architecture designs are mobility, visibility, mass limits, and operational/anthropometric constraints. The evolving design of the spacesuits demonstrates that the materials and assemblies work to enhance the effectiveness of EVA tasks. C.C.S.

A92-55718* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
HEALTH-RISK BASED APPROACH TO SETTING DRINKING WATER STANDARDS FOR LONG-TERM SPACE MISSIONS
BRUCE A. MACLER (EPA, San Francisco, CA) and ELIZABETH C. DUNSKY (NASA, Ames Research Center, Moffett Field, CA) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 11 p. refs
(IAF PAPER 92-0283) Copyright

In order to develop plausible and appropriate drinking water contaminant standards for longer-term NASA space missions, such as those planned for the Space Exploration Initiative, a human health risk characterization was performed using toxicological and exposure values typical of space operations and crew. This risk characterization showed that the greatest acute waterborne health concern was from microbial infection leading to incapacitating gastrointestinal illness. Ingestion exposure pathways for toxic materials yielded de minimus acute health risks unlikely to affect SEI space missions. Risks of chronic health problems were within acceptable public health limits. Our analysis indicates that current Space Station Freedom maximum contamination levels may be unnecessarily strict. We propose alternative environmental contaminant values consistent with both acceptable short and long-term crew health safety. Author

A92-55965
HAND MOVEMENT STRATEGIES IN TELECONTROLLED MOTION ALONG 2-D TRAJECTORIES
GIOVANNI MAGENES (Pavia, Universita, Italy), JEAN L. VERCHER, and GABRIEL M. GAUTHIER (Aix-Marseille I, Universite, Marseille, France) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. 22, no. 2, Mar.-Apr. 1992, p. 242-257. Research supported by CNRS and Ministere de la Recherche et de la Technologie. refs
(Contract EEC-SC1-0029-C)
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The authors evaluate the performance and try to identify the strategies of human operators (HOs) teleoperating a robot along 2D-trajectories in simulations of place-like tasks in an obstacle encumbered environment. The experiments utilize computer graphic simulations of a remote robot whose end-effector displacements are dynamically controlled in the X-Y plane by the HO's hand displacements. The performance is described in the various displayed conditions in terms of movement duration, spatial and temporal errors, and energy. The data show that performance depends on the nature of the cues and instructions provided to the operators. Comparative analysis of the various conditions suggests that visual feedback position control is used when continuous static or dynamic information about the trajectory is provided, while feedforward control, corrected by sampled visual information, is adopted when a self-generated movement can be planned and executed. The data also show that for a given set of execution cues, equivalent performance is achieved in both visual frames of reference. I.E.

A92-55969
THE DETECTION OF LOW-AMPLITUDE YAWING MOTION TRANSIENTS IN A FLIGHT SIMULATOR
AL-AMYN SAMJI and LLOYD D. REID (Toronto, University, Downsview, Canada) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. 22, no. 2, Mar.-Apr. 1992, p. 300-306. refs
Copyright

A perennial problem facing flight simulator designers is how to handle motion system transients generated by washout algorithms intended to restrict the travel of the motion-base hardware. Motion cues in the flight simulator provide opportunities for lead compensation on the part of the pilot and thus one must ensure that other unwanted motion transients generated by the system

are not detected. The present study employs typical washout motion transients in an experiment designed to establish the motion levels required to achieve the aforementioned design goals. A set of critical amplitudes for both onset and return motion are determined in a flight simulator environment. It is found that a significant increase in detection levels occurs when the pilot switches from being a pure observer to actively controlling the simulator. I.E.

A92-56267
A STUDY ON FLUOMINE AS AN OXYGEN CARRIER FOR OXYGEN GENERATING SYSTEMS
YA-MEI ZHANG, RENJIN HE, CHANGHONG ZHEN, XIANG OUYANG, and BANGKE ZHONG (Jinan University, China) Space Medicine & Medical Engineering (ISSN 1002-0837), vol. 5, no. 2, 1992, p. 133-139. In Chinese. refs

The chelate of cobalt (II) - fluomine, derived from 3 - fluorosalicylaldehyde and etheylenediamine, was synthesized, analyzed, and characterized by IR, NMR, UV - VIS, EPM and DTA - TG. Its performance under oxygenation and deoxygenation were studied and optimum operation conditions were obtained. After activation in vacuum with heating, fluomine absorbs with extreme rapidity 4.2 percent of its weight in oxygen. After 4012 cycles of operation, the oxygen absorbed decreased by 44 percent. The results show that fluomine is an excellent oxygen carrier owing to its high rate of reversibly absorbing and releasing molecular oxygen, long life, and mild operation conditions. There are bright prospects for its use in oxygen-generating systems for aircraft or spacecraft. Author

A92-56953* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
USE OF NONTRADITIONAL FLIGHT DISPLAYS FOR THE REDUCTION OF CENTRAL VISUAL OVERLOAD IN THE COCKPIT
LISA F. WEINSTEIN (Krug Life Sciences, Inc.; USAF, Armstrong Laboratory, Brooks AFB, TX) and CHRISTOPHER D. WICKENS (Illinois, University, Savoy) International Journal of Aviation Psychology (ISSN 1050-8414), vol. 2, no. 2, 1992, p. 121-142. Research supported by University of Illinois. refs
(Contract NAG2-308)
Copyright

The use of nontraditional flight displays to reduce visual overload in the cockpit was investigated in a dual-task paradigm. Three flight displays (central, peripheral, and ecological) were used between subjects for the primary tasks, and the type of secondary task (object identification or motion judgment) and the presentation of the location of the task in the visual field (central or peripheral) were manipulated with groups. The two visual-spatial tasks were time-shared to study the possibility of a compatibility mapping between task type and task location. The ecological display was found to allow for the most efficient time-sharing. L.M.

A92-57122* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
SPACE STATION FREEDOM THERMAL CONTROL AND LIFE SUPPORT SYSTEM DESIGN
R. D. WEGRICH (NASA, Marshall Space Flight Center, Huntsville, AL) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 9 p. refs
(IAF PAPER 92-0691)

The Space Station Freedom thermal control system (TCS) and environmental control and life support system (ECLSS) are reviewed. Differences in the TCS and ECLSS are discussed between the early man-tended configuration (MTC) compared to the eventual evolutions to the permanently manned configuration (PMC). Concurrent analytical and developmental testing programs are included in the systems discussions as well as a description of an early 1993 flight test program on elements of the PMC water recovery system. Recent TCS design changes to the air cooling of rack mounted equipment are discussed. An overview of all TCS and ECLSS subsystems is included. Author

A92-57141
SUPERVISED AUTONOMOUS CONTROL AND GROUND-BASED OPERATION OF SPDM ROBOT ON SPACE STATION FREEDOM
GUY IMMEGA (Kinetic Sciences, Inc., Vancouver, Canada) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 7 p.
(IAF PAPER 92-0713) Copyright

A suite of technologies are being developed to show the feasibility of autonomous operation of the SPDM (Special Purpose Dexterous Manipulator) on SSF. Five parallel projects are ongoing: Supervised Autonomous System Design, Database for Autonomous Operation, Real-Time Inverse Kinematics, High-Level Operator Interface, and Vision System Object Recognition. A high level description of the research is provided. Author

A92-57155* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
ON THE USE OF SPACE STATION FREEDOM IN SUPPORT OF THE SEI - LIFE SCIENCE RESEARCH
K. LEATH (McDonnell Douglas Space Systems Co., Huntington Beach, CA), J. VOLOSIN (Booz, Allen & Hamilton, Inc., Washington), and S. COOKSON (Egan Group, Inc., Washington) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 12 p. Research supported by NASA. refs
(IAF PAPER 92-0729)

The use of the Space Station Freedom (SSF) for life sciences research is evaluated from the standpoint of requirements for the Space Exploration Initiative (SEI). SEI life sciences research encompasses: (1) biological growth and development in space; (2) life support and environmental health; (3) physiological/psychological factors of extended space travel; and (4) space environmental factors. The platforms required to support useful study in these areas are listed and include ground-based facilities, permanently manned spacecraft, and the Space Shuttle. The SSF is shown to be particularly applicable to the areas of research because its facilities can permit the study of gravitational biology, life-support systems, and crew health. The SSF can serve as an experimental vehicle to derive the required knowledge needed to establish a commitment to manned Mars missions and colonization plans. C.C.S.

A92-57203* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
NEEDS FOR SUPERVISED SPACE ROBOTS IN SPACE EXPLORATION
JON D. ERICKSON (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. refs
(IAF PAPER 92-0800)

The areas of application for space robots in the Space Exploration Initiative (SEI) are examined by reviewing the roles of SEI supervised robots particularly with planet-surface systems (PSSs). Treatment is given to both teleoperated conventional robot systems and autonomous intelligent systems for comparison in terms of safety, reliability, and productivity. Two development stages are proposed including one with a robotic actor, human observer, and a human supervisor and a second in which a closed-loop control and monitoring system is established. The use of remote control is shown to require robustness, self-calibration and -diagnosis, adjustable autonomy, and multitask capability. The requirements of intelligent control are also listed so that the PSSs of the SEI can be used to enable surface exploration, local-resource utilization potential, and reductions of human tasks. C.C.S.

A92-57205
AUTOMATION AND ROBOTICS TELEAUTONOMOUS CONTROL SYSTEM FOR COLUMBUS MODULES
O. EL ZUBI, R. MUENSTERMANN (MBB GmbH, Bremen, Germany), and G. GOELZ (DARA, Bonn, Germany) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 7 p. refs
(IAF PAPER 92-0804) Copyright

A testbed for Space Automation and Robotics is being developed under a contract with the German Space Agency with the objective of providing the appropriate environment for the development and testing of teleautonomous operation and experimentation in the Columbus laboratories. The conceptual design and the current status of the Modular Automation and Robotics System are discussed. In particular, attention is given to the system architecture, Columbus mission management system, control system, communication, hardware and software configuration, and future work. V.L.

A92-57213
MODELING OF IMPACT DYNAMICS BETWEEN FREE-FLOATING TARGET AND SPACE ROBOTIC ARM - AN EXTENDED INERTIAL TENSOR APPROACH
KAZUYA YOSHIDA, NAOKI SASHIDA, and YOJI UMETANI (Tokyo Institute of Technology, Japan) IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 10 p. refs
(IAF PAPER 92-0812) Copyright

An extended inertial tensor aproach is developed for establishing a basis of impact dynamics for free-floating multibody systems in space. Two new concepts are proposed, both of which are extended versions of the conventional concepts of ground-based robotic arms: the Extended Inversed Inertia Tensor and the Floating Virtual Mass (FVM). Using these concepts, the collision problem is formulated focusing on a velocity relationship just before and immediately after the collision, without sensing the impact force but considering the momentum conservation law. Results of simulations demonstrate that the FVM concept is a useful index for representing the magnitude and the direction of impulsive acceleration. I.S.

N92-32433# Klein Associates, Inc., Yellow Springs, OH.
OBSERVING TEAM COORDINATION WITHIN ARMY ROTARY-WING AIRCRAFT CREWS Interim Report, Apr. - Oct. 1990
MARVIN L. THORDSEN, GARY A. KLEIN, and STEVE WOLF May 1992 41 p
(Contract MDA903-87-C-0523; DA PROJ. 2Q1-62785-A-791)
(AD-A252234; ARI-RN-92-40) Avail: CASI HC A03/MF A01

The purpose of this project was to demonstrate the feasibility of using team decision models to help train crew coordination in the tactical helicopter domain. Ten aircrews were studied as they performed a tactical mission in a UH-60 simulator facility at Fort Campbell, Kentucky. The results indicate that the methods can be adapted for observing team decision-making processes during some types of helicopter missions. Five opportunities for aircrew coordination training were identified: rehearsing mission functional profiles, analyzing commander's intent during preplanning sessions, focusing the time horizon, avoiding micromanagement, and getting cues for anticipation/confirmation during the actual mission. Recommendations were presented for training observers and instructors to use these categories. GRA

N92-32790# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
THERMAL ASSESSMENT OF MUSTANG INDUSTRIES, INC. NEOPRENE QUICK-DON ANTI-EXPOSURE IMMERSION SUITS AND STORAGE EVALUATION FOR THE CP140 AURORA AIRCRAFT
DONALD W. FERGUSON and WAYNE R. STURGEON Apr. 1990 24 p
(DCIEM-90-23; CTN-92-60351) Avail: CASI HC A03/MF A01

The Defence and Civil Institute of Environmental Medicine (Canada) (DCIEM) has undertaken a study to develop or identify a commercially available quick-don immersion suit to replace the suit in use on the CP121, CP140, CH135, and CH124A aircraft. Operational evaluation of a suit developed to DCIEM specifications and constructed of 3 mm closed cell neoprene has been carried out. It was concluded that the new suit was acceptable on the CH124A and CH135 but the bulk of the 3 mm suit precluded proper storage on the CP140 and CP121. A stowage assessment was made on 1 mm, 2 mm, and 3 mm immersion suits onboard a CP140. In addition, the three suits were evaluated for thermal insulation values while immersed in both still and turbulent water. It was found that all three suits provide considerably more thermal protection than the existing quick-don suit in use by Canadian forces. In addition, all three suits can be stored in the CP140 if appropriate modification or relocation of some storage positions is made. CISTI

N92-33056# Institut National des Sciences Appliquees de Lyon, Villeurbanne (France).
CONTRIBUTION TO ROBOT-TASK ADAPTATION, INTRODUCTION AND USE OF ROBOT ANISOTROPY AND TASK OBJECT FOR THE DESIGN OF THE WORKSTATION Ph.D. Thesis [CONTRIBUTION A L'ADAPTATION ROBOT TACHE, PRISE EN COMPTE ET EXPLOITATION DE L'ANISOTROPIE DU ROBOT ET DE L'OBJET DE LA TACHE EN VUE DE LA CONCEPTION DU POSTE DE TRAVAIL]
GUY M. CLOUTIER 1991 228 p In FRENCH
(ISAL-91-0095; ETN-92-92086) Avail: NTIS HC A11/MF A01

The grounds of a procedure for the design of robot workstations, based on an offline 'preadaptation' of the robot hinging on the satisfaction of intrinsic and extrinsic task constraints are discussed. Means to evaluate and achieve a better robot task adequacy are introduced. Hyper-ellipsoids, revealing the capabilities of the robot as to its probability of pose (compliance), are projected on (intersect with) the task subspace. The intrinsic constraints of the task are reduced to a sufficient ellipsoid. The simultaneous diagonalization of robot and task ellipsoids, specifies a new conformity index. It expresses the robot task adequacy for joint postures. However, the design of the coupling device linking the tool to the orbit, impacts the satisfaction of intrinsic task constraints. The 'agreement' between the robot and the task determines an adapted domain in jointspace. Its boundaries set fictitious joint limits not to surpass, in order to meet, the intrinsic constraints of the task. For a single task, the direct kinematics of the inverted structure maps it into the adapted Cartesian implementation domain of the base frame. Within a 'multitask' production context, the relative situations of the tasks impose intrinsic 'between task' constraints in the space of large solid body motions. Two solutions are proposed for the design of an adapted workstation layout, given an environment of rigidly predetermined tasks. Appropriate categories of workspaces are introduced to provide practical means to apply the standardized concept of a useful workspace. ESA

N92-33079# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
AN EVALUATION OF THE PERFORMANCE CHARACTERISTICS OF A TWO-MAN MOLECULAR SIEVE OXYGEN GENERATING SYSTEM
DAVID G. MOHN Feb. 1991 23 p
(DCIEM-91-20; CTN-92-60386) Avail: CASI HC A03/MF A01

This report provides a detailed description of a two-man molecular sieve oxygen generating (MSOG) system and an evaluation of its performance characteristics at ground level and altitude. The system was designed to provide adequate oxygen enriched breathing gas for two crew members up to a cabin altitude of 25,000 feet. The study consisted of operating the MSOG system through a range of product gas flowrates at ground level and various aircraft cabin altitude combinations in order to determine if the system is as efficient as it was designed to be. The results indicated that up to a cabin altitude of 8,000 feet and an aircraft altitude of 23,000 feet, the system is capable of providing sufficient oxygen enriched breathing gas for two active crew members. The maximum oxygen generating capability of the system was 95 percent, the present limit for molecular sieve oxygen concentrators. Evaluation of outlet pressure indicated that the MSOG system requires a breathing regulator with a low pressure operating capability. It was recommended that a high altitude evaluation of the MSOG system be completed in order to further verify the systems effectiveness. Author (CISTI)

N92-33099 American Astronautical Society, San Diego, CA.
HUMANS AND MACHINES IN SPACE: THE PAYOFF

PAULA KORN, ed. and JAMES A. ABRAHAMSON, ed. Univelt, Inc. 1992 126 p Symposium held in Washington, DC, 15 Mar. 1991 Sponsored in part by Hughes Aircraft Co. and Lockheed Engineering and Sciences Co. Its Science and Technology Series Original contains color illustrations
(ISBN-0-87703-343-9) Avail: Issuing Activity

This publication was prepared from a transcript of a panel discussion held on March 15, 1991, in Washington, DC. The panel was part of the 29th American Astronautical Society Goddard Memorial Symposium, whose theme was, 'Humans and Machines in Space: The Vision, The Challenge, The Payoff.' The speakers discussed the anticipated outcome of our efforts to put humans and machines in space. Specific topics included space science payoffs in an era of human-machine partnership, the economic impact of the space program, the impact of the space program on education, the space program's impact on society, and the payoff of humans and machines in space. Author

N92-33345*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
FIRST LUNAR OUTPOST CREW MODULE THERMAL PROTECTION DESIGN SENSITIVITY
STAN BOUSLOG (Lockheed Engineering and Sciences Co., Houston, TX.), BILL ROCHELLE (Lockheed Engineering and Sciences Co., Houston, TX.), STAN WILLIAMS (Lockheed Engineering and Sciences Co., Houston, TX.), JOE CARAM, DON CURRY, STEVE DERRY, and MATT ONDLER *In its* Third SEI Technical Interchange: Proceedings p 555-569 1992
Avail: CASI HC A03/MF A05

A thermal protection study was conducted on the first lunar outpost (FLO) crew module. The study objectives are as follows: (1) assess effects of vehicle size on aerothermodynamic environment and thermal protection system (TPS) weight; (2) assess effects of lunar-return strategies on aerothermodynamic environment and TPS weight; and (3) assess weight penalty for common TPS design for all lunar-return strategies. All material is covered in viewgraph format. H.A.

N92-33346*# Martin Marietta Corp., Denver, CO.
SPACE HABITATION AND OPERATIONS MODULE (SHOM)
RALPH EBERHARDT *In* NASA. Lyndon B. Johnson Space Center, Third SEI Technical Interchange: Proceedings p 570-576 1992
Avail: CASI HC A01/MF A05

Viewgraphs present floorplans for a space habitation module. Charts show various human needs in a habitation module and how they are weighted towards individual or group requirements. H.A.

N92-33348*# Tracor, Inc., Austin, TX.
PNEUMATICALLY ERECTED RIGID HABITAT
BRADLEY SALLES *In* NASA. Lyndon B. Johnson Space Center, Third SEI Technical Interchange: Proceedings p 592-596 1992
Avail: CASI HC A01/MF A05

The pneumatically erected rigid habitat concept consists of a structure based on an overexpanded metal bellows. The basic concept incorporates the advantages of both inflatable and rigid structures. The design and erection detail are presented with viewgraphs. H.A.

N92-33660# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
HUMAN FACTORS IN THE CF-18 PILOT ENVIRONMENT [LES FACTEURS HUMAINE PROPRES A L'ENVIRONNEMENT DES PILOTES DE CF-18]
R. A. DAVIDSON, D. BEEVIS, F. BUICK, A. L. M. DONATI, L. KANTOR, S. H. R. BANNISTER, E. A. BROOK, J. A. P. ROCHEFORT, and J. R. TURNER Jan. 1991 293 p In ENGLISH and FRENCH
(DCIEM-91-11; CTN-92-60591) Avail: CASI HC A13/MF A03

A review of human factors in the CF-18 pilot environment was undertaken via a survey of 161 active CF-18 pilots. Over 300 human factors issues were initially identified, of which the 88 most relevant to CF-18 operations were selected and evaluated. The pilots were asked to assess, from a squadron perspective, the current effect of each issue on flight safety and operational effectiveness. Each issue was rated on a sliding scale and ratings were analyzed using a non-parametric procedure. Aircraft and aircraft operations issues were rated almost equally divided between beneficial and neutral. Most of the training related issues were rated as beneficial. Among issues related to squadron personnel, comparable numbers received beneficial, neutral, and detrimental ratings. A fourth of the organizational issues were rated as detrimental, with most of the rest rated as neutral. In general, issues beneficial to flight safety were also beneficial to operational effectiveness. Cause and effect models were developed to explain the ratings, supporting the opinion that the greatest threats to flight safety and operational effectiveness are the decreasing level of flying experience and inadequate manning levels. Specific conclusions and recommendations are presented for improving flight safety and operational effectiveness. Author (CISTI)

N92-33757# Kawasaki Heavy Industries Ltd., Kobe (Japan).
REVIEW ON LIFE SUPPORT TECHNOLOGIES IN EXTRA-VEHICULAR ACTIVITY TECHNOLOGY [SENGAI KATSUDOU GIJUTSU NI OKERU SEIMEI IJI GIJUTSU NO KENTOU]
HIROYUKI TORII *In* NASDA, Future Space Activities Workshop: Lunar Base Workshop 1991 22 p 17 Jul. 1991 In JAPANESE
Avail: CASI HC A03/MF A10

Reviews are conducted of life support systems in space suits for Extra-Vehicular Activity (EVA). The reviews are also conducted for non-decompression type space suits. In non-decompression type suits, the interior pressure is increased and this allows the omission of prebreathing. Reviews are presented for the more fundamental technology of space suits. Technical problems concerning the development of non-decompression type space suits are also reviewed. Topics discussed include the following: carbon dioxide absorbents, the interior pressure of space suits, and oxygen partial pressure meters. Author (NASDA)

N92-33758# Takenaka Works, Osaka (Japan).
FUNDAMENTAL EXPERIMENTS OF SHOWER DEVELOPMENT FOR SPACE USE [UCHUU YOU SHAWA NO KAIHATSU NI KANSURU KISO JIKKEN]
NORIYUKI TAKAHASHI, KENICHI UNNO, KAORU OOTSUJI (Mitsubishi Heavy Industries Ltd., Tokyo, Japan), and TAKESHI MIYAMOTO (Mitsubishi Heavy Industries Ltd., Tokyo, Japan) *In* NASDA, Future Space Activities Workshop: Lunar Base Workshop 1991 8 p 17 Jul. 1991 In JAPANESE
Avail: CASI HC A02/MF A10

The problems associated with humans living in space have been investigated during past manned flights. The problems fall into two categories: (1) the effects of microgravity on human physiology; and (2) the problem of closed system substance circulation. The specialized equipment that is necessary for closed system substance circulation (equipment for air and water processing, air conditioning, water supply and drainage, and sanitation) is discussed. Data concerning the behavior of water drops in microgravity conditions were obtained utilizing parabolic flight. There are also problems of physical phenomena which relate to gravity (sedimentation) and convection. These problems are primarily concerned with equipment related to water. Possible solutions to these problems may make use of centrifugal force or air flow systems. Author (NASDA)

N92-33780# Nippon Electric Co. Ltd., Tokyo (Japan).
ECLSS EXPERIMENTS AT MANNED LUNAR SURFACE SITES [GETSUMEN YUUJIN KYOTEN NI OKERU ECLSS JIKKEN]
TOSHIMITSU KANEMURA, JUN INAGAKI, and SHIGERU OONO *In* NASDA, Future Space Activities Workshop: Lunar Base Workshop 1991 19 p 17 Jul. 1991 In JAPANESE
Avail: CASI HC A03/MF A10

Conceptual study of ECLSS (Environmental Control and Life Support System) experiment plans and equipment for developing water recycling technology, one of the technologies which constitute the base for constructing the foundation for enlargement

of lunar surface human activities, is conducted. Experiment subjects are as follows: (1) water processing experiments to find out if human waste excreted by the crew can be processed using aerobic microorganisms originally existing in the waste; (2) physical and chemical water processing experiments to conduct tests to verify the drainage processing capability of the water recycling processes focussing on membrane process; and (3) an experiment of substance utilization derived from water recycling process (surplus sludge, concentrated waste). The aim is to bring the material back to earth. Plans of experiments, system concepts, system structures and system flow chart are illustrated, and methods of shipment, operation and maintenance, and safety of the system are outlined. Function and performance of subsystems such as electric power supply, gas supply, control and data processing, thermal control, organism processing, and physical and chemical processing experiment subsystems are also presented. Author (NASDA)

N92-33782# Toshiba Corp., Tokyo (Japan).
REVIEW ON HABITABILITY AT MANNED LUNAR SURFACE SITES [YUUJIN GETSUMEN KYOTEN NI OKERU KYOJUUSEI NO KENTOU]
KOUICHI FURUKAWA *In* NASDA, Future Space Activities Workshop: Lunar Base Workshop 1991 15 p 17 Jul. 1991 In JAPANESE
Avail: CASI HC A03/MF A10

A review is conducted on the habitability of a module to accommodate the short-time (ten sunlit days, maximum 15 days) stay of three crews at manned lunar surface sites to be used for various experiments and observations. Prerequisites for review are: (1) constructed in around 2010; (2) stay time is ten sunlit days and 15 days at the maximum; (3) constructed at the east side of equator facing at the earth; (4) lunar landing weight per one flight is within ten tons; (5) operation for three years twice per year; (6) consumed materials (water, oxygen, foods, etc.) are expendable; and (7) every crew is given one room. Pressurized module, sizings (constraints by launch vehicles dimensions, ceiling height for expected body statures of white race and the floor spaces and volumes of rooms of the pressurized module), layout, weights and electric power of room spaces of the living module are outlined. Configurations of overall lunar surface sites and living modules are conceptually displayed in drawings. Author (NASDA)

N92-33832 National Physical Lab., Teddington (England). Radiation Science and Acoustics Div.
ALVEY MAN-MACHINE INTERFACE PROJECT MMI/132 SPEECH TECHNOLOGY ASSESSMENT Final Report
M. J. GOLDSMITH and H. C. FULLER Nov. 1991 28 p
(ISSN 0955-9655)
(NPL-RSA(EXT)-26; ETN-92-91984) Copyright Avail: National Physical Lab., Teddington, Middlesex, TW11 0LW, England

The work of the Alvey speech technology assessment project to investigate aspects of the automated assessment of the performance of speech recognizers is summarized. The technical activities and major achievements of the project are outlined, and a bibliography of the detailed papers covering work carried out for the project is included. ESA

N92-33987# EG and G Energy Measurements, Inc., Idaho Falls. National Engineering Lab.
REVIEWING THE IMPACT OF ADVANCED CONTROL ROOM TECHNOLOGY
C. A. WILHELMSEN, D. I. GERTMAN, L. T. OSTROM, W. R. NELSON, W. J. GALYEAN, and J. C. BYERS 1992 4 p Presented at the 5th Conference on Human Factors and Power Plants: Power Generation - The Next Decade and Beyond, Monterey, CA, 7-11 Jun. 1992
(Contract DE-AC07-76ID-01570)
(DE92-018032; EGG-M-91550; CONF-9206106-1) Avail: CASI HC A01/MF A01

Progress to date on assessing the nature of the expected changes in human performance and risk associated with the introduction of digital control, instrumentation, and display systems is presented. Expected changes include the shift toward more supervisory tasks, development of intervention strategies, and reallocation of function between human and machine. Results are reported in terms of the scope of new technology, human performance issues, and crews experience with digital control systems in a variety of industries petrochemical and aerospace. Plans to conduct a limited Probabilistic Risk Assessment/Human Reliability Assessment (PRA/HRA) comparison between a conventional NUREG-1150 series plant and that same plant retrofit with distributed control and advanced instrumentation and display are also presented. Changes needed to supplement existing HRA modeling methods and quantification techniques are discussed. DOE

N92-34016# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (Germany).
INTEGRATION OF AN INTEGRATED HELMET SYSTEM FOR PAH2
HANS DIETER VIKTOR BOEHM (Eurocopter Deutschland G.m.b.H., Munich, Germany, F.R.) and HERBERT SCHREYER (Eurocopter Deutschland G.m.b.H., Munich, Germany, F.R.) 1992 13 p Presented at the Royal Aeronautical Society Avionics Systems Group Conference on IR Sensors, London, England, 18 Feb. 1992
(MBB-UD-0615-92-PUB; ETN-92-92110) Avail: CASI HC A03/MF A01

Tests results and PAH2 (second generation Tiger antitank helicopter) integration aspects of a modern Integrated Helmet System (IHS) are presented. The IHS consists of a helmet shell, a Helmet Mounted Sight (HMS), two Image Intensifier Tubes (IIT), and two Cathode Ray Tubes (CRT), with an optical system including combiners to present binocular images. Additional symbology can be superimposed to the CRT or IIT image. An IHS is a further development of a Helmet Mounted Display (HMD) to cope with mode demanding requirements regarding ergonomics and operability under adverse visual conditions. The HMS can steer a sensor platform with a thermal camera or an air to air missile system. The aim helicopter (HC) requirements on such a system are: human factors; fit of helmet including optimized center of gravity (CG) and weight; optimized day, twilight, and night optical modules; large exit pupil, good transmission of the optical path and a large adjustment range; good geometrical resolution/Modulation Transfer Function (MTF) with a large Field of View (FOV); high focusing range of the IIT and a good S/N ratio below 1 mLux; CRT automatic brightness and constrast control with a good readability on day time; flight symbology presentation for one or two eyes; good static and dynamic HMS accuracy with a large Head Motion Box (HMB); and NBC and laser protection compatibility. ESA

N92-34022*# Sterling Federal Systems, Inc., Palo Alto, CA.
ARMY-NASA AIRCREW/AIRCRAFT INTEGRATION PROGRAM. PHASE 5: A3I MAN-MACHINE INTEGRATION DESIGN AND ANALYSIS SYSTEM (MIDAS) SOFTWARE CONCEPT DOCUMENT
CAROLYN BANDA, DAVID BUSHNELL, SCOTT CHEN, ALEX CHIU, CHRISTIAN NEUKOM, SAYURI NISHIMURA, MICHAEL PREVOST, RENUKA SHANKAR, LOWELL STAVELAND, and GREG SMITH Jun. 1992 83 p
(Contract NAS2-13210)
(NASA-CR-177596; A-92137; NAS 1.26:177596) Avail: CASI HC A05/MF A01

This is the Software Concept Document for the Man-machine Integration Design and Analysis System (MIDAS) being developed as part of Phase V of the Army-NASA Aircrew/Aircraft Integration (A3I) Progam. The approach taken in this program since its inception in 1984 is that of incremental development with clearly defined phases. Phase 1 began in 1984 and subsequent phases have progressed at approximately 10-16 month intervals. Each phase of development consists of planning, setting requirements, preliminary design, detailed design, implementation, testing, demonstration and documentation. Phase 5 began with an off-site planning meeting in November, 1990. It is expected that Phase 5 development will be complete and ready for demonstration to

invited visitors from industry, government and academia in May, 1992. This document, produced during the preliminary design period of Phase 5, is intended to record the top level design concept for MIDAS as it is currently conceived. This document has two main objectives: (1) to inform interested readers of the goals of the MIDAS Phase 5 development period, and (2) to serve as the initial version of the MIDAS design document which will be continuously updated as the design evolves. Since this document is written fairly early in the design period, many design issues still remain unresolved. Some of the unresolved issues are mentioned later in this document in the sections on specific components. Readers are cautioned that this is not a final design document and that, as the design of MIDAS matures, some of the design ideas recorded in this document will change. The final design will be documented in a detailed design document published after the demonstrations. Author

N92-34179*# Lockheed Engineering and Sciences Co., Houston, TX.
THE EFFECT OF A REDUNDANT COLOR CODE ON AN OVERLEARNED IDENTIFICATION TASK
KEVIN OBRIEN Washington Oct. 1992 30 p Sponsored by NASA. Lyndon B. Johnson Space Center
(Contract NAS9-17900)
(NASA-CR-4445; S-679; NAS 1.26:4445; LESC-28803) Avail: CASI HC A03/MF A01

The possibility of finding redundancy gains with overlearned tasks was examined using a paradigm varying familiarity with the stimulus set. Redundant coding in a multidimensional stimulus was demonstrated to result in increased identification accuracy and decreased latency of identification when compared to stimuli varying on only one dimension. The advantages attributable to redundant coding are referred to as redundancy gain and were found for a variety of stimulus dimension combinations, including the use of hue or color as one of the dimensions. Factors that have affected redundancy gain include the discriminability of the levels of one stimulus dimension and the level of stimulus-to-response association. The results demonstrated that response time is in part a function of familiarity, but no effect of redundant color coding was demonstrated. Implications of research on coding in identification tasks for display design are discussed. Author

N92-34209*# National Aeronautics and Space Administration, Washington, DC.
STRATEGIC CONSIDERATIONS FOR SUPPORT OF HUMANS IN SPACE AND MOON/MARS EXPLORATION MISSIONS. LIFE SCIENCES RESEARCH AND TECHNOLOGY PROGRAMS, VOLUME 1
Jun. 1992 155 p
(NASA-TM-107983; NAS 1.15:107983) Avail: CASI HC A08/MF A02

During the next several decades, our nation will embark on human exploration in space. In the microgravity environment we will learn how human physiology responds to the absence of gravity and what procedures and systems are required to maintain health and performance. As the human experience is extended for longer periods in low Earth orbit, we will also be exploring space robotically. Robotic precursor missions, to learn more about the lunar and Martian environments will be conducted so that we can send crews to these planetary surfaces to further explore and conduct scientific investigations that include examining the very processes of life itself. Human exploration in space requires the ability to maintain crew health and performance in spacecraft, during extravehicular activities, on planetary surfaces, and upon return to Earth. This goal can only be achieved through focused research and technological developments. This report provides the basis for setting research priorities and making decisions to enable human exploration missions. Author

N92-34210*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
GLOVE ATTACHMENT Patent Application
FREDERIC DAWN, inventor (to NASA), WALTER GUY, inventor (to NASA), JOSEPH KOSMO, inventor (to NASA), ARTHUR DRENNAN, inventor (to NASA) (Little, Arthur D., Inc., Cambridge, MA), and RICHARD TSCHIRCH, inventor (to NASA) (Little, Arthur D., Inc., Cambridge, MA) 14 Aug. 1992 13 p
(NASA-CASE-MSC-21632-1; NAS 1.71:MSC-21632-1; US-PATENT-APPL-SN-929556) Avail: CASI HC A03/MF A01

An attachment principally for the palm of an astronaut glove to enhance the gripping area of the palm without detracting from the flexibility and utility of the glove is presented. The attachment is a composite construction formed from a layer of silicone rubber having an outer surface with a friction configuration and another layer of silicone rubber in which a Nomex Aramid mesh fabric is embedded prior to curing. The method of construction involves the use of a mold with a friction configuration surface. A first layer of silicone rubber or sealant is disposed in the mold and allowed to set for an hour. A second layer of silicone rubber or sealant is layered over the first layer and leveled. A Nomex Aramid mesh fabric is embedded into the second layer and the composite is permitted to cure. When cured, a configured area of the composite construction is glued or stitched to the palm area of the glove. NASA

N92-34211*# National Aeronautics and Space Administration, Washington, DC.
STRATEGIC CONSIDERATIONS FOR SUPPORT OF HUMANS IN SPACE AND MOON/MARS EXPLORATION MISSIONS. LIFE SCIENCES RESEARCH AND TECHNOLOGY PROGRAMS, VOLUME 2
Jun. 1992 442 p
(NASA-TM-107984; NAS 1.15:107984) Avail: CASI HC A19/MF A04

Summary charts of the following topics are presented: the Percentage of Critical Questions in Constrained and Robust Programs; the Executive Committee and AMAC Disposition of Critical Questions for Constrained and Robust Programs; and the Requirements for Ground-based Research and Flight Platforms for Constrained and Robust Programs. Data Tables are also presented and cover the following: critical questions from all Life Sciences Division Discipline Science Plans; critical questions listed by category and criticality; all critical questions which require ground-based research; critical questions that would utilize spacelabs listed by category and criticality; critical questions that would utilize Space Station Freedom (SSF) listed by category and criticality; critical questions that would utilize the SSF Centrifuge; facility listed by category and criticality; critical questions that would utilize a Moon base listed by category and criticality; critical questions that would utilize robotic missions listed by category and criticality; critical questions that would utilize free flyers listed by category and criticality; and critical questions by deliverables. Author

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SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

A92-54947* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
SURVIVAL OF MICROORGANISMS IN SMECTITE CLAYS - IMPLICATIONS FOR MARTIAN EXOBIOLOGY
DEBORAH M. MOLL and J. R. VESTAL (Cincinnati, University, OH) Icarus (ISSN 0019-1035), vol. 98, no. 2, Aug. 1992, p. 233-239. refs
(Contract NCA2-366)
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The survival of Baccillus subtilis, Azotobacter chroococcum, and the enteric bacteriophage MS2 has been examined in clays representing terrestrial (Wyoming type montmorillonite) and Martian

(Fe3+ montmorillonite) soils exposed to terrestrial and Martian environmental conditions of temperature and atmospheric composition and pressure. An important finding is that MS2 survived simulated Mars conditions better than the terrestrial environment, probably owing to stabilization of the virus caused by the cold and dry conditions of the simulated Mars environment. This finding, the first published indication that viruses may be able to survive in Mars-type soils, may have important implications for future missions to Mars. L.M.

A92-57366
A HISTORY OF THE SCIENTIFIC STUDY OF LIVING ORGANISMS IN SPACE
A. N. MARSHALL (Wolverhampton Polytechnic, United Kingdom)
IAF, International Astronautical Congress, 43rd, Washington, Aug. 28-Sept. 5, 1992. 11 p. refs
(IAF PAPER ST-92-0022)

The scientific study of terrestrial organisms in the space environment is surveyed to assess the utility of space biology. Space projects involving biology and microorganisms are reviewed including Soviet and U.S. studies of humans, primates, smaller organisms, and microbes on orbiting satellites and rocket launches. Attention is given to the challenge of generating popular support for such experiments which provide key data on the effects of spaceflight on humans and terrestrial organisms with applications to nonspace science. C.C.S.

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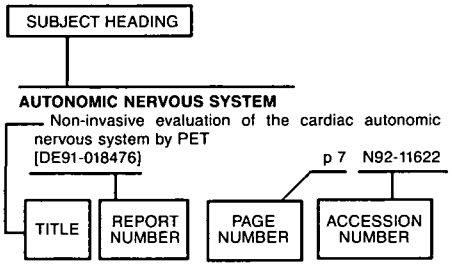

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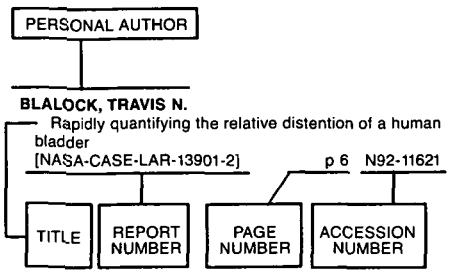

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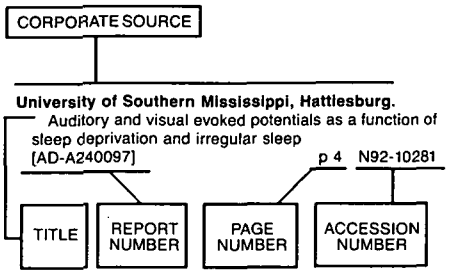

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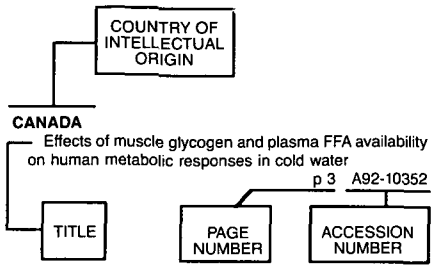

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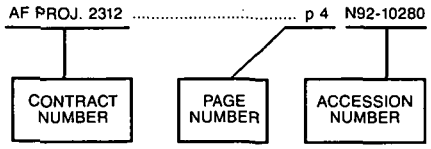

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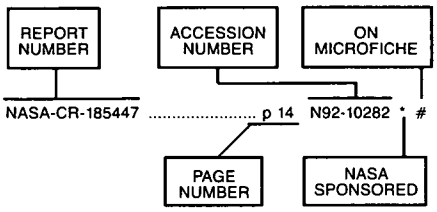

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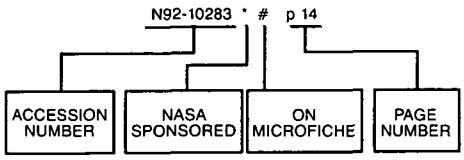

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