



Aerospace Medicine
and Biology
A Continuing
Bibliography
with Indexes

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August 1987

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ACCESSION NUMBER RANGES

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STAR (N-10000 Series) N87-20171 — N87-21845

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AEROSPACE MEDICINE AND BIOLOGY

**A CONTINUING BIBLIOGRAPHY
WITH INDEXES**

(Supplement 300)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in July 1987 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA)*.



This supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, price code A05.

INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 232 reports, articles and other documents announced during July 1987 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of 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. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a 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, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

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

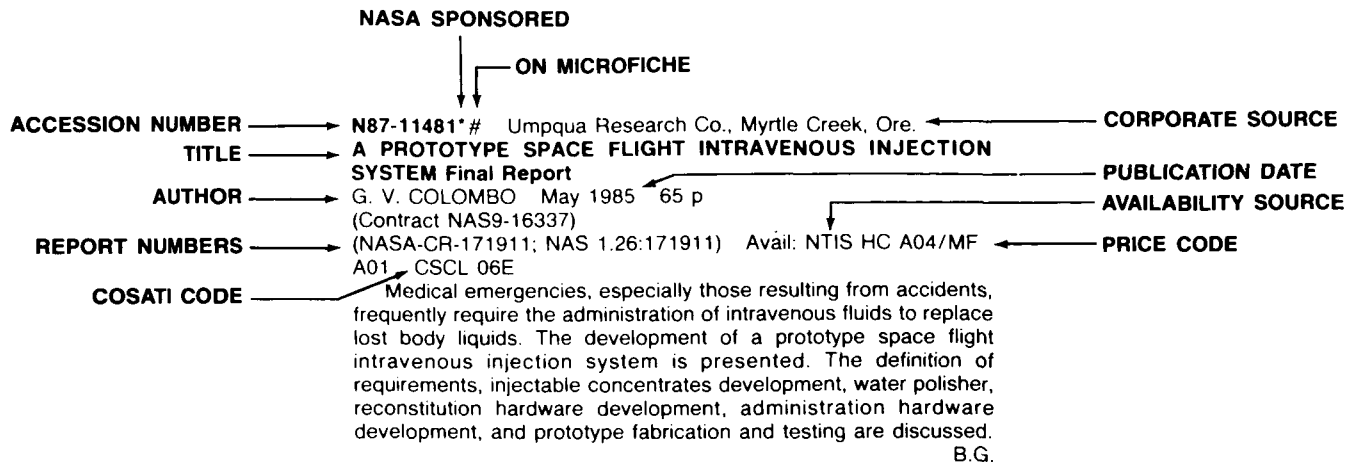
An annual index will be prepared at the end of the calendar year covering all documents listed in the 1987 Supplements.

Information on the availability of cited publications including addresses of organizations and NTIS price schedules is located at the back of this bibliography.

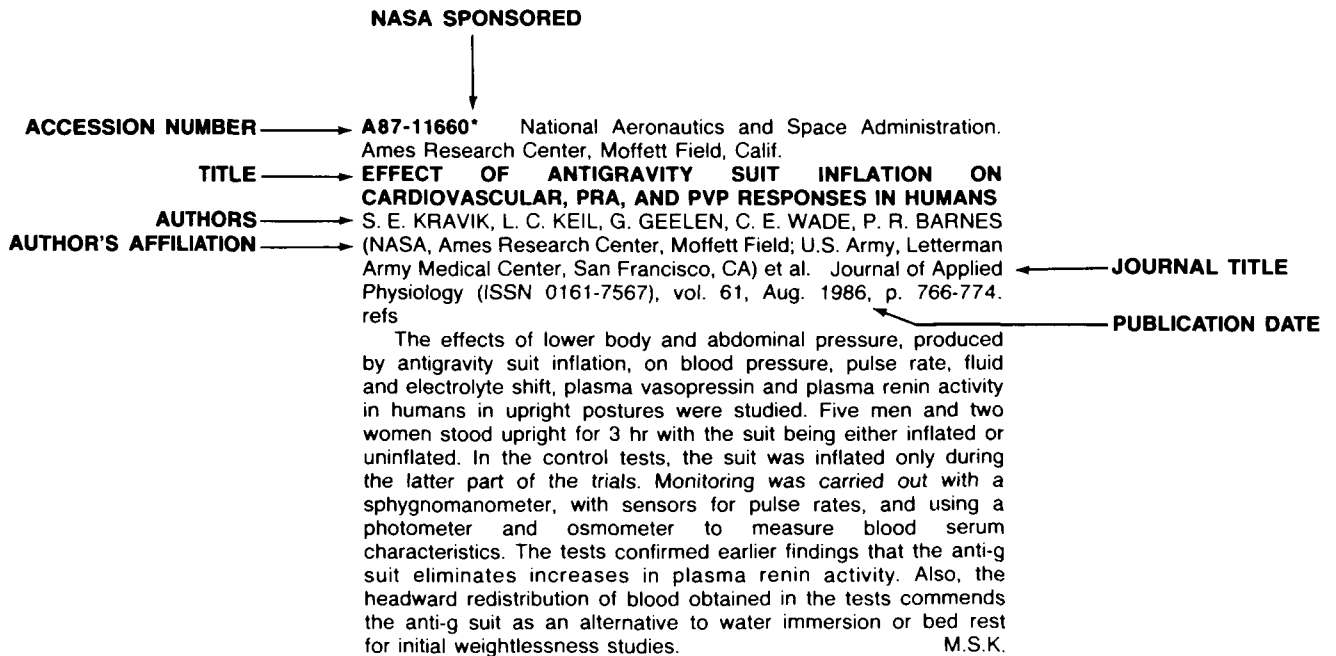
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TYPICAL REPORT CITATION AND ABSTRACT



TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 300)

AUGUST 1987

51

LIFE SCIENCES (GENERAL)

A87-31924

ACTINOMYCES ISOLATED FROM THE CENTRAL ANTARCTIC ICE SHEET [AKTINOMITSETY IZ TOLSHCHI LEDNIKA TSENTRAL'NOI ANTARKTIDY]

S. S. ABYZOV, S. N. FILIPPOVA, and V. D. KUZNETSOV (AN SSSR, Institut Mikrobiologii, Moscow, USSR) *Akademiia Nauk SSSR, Izvestiia, Serii Biologicheskaiia* (ISSN 0002-3329), Jan.-Feb. 1987, p. 35-41. In Russian. refs

Using an aseptic method of microbial sampling and isolation, viable actinomycetes of two genera (*Nocardia Trevisan* and *Nocardiopsis Meyer*) were isolated from 202 ice samples taken from different depths (down to 320 m) of the central Antarctic ice sheet. The organisms were similar to those reported earlier to be present in probes of the Antarctic soil, snow, and air. The approximate age of the ice layers from which the two actinomycetes were isolated is estimated to be from 150 to 9400 years. I.S.

A87-31925

PHYSICOCHEMICAL LAWS GOVERNING THE ADAPTATION OF THE ORGANISM TO EXTREME ENVIRONMENTS [FIZIKO-KHIMICHESKIE ZAKONOMERNOSTI ADAPTATSII ORGANIZMA K EKSTREMAL'NYM VOZDEISVIAM]

A. F. KONKOVA, I. A. MAGAI, O. M. SHEKHAEVA, V. F. SOKOLOV, and M. N. ANUFRIEVA (AN SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR) *Akademiia Nauk SSSR, Izvestiia, Serii Biologicheskaiia* (ISSN 0002-3329), Jan.-Feb. 1987, p. 104-118. In Russian. refs

Physicochemical patterns of the parameter changes induced by extreme environments in the energy homeostasis of the human organism are examined. It is shown that under conditions of extreme environments the metabolism of an open dynamic autoregulated system shifts to a new stationary level of functioning. The qualitative and quantitative characteristics of changes in the energy exchange parameters in the transition period are obtained. It is shown that the adequacy of nonspecific defense adaptive reactions of a biological system depends on the functional state of the regulatory processes active during the transition period. I.S.

A87-32551

BROWNIAN MOTION OF A BIOPOLYMER AFFECTED BY GAUSSIAN FORCE IN A GRAVITATIONAL FIELD

KANJI ETORI (Miyazaki, University, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 2055-2060. refs

Stochastic processes of a Brownian motion of biopolymer molecules are discussed in relation to the description of a phase transition of a polypeptide chain as a denaturation process of a biopolymer. In order to estimate a dynamical behavior of biopolymer molecules affected by any external force, both the velocity correlation and the spectral density of a Brownian particle affected

by Gaussian force in gravitational field are calculated. As a result, it is proved that the characteristic properties of the denaturation process are affected not only by the temperature variation but also by any external force in the gravitational field. Author

A87-32552

SINGLE NEURON ACTIVITY IN THE RAT LATERAL HYPOTHALAMUS DURING HYPOGRAVIC SIMULATION INDUCED BY BODY SUSPENSION

YUTAKA OOMURA and TOSHIHIKO KATAFUCHI (Kyushu University, Fukuoka, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 2061-2065. refs

The effects of sensory input changes on the activity of single lateral hypothalamic neurons (SLHN) in rats in hypogravitic conditions were examined experimentally. Unanesthetized subjects were suspended in a 45 deg head-down tilt configuration while implanted wires provided a pathway to monitoring electrical activity in the SLHNs. Other rats were monitored while standing on the floor and in a horizontal position. Head-down tilting suppressed SLHN responses in half the neurons, demonstrating the proprioceptive, vestibular and/or baroreceptor inputs alter LHN activity, which also changes in response to food intake. Further studies in actual microgravity conditions are judged necessary to discern the exact impacts of behavioral, metabolic and autonomic disorders on the LHN responses. M.S.K.

A87-32554

DIFFERENCE IN DIRECTIONAL EFFECTS OF CENTRIFUGAL ACCELERATION (+Gz, -Gz) UPON CARDIOPULMONARY SYSTEM OF HAMSTERS

H. SATAKE, K. MATSUNAMI (Gifu University, Tsukasa, Japan), Y. MIZUNO (Daido Institute of Technology, Nagoya, Japan), H. URANO (Fukui Medical School, Japan), and S. WATANABE (Nagoya, University, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 2073-2078. refs

Results are reported from studies of the impact the direction of acceleration has on the cardiopulmonary responses of hamsters on a disorientator with a 1.5 m radius. The subjects were 16 male hamsters who were slightly anesthetized to stabilize the electrophysiological signals. The forces applied were +2 G and +4 G for 15 min 20 second and 14 min, respectively. ECG, stroke volume, respiratory responses and rate, and tidal volume data were recorded during and after the trials. Cardiopulmonary responses were more sensitive to +Gz than -Gz (transverse) acceleration. The biphasic stroke volume of some of the hamsters did not reverse after 4 Gz acceleration, and exhibited bradycardia, sino-atrial block and a negative P wave. The same hamsters displayed lower decreases in -Gz acceleration, which indicates that cerebral ischemia produced by a footward fluid shift in +Gz conditions may produce greater cardiopulmonary deconditioning than footward acceleration. M.S.K.

51 LIFE SCIENCES (GENERAL)

A87-32555

A LIFE-SUPPORT SYSTEM DEVELOPED FOR THE FISH EXPERIMENT IN SPACELAB

SHIGEO MORI, SATORU WATANABE, AKIRA TAKABAYASHI, MANABU SAKAKIBARA, SADAHARU TAKAGI (Nagoya University, Japan) et al. IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 2079-2083.

The life support system devised for the two labyrinthectomized carp scheduled to be flown on the Spacelab-J mission is described. Design constraints were a compact device capable of keeping the fish alive for up to 2 weeks in space without posing risks to the crew. A double-walled structure was selected to ensure that no water would escape. The fish containment parcel has a bundle of microporous polypropylene hollow fibers for circulating oxygen into the water to maintain the oxygen level at over 7.0 ppm. Activated charcoal and zerolite, in amounts of 150 g and 300 g, respectively, have been determined to be effective as filters for removing NH₃, bacteria, fecal matter, and fish aroma from 50 liters of water. M.S.K.

A87-34300

CRYSTALLIZATION OF 30S SUBPARTICLES FROM THERMUS THERMOPHILUS RIBOSOMES [KRISTALLIZATSIIA 30S SUBCHASTITS RIBOSOM THERMUS THERMOPHILUS]

M. M. IUSUPOV, S. D. TRAKHANOV, V. V. BARYNIN, V. L. BOROVIAGIN, M. B. GARBER (AN SSSR, Institut Belka and Institut Biologicheskoi Fiziki, Pushchino; AN SSSR, Institut Kristallografii, Moscow, USSR) et al. Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 292, no. 5, 1987, p. 1271-1274. In Russian. refs

A87-34403

PHOTODIMERIZATION OF URACIL IN ITS FILMS AND THE POSSIBILITY OF ITS APPLICATION TO THE DOSIMETRY OF GENERICALLY ACTIVE ULTRAVIOLET RADIATION [FOTODIMERIZATSIIA URATSILA V PLENKAKH I VOZMOZHNIOSI EE PRIMENENIIA DLIA DOZIMETRII GENETICHESKI AKTIVNOGO UL'TRAFIOLETOVOGO IZLUCHENIIA]

N. M. TSYGANENKO, M. N. KISELEVA, A. V. ALEKSEEV, N. IA. DODONOVA, A. S. CHUNAEV (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR) et al. Biofizika (ISSN 0006-3029), vol. 32, Jan.-Feb. 1987, p. 7-11. In Russian. refs

The possibility of using UV spectra produced by dimers in UV-irradiated uracil to determine genetically active UV radiation doses was explored using uracil films (prepared by sublimation in vacuum) irradiated by a xenon lamp. The radiation dose rates resulting in relative changes of the film optical density were related to the degree of uracil photodimerization that caused these changes. The data were used to estimate lethal-damage doses for *Chlamydomonas reinhardtii*. In addition, estimates were made of the solar radiation dose rate sufficient to induce dimerization of uracil on the earth surface and outside the earth atmosphere. I.S.

A87-34450

SPACE COLOR VISION IN PRIMATES [TSVETOVOE PROSTRANSTVENNOE ZRENIE PRIMATOV]

A. V. BERTULIS (Kaunasskii Meditsinskii Institut, Kaunas, Lithuanian SSR) and V. D. GLEZER (AN SSSR, Institut Fiziologii, Leningrad, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 18, Jan.-Mar. 1987, p. 3-22. In Russian. refs

A neuronal model of space color vision is developed on the basis of data obtained in earlier neurophysiological and psychophysiological studies in primates. The model explains such psychophysiological phenomena as the color fusion of the high-frequency components of an image, the McCollough (1965) effect, simultaneous and consecutive color contrasts, the constancy of color perception, and the perception of nonspectral colors. Two principal mechanisms for color vision are proposed. The first provides a set of coefficients which describe the spatial distribution of light and color in a site of the vision field; the second is

responsible for determining the color in each homogeneously colored area of this site. I.S.

A87-34705* Louisville Univ., Ky.

INTERACTIONS OF THE INTERFERON SYSTEM WITH CELLULAR METABOLISM

GERALD SONNENFELD (Louisville, University, KY) IN: Clinical applications of interferons and their inducers (2nd edition). New York, Marcel Dekker, Inc., 1986, p. 43-60. Research supported by the Kentucky Tobacco and Health Research Institute. refs (Contract EPA-R-807619; NCA2-OR-400-901; NCA2-OR-400-101)

The results of studies concerning the interaction of the interferon (Inf) system with the activities of carcinogens, tumor promoters, and cytochrome P-450 are presented. The results show that the addition of a tumor promoter (TPA or 4-O-methyl-TPA) to a tissue culture enhances virus-induced Inf-gamma production, suggesting a potential value of tumor promoters in the biosynthesis of commercial Inf. On the other hand, the carcinogens were reported to inhibit the induction of Inf-alpha/beta in cultured cells and in intact animals (with no effect on the administered or preformed Inf). The demonstration of a correlation between the carcinogenic potential of a compound and its inhibitive effect on Inf production suggests a possible use of the Inf production assay in the evaluation of the carcinogenicity of chemicals. In addition, it was shown that the induction of Inf-alpha/beta as well as the administration of this Inf depresses the levels of rat liver cytochrome P-450 which is responsible for binding lipophilic drugs, steroids, and carcinogens, thus increasing the toxicity of the respective chemical. I.S.

A87-34716* Massachusetts Univ., Worcester.

ROLE OF GLUCOCORTICOIDS IN THE RESPONSE OF RAT LEG MUSCLES TO REDUCED ACTIVITY

STEPHEN R. JASPERS (Massachusetts, University, Worcester) and MARC E. TISCHLER (Arizona, University, Tucson) Muscle and Nerve (ISSN 0148-639X), vol. 9, July-Aug. 1986, p. 554-561. refs

(Contract NAGW-227; NIH-AM-28647)

Adrenalectomy did not prevent atrophy of rat soleus muscle during 6 days of tail cast suspension. Cortisol treatment enhanced the atrophy and caused atrophy of the weight-bearing soleus and both extensor digitorum longus (EDL) muscles. Unloading led to increased sarcoplasmic protein concentration in the soleus but cortisol administration increased the myofibrillar (+stromal) protein concentration in both muscles. Suspension of hindlimbs of adrenalectomized animals led to faster protein degradation, slower sarcoplasmic protein degradation, and faster myofibrillar protein synthesis in the isolated soleus, whereas with cortisol-treated animals, the difference in synthesis of myofibrillar proteins was enhanced and that of sarcoplasmic proteins was abolished. Both soleus and EDL of suspended, cortisol-treated animals showed faster protein degradation. It is unlikely that any elevation in circulating glucocorticoids was solely responsible for atrophy of the soleus in this model, but catabolic amounts of glucocorticoids could alter the response of muscle to unloading. Author

A87-34871

SPACE STATION - OPPORTUNITIES FOR THE LIFE SCIENCES

M. H. HARRISON (RAF, Institute of Aviation Medicine, Farnborough, England) British Interplanetary Society, Journal (Space Chronicle) (ISSN 0007-084X), vol. 40, March 1987, p. 117-124. refs

Opportunities for bioprocessing, basic biological research and space medicine offered by the Space Station are examined. Space offers two conditions which are duplicated on earth only with great difficulty; microgravity and high vacuum. Microgravity permits enhanced control of temperature and concentration gradients and particle distributions in fluids and containerless processing. Several likely candidates for electrophoresis processing in space are identified, noting that the greatest obstacle to realizing the new industry is commercial doubts as to its viability. Areas of cell and animal physiology, radiation biology, and exobiology that would benefit from Space Station research are considered. Finally,

necessary space medicine research, by NASA and ESA, in medicine, toxicology, human factors, psychology, and adaptation to microgravity in support of the Space Station program are explored. M.S.K.

N87-20308*# Colorado Univ., Boulder. Get Away Special Project G-285

PHYCOMYCES IN SPACE: A PROBLEM IN BIOENGINEERING
JULIE A. SCHNERINGER /n NASA. Goddard Space Flight Center The 1986 Get Away Special Experimenter's Symposium p 35-39 Feb. 1987

Avail: NTIS HC A11/MF A01 CSCL 06B

Sustaining life with total automation is a difficult problem for GAS canisters. The length of time between setting the experiment and flight, the conditions of a completely sealed container, no guarantee on launch delay, orientation and the possibility of contamination all tend to exclude experiments with living matter. This experiment examines the growth of a nontoxic, everyday fungus, *Phycomyces*, in a microgravity environment. Data from this experiment will help define the mechanism by which plants determine the direction of gravity. The bioengineering problems were solved only after numerous tests and design changes. *Phycomyces* normally have a shelf life of approximately one week. Storing the fungus for two months, activating the fungus for growth and precise timing were the major obstacles. Solutions were found for storage by drying the fungus spores onto pieces of filter paper. Activation occurs when this filter paper is dropped onto the growth medium, via a solenoid system. The problem of timing is partially solved by growing more than one chamber of the fungus at different time intervals. This experiment proves that the simpler a design, the better it works. Author

N87-20322*# City Coll. of the City Univ. of New York. Dept. of Biology.

GEOTAXIS BASELINE DATA FOR DROSOPHILA
E. M. SCHNEBEL, R. BHARGAVA, and J. GROSSFIELD /n NASA. Goddard Space Flight Center The 1986 Get Away Special Experimenter's Symposium p 141-148 Feb. 1987

Avail: NTIS HC A11/MF A01 CSCL 06B

Geotaxis profiles for 20 *Drosophila* species and semispecies at different ages have been examined using a calibrated, adjustable slant board device. Measurements were taken at 5 deg intervals ranging from 0 deg to 85 deg. Clear strain and species differences are observed, with some groups tending to move upward (-geotaxis) with increasing angles, while others move downward (+geotaxis). Geotactic responses change with age in some, but not all experimental groups. Sample geotaxis profiles are presented and their application to ecological and aging studies are discussed. Data provide a baseline for future evaluations of the biological effects of microgravity. Author

N87-20324*# California Polytechnic State Univ., San Luis Obispo.

CAL POLY SPACE PROJECT G-279

DAVID R. FARLEY /n NASA. Goddard Space Flight Center The 1986 Get Away Special Experimenter's Symposium p 157-162 Feb. 1987

Avail: NTIS HC A11/MF A01 CSCL 06B

The Cal Poly Space Project is an effort on the part of several highly motivated students to deploy a space canister which will examine the effects of microgravity on electroplating and immiscible metals. The experiments will be controlled and monitored by a specialized triple redundancy system developed to defer the possible electronic errors due to uncontrollable factors such as photons from the Sun. With the finalization of the payload design and the near completion of the data control system, the integration phase of the project is anticipated to be completed and the project ready for launching by early 1987. It is hoped that the experiments will lead to new insights in space research and also prove profitable to industry. Author

N87-20727*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

LIQUID DROP STABILITY FOR PROTEIN CRYSTAL GROWTH IN MICROGRAVITY

ROBERT B. OWEN, BETH H. BROOM, ROBERT S. SNYDER, and RON DANIEL Apr. 1987 17 p
(NASA-TP-2724; NAS 1.60:2724) Avail: NTIS HC A02/MF A01 CSCL 06B

It is possible to grow protein crystals for biomedical research in microgravity by deploying a protein-rich solution from a syringe, forming a drop in which crystallization can occur with the proper degree of supersaturation. Drop stability is critical to the success of this research, due to the large drop sizes which can be achieved in space. In order to determine the type of syringe tips most suitable to support these large drops, tests were performed during brief periods of weightlessness onboard the NASA KC-135 low-gravity simulation aircraft. The drops were analyzed using three simple models in which the samples were approximated by modified pendulum and spring systems. It was concluded that the higher frequency systems were the most stable, indicating that of the syringes utilized, a disk-shaped configuration provided the most stable environment of low-gravity protein crystal growth. Author

N87-20728# Brandeis Univ., Waltham, Mass.

EFFECT OF LIGHT AND DEVELOPMENT OF PHOTOSYNTHETIC CELLS Final Report

M. GIBBS 1986 11 p
(Contract DE-AC02-76ER-03231)
(DE87-005183; DOE/ER-03231/10) Avail: NTIS HC A02/MF A01

Green algae exposed to an anaerobic environment adapt to a hydrogen metabolism and can photooxidize H₂O to H₂ and O₂ as well as carbon compounds to H₂ and CO₂. The products from fermentation of chloroplastic starch included acetate, formate, ethanol, CO₂, H₂, glycerol, and lactate. Light caused an increase in H₂ and CO₂ and decreases in acetate and ethanol. Aerobically isolated algal chloroplasts adapted to a hydrogen metabolism where H₂ was evolved. The oxyhydrogen reaction was not detected in the chloroplasts. Acetate is photoassimilated anaerobically by *Chlamydomonas* cells to lipid, carbohydrate, CO₂, and H₂ with a stoichiometry indicating a light-dependent anaerobic glyoxylate cycle as the primary assimilatory pathway. DOE

N87-20729# Midwest Research Inst., Golden, Colo.

MICROALGAE CULTURE COLLECTION, 1986-1987

W. BARCLAY, J. JOHANSEN, P. CHELF, N. NAGLE, P. ROESSLER, and P. LEMKE Dec. 1986 153 p
(Contract DE-AC02-83CH-10093)
(DE87-005578; SERI/SP-232-3079) Avail: NTIS HC A08/MF A01

The SERI Microalgae Culture Collection provides a repository for strains identified or developed for mass culture biomass production and makes these strains readily available to the research community. The strains in the collection have been selected for their potential in biomass fuel applications, and many produce significant quantities of cellular storage lipids. All of the newly added strains have been recently isolated by SERI and its subcontractors in organized screening programs. Many have been tested in outdoor mass culture systems, and several have demonstrated excellent performance as biomass producers. The strains added to the collection this year have been isolated from inland saline waters and marine waters. We believe that the strains in this collection can provide a source of extremely useful organisms, both for laboratory experimentation and for mass culture research. Most of the strains are currently nonaxenic. Again this year, cultures will be shipped free of charge to interested researchers. An important function of the culture collection catalog, in addition to listing the available strains, is to provide culture and performance data for each of the organisms. By collecting a summary of the requirements and characteristics of these organisms, we hope to allow requestors of cultures to begin productive research with a minimum of preliminary work on culture techniques. DOE

N87-20741# Joint Publications Research Service, Arlington, Va.
EFFECT OF LONG-TERM SPACEFLIGHT ON RAT BRAIN POLYAMINE CONTENT

R. A. TIGRANYAN and V. YU. KOVALEV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 74-79 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 53-57
Avail: NTIS HC A08/MF A01

The concentration of polyamines, i.e., putrescine, spermidine and spermine, was measured in different brain compartments of rats flown for 18.5 days on Cosmos-1129. Exposure to space flight led to changes in the polyamine content that were the most distinct in medulla oblongata. It is suggested that the changes develop as a result of a chronic stress associated with the effects of weightlessness. Author

N87-21580# Joint Publications Research Service, Arlington, Va.
RAT BRAIN POLYAMINE LEVELS DURING LONG-TERM HYPOKINESIA

V. YU. KOVALEV and R. A. TIGRANYAN *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 130-132 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 86-87
Avail: NTIS HC A01/MF A01

Hypokinesia leads to changes in various aspects of metabolic processes. Polyamines, which include putrescine, spermidine and spermine, are considered to be indicators of intensity of protein biosynthesis, since they stimulate it on the level of DNA transcription. There are no data in the literature concerning involvement of polyamines in processes of adaptation to hypokinesia. The levels of polyamines in different parts of the rat brain as related to different durations of hypokinesia are investigated. Author

N87-21581# Joint Publications Research Service, Arlington, Va.
REACTION OF SYMPATHECTOMIED RAT OPIOID SYSTEM TO IMMOBILIZATION STRESS

R. A. TIGRANYAN and O. P. VAKULINA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 133-136 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 87-90
Avail: NTIS HC A01/MF A01

Catecholaminergic neurons of the brain form contacts with opioid neurons. There are data in the literature to the effect that there are opiate peptides in sympathetic nerve endings; however, little information is encountered about correlations between the catecholaminergic and opiate systems, and it is contradictory. It is assumed that opioids lower hyperactivity of noradrenergic neurons of the brain with exposure to stress. On the other hand, catecholamines of the brain participate in expression of some effects induced by opiate peptides, for example, in control of retention or stimulation of prolactin secretion. The reaction was studied of the opiate system to immobilization, with change in functional state of the catecholaminergic system of the brain and peripheral adrenergic innervation. Author

N87-21582# Joint Publications Research Service, Arlington, Va.
RADIOSENSITIVITY OF ESCHERICHIA COLI FOLLOWING IRRADIATION IN A STATIONARY MAGNETIC FIELD

M. I. MINKOVA and T. P. PANTEV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 137-139 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 87-90
Avail: NTIS HC A01/MF A01

There is change not only in general reactivity of an organism, but in different elements of the immune system under the effect

of a stationary magnetic field (SMF). Saprophytic bacterial flora is present in the pressurized part of a craft. There is rather limited information about the effect of magnetic fields on microbial flora and its radiosensitivity. The effect of SMF was tested on growth and radiosensitivity of *E. coli* B. Author

AEROSPACE MEDICINE

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

A87-31693
AEROBIC FITNESS AND SUSCEPTIBILITY TO MOTION SICKNESS

G. R. BANTA, W. C. RIDLEY, J. MCHUGH, J. D. GRISSETT, and F. E. GUEDRY (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Feb. 1987, p. 105-108. refs

Susceptibility to motion sickness was evaluated in 29 males having high, moderate, and low levels of aerobic fitness. Subjects underwent Coriolis (cross-coupled) vestibular stimulation on a Stille-Werner rotator during a 10-min modification of the Brief Vestibular Disorientation Test. Variables evaluated were: spin time before aborting (ST), heart rate (HR), respiratory rate (RR), mean skin temperature (Tsk), subject observation values (SV), and observation values. Aerobic fitness and ST for the total population were inversely related ($r = -0.506$, p less than 0.01). Difference in ST was significant ($F/2.26/ = 6.67$, p less than 0.01), with the high aerobic group demonstrating an earlier ST and greater SV than the low aerobic group (Student-Newman-Keuls; $\alpha = 0.05$). Analysis of HR, RR, and mean Tsk between groups revealed limited differences. Based on these data, men with high aerobic fitness appear to have an increased susceptibility to motion sickness. Author

A87-31694
NOISE, VIBRATION AND CHANGES IN WAKEFULNESS DURING HELICOPTER FLIGHT

ULF LANDSTROM and PER LOFSTEDT (National Board of Occupational Safety and Health, Umea, Sweden) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Feb. 1987, p. 109-118. Research supported by the National Board of Occupational Safety and Health of Sweden. refs

The investigation was carried out in cooperation with the helicopter school AF 1 in Boden. Measurements were made in two different types of helicopter, Hkp 3 and Hkp 6. Three different parameters were recorded during the flights: noise, vibrations, and wakefulness. Noise and vibration exposures were mainly correlated to the main rotor energy and frequency. Both types of exposure were dominated by lower frequencies, below 10 Hz. Analyses of wakefulness during long-distance flights, about 4 h, and short-distance flights, less than 2 h, were based on EEG and EKG recordings. As expected the level of wakefulness was influenced by the stress upon the pilots. Take-offs and landings, as well as unexpected events during the flight, were correlated to an increased level of wakefulness. In some cases flying was correlated to a gradual increase of weariness. The correlation between weariness, types of flying, and the external environmental factors of noise and vibration, is also discussed. Author

A87-31695* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FAILURE OF METOCLOPRAMIDE TO CONTROL EMESIS OR NAUSEA DUE TO STRESSFUL ANGULAR OR LINEAR ACCELERATION

RANDALL LEE KOHL (NASA, Johnson Space Center; Universities Space Research Association, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Feb. 1987, p. 125-131. refs

Orally administered metoclopramide (REGLAN) at doses of 10 or 20 mg, 75 min prior to either stressful linear acceleration (parabolic flight) or cross-coupled accelerative semicircular canal stimulation in a rotating chair was evaluated for its ability to prevent emesis or nausea II, respectively. Although metoclopramide is an effective antiemetic agent that enhances gastric emptying and prevents cancer chemotherapy-induced emesis, it was not possible to demonstrate any significant (p less than 0.05) effects of this drug on motion sickness. Author

A87-31697
CHANGES OF SKIN POTENTIAL LEVEL AND OF SKIN RESISTANCE LEVEL CORRESPONDING TO LASTING MOTION DISCOMFORT

NAOKI ISU, JIRO KOO, and NOBUYUKI TAKAHASHI (National Aerospace Laboratory, Chofu, Japan) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Feb. 1987, p. 136-142. refs

The qualitative correspondence between degree of motion discomfort and electrodermal activity was investigated. Skin potential level (SPL) and skin resistance level (SRL) in the arousal sweat area and the thermal sweat area were recorded. In order to induce motion discomfort, Coriolis stimulation and/or horizontal body rotation were provided by using a rotatory chair. The degree of discomfort was evaluated according to reports by the subjects. It was observed that SPL depolarized in the arousal sweat area as well as in the thermal sweat area and SRL lowered in the thermal sweat area coincidentally with lasting motion discomfort. SPL showed better correspondence to lasting motion discomfort than did SRL, especially during the recovery period from the motion discomfort. Author

A87-31699
HYDROSTATIC THEORY AND G PROTECTION USING TILTING AIRCREW SEATS

JOHN G. NELSON (U.S. Navy, Naval Air Development Center, Warminster, PA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Feb. 1987, p. 169-173. refs (Contract NAVAIR TASK AIR-310H)

The hydrostatic theory of the cause of pilot blackout proposes that the inadequate blood pressure at the eye, which produces blackout, is caused by acceleration acting on the hydrostatic column of blood (h) supplying the eye. However, no general agreement exists as to the origin for h in the thorax. Published data pertaining to the causes of pilot blackout were reviewed with the aim of finding the correct origin for h. On the basis of the reanalysis of Burns's (1975) data relating the value of the acceleration tolerance (T) to the seat-back angle, it was found that a simple hydrostatic model, with h measured from the aortic valve to the eye, yields an excellent fit with the nonlinear equation relating the value of T to both the seat-back angle and the correction to the back angle, ϕ . The value of ϕ (13.74 deg) derived using this model and Burns's data was the same as the independent estimate of ϕ for the same seat derived from values of h (which were measured by X-rays with h referenced to the aortic valve and the eye) published by Burns and Whinnery (1984). I.S.

A87-31700
INFECTIOUS DISEASE IN ANTARCTICA AND ITS RELATION TO AEROSPACE MEDICINE - A REVIEW

BARD C. COSMAN and PAUL W. BRANDT-RAUF (Columbia-Presbyterian Medical Center, New York) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Feb. 1987, p. 174-179. refs

In many aspects, an Antarctic Station provides parallels to the environments encountered in space exploration, particularly with reference to infectious disease. In both instances, small groups of people live in isolation for long periods of time in a functionally sterile atmosphere. Therefore, studies of infectious disease in Antarctica should provide important insights into the experiences to be expected in spaceflight. This paper presents a summary of the information on the infectious and immunologic aspects of isolation derived over the years from research in Antarctica. Author

A87-31748
THE BRAIN HEMODYNAMICS OF PILOTS IN ALTITUDE CHAMBER STUDIES [SOSTOIANIE GEMODINAMIKI GOLOVNOGO MOZGA U LETCHIKOV PRI BAROKAMERNYKH ISSLEDOVANIYAKH]

L. I. STARIKOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Oct. 1986, p. 37-40. In Russian. refs

The effect of hypoxia on the cerebral blood supply was investigated in pilots during a 30-min stay in an altitude chamber at 54 kPa using partial integral rheography. The changes in the hemocirculation parameters used to measure cerebral blood supply exhibited by subjects with poor adaptability to hypoxia were different from those of normal, well-adapted subjects. In particular, the cerebral blood flow and cerebral blood supply in well-adapted subjects increased during the high-altitude exposure and returned to normal levels 3-5 min after the exposure to atmospheric pressure. Poorly adapted subjects, on the other hand, exhibited either a decrease of the cerebral blood supply (which was particularly significant in the basal-vertebral sinus) or an increase which continued after the end of low-altitude exposure. It is suggested that encephalographic examination may reveal signs of potential hypersensitivity to hypoxia and that the presence of alpha activity in the EEGs may be of predictive value. I.S.

A87-31976
MEDICAL SUPPORT FOR YOUNG PILOTS [MEDITSINSKOE OBESPECHENIE POLETOV, VYPOLNIAEMYKH MOLODYMI LETCHIKAMI]

I. M. ALPATOV, G. A. ANOKHIN, N. D. KHAVRUK, and G. G. SBORETS Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Jan. 1986, p. 43-45. In Russian.

Due to drastic differences between the physical and emotional environments of flight school and actual service, which are connected with unique stress during the initial period of service, pilots at the start of their career demand special medical attention. The medical program designed for the thorough examination of young pilots arriving at their base and for treating sources of potential mental or physical disorders is described. The first stage of the program includes a thorough examination of the medical history of a pilot, his present physical and emotional status, dexterity, and acuteness, as well as his habits, social skills, family life, and living conditions. This stage of the program includes lectures for pilots' wives, preparing them for their role as partners in their husbands' stressful and demanding careers. The second stage of the program consists of the appraisal of the functional status of a pilot during the first month of flight assignments. Pilots displaying slow learning or those committing errors in the piloting techniques are subjected to a battery of physiological and psychological tests designed to pinpoint the source of their unsatisfactory performance. I.S.

A87-31977

THE CAUSES FOR THE APPEARANCE OF SPECIFIC SICKNESSES IN DIVERS [O PRICHINAKH VOZNIKOVENIIA SPETSIFICHESKIKH ZABOLEVANII VODOLAZOV]V. S. POTAPOV, M. I. CHERNETS, and A. V. POTAPOV
Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Jan. 1986, p. 45-47.
In Russian.

The symptoms of the sicknesses that are specific for divers working in shallow or deep waters and that are frequent causes of fatalities are discussed. The detrimental health conditions caused by working under water include barotrauma, which is a most frequent cause of professional fatalities in scuba divers and is a danger even in very shallow (1.5-3 m) water, decompression illness, and poisoning by either oxygen, carbon dioxide, nitrogen, or exhaust gases contaminating compressed air used in the divers' gas balloons. Emergency measures which must be taken immediately upon appearance of the symptoms of each of the above conditions are described. I.S.

A87-32005* National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.**ECHOCARDIOGRAPHIC EVALUATION OF SPACE SHUTTLE CREWMEMBERS**M. W. BUNGO, D. J. GOLDWATER, R. L. POPP, and H. SANDLER
(NASA, Johnson Space Center, Houston, TX; NASA, Ames Research Center, Moffett Field; Stanford University, CA) Journal of Applied Physiology (ISSN 0161-7567), vol. 62, Jan. 1987, p. 278-283. refs

Echocardiographic measurements of left ventricular volume were obtained from 17 members of four Space Shuttle crews before and after 5- to 8-day space flights. Measurements obtained 1 h after landing indicated increases in the heart rate (HR), mean arterial pressure, and systemic vascular resistance values. On the other hand, the end-diastolic volume index (EDVI) fell 17 ml/sq m, and the stroke volume index (SVI) fell 15 ml/sq m. Measurements taken 1-2 weeks later demonstrated that the HR values returned to normal, but the EDVI and SVI values remained significantly below preflight levels, despite the ability of the subjects to ambulate and exercise. The results indicate that a space flight induces significant changes in heart volume affecting the left-ventricle function. It is suggested that the prolonged recovery period is related to the high level of aerobic conditioning in these subjects. I.S.

A87-32116

A QUESTION OF GRAVITY

RAY SPANGENBURG and DIANE MOSER Space World (ISSN 0038-6332), vol. X-2-278, Feb. 1987, p. 8-11.

Artificial gravity is the only currently known method for avoiding the physiological effects of long-term weightlessness which Space Station and Mars mission crew would encounter. Techniques such as exercise and lower body negative pressure devices have not proven sufficiently effective. Vestibular excitement by the Coriolis force rules out use of a rotating room that could be contained in spaceships. A leading alternative for a Mars mission is to have a nuclear reactor tethered to a spacecraft a kilometer away. The entire configuration would rotate about its center, providing artificial gravity and minimizing the Coriolis force at the populated end. Ground-based bedrest and rotating room and proposed Space Station co-orbiting variable gravity experiments which may determine the minimal artificial gravity needed to avoid the effects of prolonged weightlessness are summarized. M.S.K.

A87-32550

ELECTRODERMAL ACTIVITY DURING MOTION DISCOMFORT

NAOKI ISU (National Aerospace Laboratory, Chofu, Japan), NOBUYUKI TAKAHASHI (Ford Motor Co., Hermosillo, Mexico), and JIRO KOO (Tokai University, Hiratsuka, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 2049-2054. refs

A study was performed of the effects of motion sickness on electrodermal activity. Human subjects, 16-28 yr old, underwent

trials in a rotatory chair in darkness. Electrodes were attached to the pollicis distalis palmares and two areas in the antebrachii palmares. Skin potential measurements were collected before and during counterclockwise rotation at 6 deg/sec-sq up to 180 deg/sec rotation. Peak angular velocities were kept constant while the subjects moved their heads up and down at 5 sec intervals. Tests featuring constant 120 deg/sec rotations were also carried out for an hour or until vomiting was imminent, and at 1 deg/sec accelerations to 180 deg/sec and then deceleration to stationarity at constant rates. Skin potentials were found to depolarize with the progress of motion discomfort, then return to pre-trial levels after stopping. The degree of depolarization, particularly the magnitude of the P subwave, was correlated with the degree of discomfort. M.S.K.

A87-32553

MAN IN LONG-TERM SPACE FLIGHT

O. G. GAZENKO, A. I. GRIGOREV, A. D. EGOROV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR), and K. E. TSIOLKOVSKII IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 2067-2072. refs

The known effects and adaptive responses by humans to long-duration spaceflight are summarized. The absence of the mechanical tension and deformations produced by gravity on earth removes the hydrostatic pressure on blood and other fluids and the weight loads on the musculo-skeleton system and modifies the afferent input in space, producing disordered reactions of the afferent systems and sensory conflicts, decreased dorsal hypothalamic activity, and displacement of blood and other fluids. Fluid losses occur, along with blood pooling in the viscera, limited delivery to the cardiopulmonary area, inhibited erythropoiesis, decreased muscle tone, etc. Space sickness generally disappears after about 6 days, while muscular coordination is initially decreased and later regained with sufficient accuracy, though requiring less muscular effort. The Soviet experience thus far, however, indicates that bone mineral loss is reversible, and that red blood cell counts rapidly revert to normal after the return to earth. The database now extends to 8 mos duration missions. M.S.K.

A87-33386

EVALUATION OF THE PREVENTION BY PHYSICAL EXERCISE OF CARDIOVASCULAR DECONDITIONING DURING PROLONGED BED REST FROM THE STUDY OF SYSTOLIC TIME INTERVALS [EVALUATION DE LA PREVENTION PAR L'EXERCICE PHYSIQUE DE LA DESADAPTATION CARDIOVASCULAIRE LORS DE DECUBITUS PROLONGE A PARTIR DE L'ETUDE DES INTERVALLES DE TEMPS SYSTOLIQUES]

J. TIMBAL, J. COLIN (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris, France), J. M. CLERE, H. MAROTTE (Centre d'Essais en Vol, Bretigny-sur-Orge, France), and A. GUELL (Centre Hospitalier Universitaire Rangueil, Toulouse, France) Medecine Aeronautique et Spatiale, vol. 25, 4th Quarter, 1986, p. 279-285. In French. refs

A87-33387

STUDY OF ECHOCARDIOGRAPHIC PARAMETERS OBTAINED FROM TWO SAMPLES OF PILOTS. II - PROPOSAL FOR A GENERALIZED Q INDEX [ETUDES DE PARAMETRES ECHOCARDIOGRAPHIQUES OBTENUS CHEZ DEUX POPULATIONS DE PILOTES. II - PROPOSITION D'UN INDEX ECHOCARDIOGRAPHIQUE GENERALISE]

PIERRE QUANDIEU, ERIC VICAUT, BERTRAND PIEDECOCQ (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris, France), JEAN LEFEBVRE, MONIQUE BOITARD (Institut National de la Recherche Agronomique, Jouy-en-Josas, France) et al. Medecine Aeronautique et Spatiale, vol. 25, 4th Quarter, 1986, p. 286-291. In French. refs

A method is presented in which 11 echocardiographic variables are used to characterize six previously derived classes of individuals, consisting of two reference classes of airline pilots

and four classes of Mirage 2000 fighter pilots. From the average matrix of the intrasample dispersion, a multistep calculation of the square of the distance between the sample centers is performed. From the analysis it is suggested that the division of the reference sample into two statistical samples is justified, while that of the Mirage 2000 population into four groups is not. Results from a scaling of the contributions of individual echocardiographic variables indicate that the 11 variables can be reduced to six, and the validity of the proposed Q index is discussed. R.R.

A87-33388

THE EFFECT OF CURRENT TREATMENTS FOR CERTAIN MALIGNANT DISEASES ON THE FITNESS OF CIVIL AND COMMERCIAL AIRCRAFT PERSONNEL [L'INCIDENCE DES THERAPEUTIQUES ACTUELLES DE CERTAINES MALADIES MALIGNES SUR L'APTITUDE DU PERSONNEL NAVIGANT DE L'AVIATION CIVILE ET COMMERCIALE]

G. BELLANGER, J. LAVERNE, J. SIROT (Compagnie Nationale Air France, Paris, France), and M. BOIRON (Hopital Saint-Louis, Paris, France) *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 291-293. In French.

A87-33390

DOPPLER VELOCIMETRY UNDER A LOADING FACTOR - ATTEMPT AT EVALUATING CAROTID BLOOD FLOW [VELOCIMETRIE DOPPLER SOUS FACTEUR DE CHARGE - TENTATIVE D'EVALUATION DES DEBITS CAROTIDIENS]

J. M. CLERE, P. ARBEILLE, Y. GUEZENEC, C. BOUTELIER, and H. VIEILLEFOND (Center d'Essais en Vol, Bretigny-sur-Orge, France) *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 299-302. In French. refs

The feasibility of using Doppler velocimetry in the hemodynamic investigation of the cardiovascular response to acceleration is demonstrated, with application to human physiological adaptation to space flight. The technique permits the measurement of the velocity of circulating blood and eliminates errors related to the movements of subject and test chamber. Accelerations up to 5 G at an increase of 0.25 G/s were tested in an experiment with a 32 year old male subject, and a reduction in internal carotid blood flow was shown, in agreement with classical hemodynamic theory. R.R.

A87-33391

PAPILLARY DRUSEN AND AERONAUTICAL FITNESS [DRUSES PAPILLAIRES ET APTITUDE AERONAUTIQUE]

M. MAILLE, P. JACQUIOT, P. CREPY, and CH. CORBE (Centre Principal d'Expertise Medicale du Personnel Navigant, Paris, France) *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 302-304. In French.

Problems posed by papillary drusen are discussed in relation to the fitness of aeronautical personnel, with emphasis on their potential evolution and difficulties in their diagnosis. Papillary drusen may appear as an epiphenomenon in the course of ocular or heredodegenerative affections including glaucoma and uveitis or severe chorioretinitis, and they may be complicated by hemorrhages. The phenomenon is associated with chronic irritation of the optical nerve fibers, leading in some cases to long-term deficits in visual acuity. It is suggested that certain aeronautical stresses, particularly those which military aviation personnel are subject to, may precipitate the evolution of papillary drusen. R.R.

A87-33392

THE FITNESS PROBLEM WITH RESPECT TO A CORONARY MALFORMATION IN A HELICOPTER PILOT [PROBLEME D'APTITUDE A PROPOS D'UNE MALFORMATION CORONAIRE CHEZ UN PILOTE D'HELICOPTERE]

J. P. BURLATON, R. BRION, J. P. OLLIVIER, J. C. ROY, J. P. GOURBAT et al. *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 304-307. In French. refs

The case of a helicopter pilot found to have an anomalous origin of the right coronary artery from the pulmonary artery after a continuous xiphoid murmur was observed is discussed, and the

diagnosis of this anomaly and its implications for aeronautical fitness are discussed. With direct reimplantation in the aorta, the circumflex artery was found by coronarography to be of practically normal size one year after surgery. Due to the vulnerability to coronary insufficiency and heart failure associated with this congenital abnormality, surgical correction is recommended in order to achieve adequate aeronautical fitness. R.R.

A87-33393

BACK PAINS OF HELICOPTER PILOTS IN 1985 - RESULTS OF A MULTIPART STUDY [RACHIALGIES DES PILOTES D'HELICOPTERES EN 1985 - RESULTATS D'UNE ENQUETE PLURICENTRIQUE]

P. J. METGES, J. FLAGEAT, and Y. MOUCHON (Hopital d'Instruction des Armees Begin, Saint-Mande, France) *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 310-315. In French. refs

A study, consisting of a questionnaire, a clinical examination, and an X-ray examination, of 232 helicopter pilots and 175 nonpilot flight personnel is performed to investigate the phenomenon of back pain. For the pilots, chronic back pain, particularly in the lumbar region, occurred most frequently, with fewer incidents of acute back pain and complications such as cervicobrachial neuralgia. Back pain appeared to be common to both groups, and its source is thought to be musculoligamentary. The onset of lumbar region pain is found to occur much later in terms of accumulated flight time than in the past, presumably due to better designed seats and technological improvements damping aircraft vibration. R.R.

A87-33394

NEW PERSPECTIVES OFFERED BY THE SPECIFIC QUANTITY OF CUTANEOUS FREE CHOLESTEROL [PERSPECTIVES NOUVELLES OFFERTES PAR LE DOSAGE SPECIFIQUE DU CHOLESTEROL LIBRE CUTANE]

P. LAFARGUE, D. DARDANT, and P. HAVIL *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 316-318. In French. refs

A specific skin cholesterol assay method is proposed to demonstrate the relationship between cutaneous cholesterol level and degree of aortic atheromatosis, with application to the early detection of atheromatosis and arteriosclerosis in the selection of personnel for high responsibility positions. The method of Folch et al. (1957) is used in the extraction of lipids from biological media, and the quantification of cholesterol is performed by gas-liquid chromatography. The average cholesterol rate determined from 10 samples is 0.0014 g/g of skin, in close agreement with the result of Bouissou et al. (1982). R.R.

A87-33396

SINUS BAROTRAUMA IN THE AERONAUTICAL ENVIRONMENT. II [DU BAROTRAUMATISME SINUSIEN EN MILIEU AERONAUTIQUE. II]

J. F. GOUTEYRON (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 324-328. In French.

The diagnosis, treatment and prevention of nasal sinus barotrauma as they apply to aeronautical fitness are discussed, and the need for education in this area is underlined. Treatments for 1st, 2nd, and 3rd degree barotraumas are first considered, in addition to the surgical interventions often necessary for more evolved conditions including frontal sinus lesions. Prophylactic approaches to sinus barotrauma include rigorous personnel selection, and the maintenance of proper pressure gradients aboard aircraft either through pressurized garments or cabin pressure maintenance. Military and civil fitness norms are discussed, and it is noted that these norms can be used to eliminate predisposed subjects. Medical-legal aspects of this condition are also considered. R.R.

A87-33397

MEDICATION PRESCRIPTIONS AND FITNESS FOR FLIGHT [LES PRESCRIPTIONS MEDICAMENTEUSES ET L'APTITUDE AU VOL]J. P. BURLATON and A. DIDIER *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 328-332. In French.

Courses of medication therapy for various medical conditions are evaluated with respect to their effect on the fitness of flight personnel, with emphasis on the dangers of side-effects. Prophylactic treatments such as the malaria vaccine do not usually produce side-effects, while prophylaxis for air sickness requires monitoring. While certain illnesses such as hypothyroidism and arterial hypertension are incompatible with flight fitness, a carefully monitored well-tolerated treatment of medication (such as the use of certain diuretics and beta-blockers for hypertension) can often bring affected personnel within the medical norms for fitness. Also considered are the effects of common medications including Tagamet and nonsteroid antiinflammatories and therapies for asthma and tuberculosis. R.R.

A87-33398

SARCOIDOSIS IN AERONAUTICAL MEDICINE [LA SARCOIDOSE EN MEDECINE AERONAUTIQUE]A. SEIGNEURIC, G. LEGUAY, J. P. BURLATON, and J. P. GOUBAT (*Hopital d'Instruction des Armees Dominique Larrey, Versailles, France*) *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 332-336. In French. refs

The diagnosis, clinical manifestations, and possible cardiac localizations of sarcoid affections are discussed, in addition to their repercussions on the aeronautical community. Early diagnosis can usually be made with systematic thoracic radiography, and general diagnostic elements include histological lesions, a particular biological profile including the elevation of angiotension converting enzyme, and the affection of certain organs. Clinical manifestations of cardiac sarcoidosis are primarily myocardial, and include congestive cardiac insufficiency and ventricular arrhythmia. Classifications which are incompatible with aeronautical fitness include a cardiac or nervous localization, the existence of pulmonary parenchymal anomalies, and the general indication for corticotherapy. R.R.

A87-33399

PROBLEMS POSED BY EXTRATERRESTRIAL RADIATION FOR MANNED SPACE FLIGHT [PROBLEMES POSES PAR LES RAYONNEMENTS EXTRATERRESTRES DANS LES VOLS SPATIAUX HABITES]R. P. DELAHAYE (*Service de Sante pour l'Armee de l'Air, Paris, France*) and P. J. METGES (*Hopital d'Instruction des Armees Begin, Saint-Mande, France*) *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 337-345. In French.

The dangers of extraterrestrial radiation for manned space flight are discussed, and results of dosimetric studies performed aboard satellites of the U.S. and USSR are considered. Highly energetic primary galactic cosmic rays (GCR) encounter atmospheric N and O nuclei to produce, by complex nuclear reactions, secondary GCR. Satellites at elevations of 1-2 AU experience 0.020-0.050 rads/d. The variation of radiation dosage with latitude and solar activity, and the dosages experienced in the radiation belts, are discussed. Solar eruptions, appearing in the sunspot regions, are characterized by strong H-alpha emission, and effects of the solar wind including nausea and vomiting have been reported during manned space flight. Deformation of the magnetosphere by the solar wind is also considered. R.R.

A87-33400

MEDICAL FITNESS STANDARDS FOR CIVIL-AVIATION FLIGHT PERSONNEL IN THE UNITED STATES OF AMERICA [LES STANDARDS MEDICAUX D'APTITUDE DU PERSONNEL NAVIGANT CIVIL AUX ETATS-UNIS D'AMERIQUE]J. LAVERNHE (*Compagnie Nationale Air France, Paris, France*) *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 346-348. In French.

Some of the recommendations submitted to the Federal Aviation Administration for the revision of medical fitness norms for civil-aviation flight personnel are discussed. Cardiovascular manifestations including coronary disease and arterial hypertension greater than 150/95, and psychiatric problems including psychosis and pharmacotoxicodependences, are considered as criteria for nonfitness. Visual guidelines are suggested, and the need for spirometry for smokers and asthmatics, and for annual hematocrits for personnel above the age of 40, is underlined. Other conditions which are associated with a lack of fitness include insulin-dependent diabetes, quadriplegic antecedents to cerebral affections, and epilepsy. R.R.

A87-33401

CABIN PRESSURE VARIATION MEASUREMENTS DURING COMMERCIAL FLIGHTS - WITH REFERENCE TO BAROTRAUMATIC OTITIS [MESURE DES VARIATIONS DE PRESSION/CABINE AU COURS DES VOLS COMMERCIAUX - A PROPOS DES OTITES BAROTRAUMATIQUES]G. CASANO, C. MONTAGNE, J. SOUDANT, J. LAVERNHE (*Compagnie Nationale Air France, Services Medicaux, Paris, France*), and H. VIELLEFOND (*Center d'Essais en Vol, Bretigny-sur-Orge, France*) *Medecine Aeronautique et Spatiale*, vol. 25, 4th Quarter, 1986, p. 348-351. In French. refs

To study the potential for occurrence of barotraumatic otitis in commercial air travel, cabin pressure measurements have been obtained for three aircraft along four different flight itineraries. Results show conformation to recommended operational limits, with the largest variation of 1.5 mb over 1-10 s durations being insufficient to cause aerotitis, except in conjunction with a previously existing chronic condition. Furthermore, it is noted that the risk of barotrauma decreases with aeronautical experience, and varies with the ability of personnel to prepare themselves for turbulence. R.R.

A87-33450

THE EFFECTS OF WHOLE-BODY VIBRATIONHEINRICH DUPUIS (*Mainz, Universitaet, West Germany*) and GEORG ZERLETT (*Rheinische Braunkohlenwerke AG, Cologne, West Germany*) Research supported by the Hauptverband der gewerblichen Berufsgenossenschaften. Berlin and New York, Springer-Verlag, 1986, 171 p. Translation. refs

The effects of vibration on the human body are examined from the perspective of occupational medicine. Chapters are devoted to terminology and definitions, the stress-strain concept in whole-body vibration (WBR), the acute effects of mechanical vibration, chronic WBR effects, the influence of particular modes of WBR, preventive measures, and protective regulations and guidelines. The most clearly proven WBR effects are found to be those on respiration (hyperventilation), the vestibular system, vision, motor performance, and (chronically) the spine and stomach. Diagrams, drawings, graphs, photographs, tables of numerical data, and a glossary are provided. T.K.

A87-33504

SENSITIVITY TO LIGHTDONALD C. HOOD (*Columbia University, New York*) and MARCIA A. FINKELSTEIN (*South Florida, University, Tampa, FL*) IN: *Handbook of perception and human performance*. Volume 1. New York, Wiley-Interscience, 1986, p. 5-1 to 5-66. refs

Sensitivity is studied as a function of wavelength, size, duration, and retinal eccentricity of aperiodic stimuli. Consideration is given to visual receptors and their pigments, correcting for light loss, spectral sensitivity, and photometric measurement. The absolute sensitivity, which is the sensitivity of the dark-adapted eye, is

analyzed in terms of spatial and temporal factors, sensitivity and eccentricity, and rod and cone systems. Incremental sensitivity which is the detectability of a change of intensity is examined; emphasis is placed on measuring changes in intensity discrimination and incremental threshold curves for the rod and cone systems. Dark adaptation and the equivalent background principle are discussed. I.F.

A87-33507**COLORIMETRY AND COLOR DISCRIMINATION**

JOEL POKORNY and VIVIANNE C. SMITH (Chicago, University, IL) IN: Handbook of perception and human performance. Volume 1. New York, Wiley-Interscience, 1986, p. 8-1 to 8-51. refs (Contract NIH-EY-00901; NIH-EY-01876)

The principles and procedures of colorimetry are described. The specifications for light, visual stimuli, wavelength, and frequency are defined. Consideration is given to the measurement of radiant energy, the spectral luminous efficiency function, and photometry. Wavelength, colorimetric purity, and lights of equal luminance discriminations and the effects of stimuli manipulation and chromatic adaptation on discrimination are examined. The use of the Young-Helmholtz trichromatic theory, the Hurvich and Jameson (1955) theory, the opponent-process theory, and line-element theories to describe color vision is studied. The classification of color defects and congenital color defects are discussed. I.F.

A87-33508**EYE MOVEMENTS**

PETER E. HALLETT (Toronto, University, Canada) IN: Handbook of perception and human performance. Volume 1. New York, Wiley-Interscience, 1986, p. 10-1 to 10-112. refs

The geometric aspects of stationary eyes orientation to the three-dimensional world; the three-dimensional aspects of the anatomy and movements; and the use of cartography to handle three-dimensional problems are reviewed. Physiological principles related to different types of eye movements, various methods for measuring eye movements, and models for studying eye movements are described. Experimental data on eye movements under different circumstances, such as eye movements with a fixed visual target, in complete darkness, and to rolling targets, are presented and discussed. I.F.

A87-33509**THE VESTIBULAR SYSTEM**

IAN P. HOWARD (York University, Toronto, Canada) IN: Handbook of perception and human performance. Volume 1. New York, Wiley-Interscience, 1986, p. 11-1 to 11-30. refs

The structure, physiology, and psychophysics of the vestibular system are reviewed. The composition and dynamics of the otolith organs, the afferent signal from the otolith organs, the central projections of otolith afferents, and linear acceleration thresholds are discussed. Consideration is given to the characteristics of the vestibular canals, the afferent signal from the vestibular canals, the central projections of canal afferents, and rotary acceleration. I.F.

A87-33517**BINOCULAR VISION**

ARIES ARDITI (New York Association for the Blind; New York University, NY) IN: Handbook of perception and human performance. Volume 1. New York, Wiley-Interscience, 1986, p. 23-1 to 23-41. refs

The advantages of binocular and monocular sensitivities are analyzed and compared. Binocular suppression and rivalry and stereopsis are examined. Free stereoscopy, stereoscopes, filter separation techniques, and random-dot stereograms, which are methods of displaying a visual scene in three dimensions, are described. The resolution and dynamics of binocular vision are discussed and the theories utilized to explain binocular vision are reviewed. I.F.

A87-33941* Pennsylvania Univ., Philadelphia.

HYPERBARIC HYPEROXIA REVERSIBLY INHIBITS ERYTHROCYTE PHOSPHOLIPID FATTY ACID TURNOVER

CRAIG A. DISE, JAMES M. CLARK, CHRISTIAN J. LAMBERSTEN, and DAVID B. P. GOODMAN (Pennsylvania, University, Philadelphia) Journal of Applied Physiology (ISSN 0161-7567), vol. 62, Feb. 1987, p. 533-538. Research supported by the University of Pennsylvania. refs (Contract N00014-81-C-0826-P04; NAS9-17238-1C)

The effect of hyperbaric hyperoxia on the acylation of membrane phospholipid was studied by measuring the rates of activation of exogenous tritiated oleic acid to acyl thioester and of transesterification of the thioester into membrane phospholipids in intact human erythrocytes obtained 1 h after an exposure of the subjects to a hyperbaric oxygen atmosphere (3.5 h, 100 pct O₂, 3 ATA). Exposure to pure oxygen was found to inhibit both the acylation and transesterification reactions by more than 30 percent, with partial recovery detected 24 h later. On the other hand, no rate changes were observed when isolated membranes from the same batches of cells were used in similar experiments. It is suggested that the decrease in the incorporation of tritiated oleic acid after hyperbaric hyperoxia may reflect an early event in the pathogenesis of oxygen-induced cellular injury and that it may be a useful index for the assessment of the tolerance of tissues to hyperoxia. I.S.

A87-33942**MAGNESIUM HOMEOSTASIS DURING HIGH-INTENSITY ANAEROBIC EXERCISE IN MEN**

PATRICIA A. DEUSTER, ERAN DOLEV, SUSAN B. KYLE, RICHARD A. ANDERSON, and ERIC B. SCHOOMAKER (Uniformed Services University of the Health Sciences, Bethesda; USDA, Vitamin and Mineral Nutrition Laboratory, Beltsville, MD) Journal of Applied Physiology (ISSN 0161-7567), vol. 62, Feb. 1987, p. 545-550. Research supported by the Uniformed Services University of the Health Sciences and USDA. refs

A87-33943**BREATHING PATTERN IN HYPOXIC EXPOSURES OF VARYING DURATION**

PAUL R. BENDER, JOHN V. WEIL, JOHN T. REEVES, and LORNA G. MOORE (Colorado, University, Denver) Journal of Applied Physiology (ISSN 0161-7567), vol. 62, Feb. 1987, p. 640-645. refs (Contract NIH-HL-14985; NIH-HD-0091; DAMD17-81-C-1057)

The relative contributions of the breathing frequency and the tidal volume to the increase in ventilation observed in humans during acute or prolonged exposure to hypoxia were assessed. End-tidal O₂ tension, end-tidal CO₂ tension, and expired airflow were measured with a fuel-cell O₂ analyzer, an IR analyzer, and a hot-film flowmeter, respectively. Arterial O₂ saturation was monitored by ear oximetry. It was found that an increase in the tidal volume accounted for the increased ventilation during 7 to 30 min of isocapnic and poikilocapnic hypoxic exposures and during 7 h of poikilocapnic hypobaric hypoxia (4800 m in a hypobaric chamber); tidal volume was also a major contributor in sea-level residents during 3 days of isocapnic hypobaric hypoxia (4100-4600 m). On the other hand, in sea-level residents during 3 days of poikilocapnic hypobaric hypoxia, the rise in ventilation was mainly due to an increase in the breathing frequency. Thus, while tidal volume contributes more than the breathing frequency to the increase in ventilation during a brief hypoxia, in prolonged poikilocapnic hypoxia the increased frequency is mainly responsible for the rise in ventilation. I.S.

A87-33944

UNALTERED NOREPINEPHRINE-HEART RATE RELATIONSHIP IN EXERCISE WITH EXOGENOUS HEAT

L. B. ROWELL, G. L. BRENGELMANN, and P. R. FREUND (Washington, University, Seattle) *Journal of Applied Physiology* (ISSN 0161-7567), vol. 62, Feb. 1987, p. 646-650. refs (Contract NIH-HL-16910)

Plasma norepinephrine (NE) and epinephrine (E) concentrations were measured in six normal young men during mild to severe exercise, with and without superimposed heat stress. The primary objective was to observe whether the normally close relationship between heart rate and log NE concentration is upset when heart rate at a given work load is increased by heat stress. Exercise, beginning at 50 W, was graded in 50-W increments lasting 10 min each up to 200 W, which lasted 5-10 min. Each subject went through the protocol twice, once with skin temperature kept low by a water-perfused suit and then with skin temperature raised to 38 C. Exogenous heart stress raised log circulating NE concentration in proportion to the rise in heart rate at a given work load so that the usual relationship between these variables, previously observed during other stresses, was preserved. In contrast to some other stresses, heat stress had no added effect on E concentration, indicating that this stress during exercise raises sympathetic neural activity (as reflected in the rise in NE) without stimulating additional adrenal release of E. Author

A87-34404

THE ROLE OF VAVILOV-CERENKOV RADIATION IN VISUAL SENSATIONS INDUCED BY PROTONS [ROL' IZLUCHENIIA VAVILOVA-CHERENKOVA V ZRITEL'NYKH OSHCHUSHCHENIIAKH VYZVANNYKH PROTONAMI]

P. V. GRAMENITSKII and I. N. FETISOV (Moskovskoe Vysshie Tekhnicheskoe Uchilishche, Moscow, USSR) *Biofizika* (ISSN 0006-3029), vol. 32, Jan.-Feb. 1987, p. 125-127. In Russian. refs

The mechanism responsible for the detection of ionizing particles by the human eye and for the production of a 'flash' sensation was studied using 1-ms monoenergetic proton beams directed at the subject's eye and recording the location, the features and the moment of the appearance of the 'flash' sensations. In particular, the relative importance in this mechanism of the Vavilov-Cerenkov radiation induced in the vitreous humor, as opposed to the importance of alternative mechanisms (the scintillation of the eye tissues or the direct stimulation of the retina), was investigated by comparing the sensations caused by 460 and 1850 MeV beams and by irradiating the eye from different angles. Bright diffuse flashes were seen with the 1850-MeV beams but not with the 460-MeV beams even when high-intensity 460-MeV beams were used. This evidence and other results (e.g., localization of the flash in the vision field after lateral) indicate that the proton-induced Cerenkov radiation in the vitreous body plays a dominant role in the sensitization of the retina. I.S.

A87-34598

RESEARCHERS ARE STUDYING HOW OUR BODIES REACT TO LONG STAYS IN A WEIGHTLESS ENVIRONMENT

LORETTA KETT BIERER *Commercial Space* (ISSN 8756-4831), vol. 2, no. 4, Winter 1987, p. 46-49.

Medical consequences of long-duration spaceflight are examined, including diminished capacity of heart and blood vessels, a tendency for blood to pool in the upper body in space and in the legs on return to earth, and the loss of calcium and other minerals from the weight-carrying bones. Of the problem areas defined by NASA for investigation, calcium metabolism and bone loss are likely to be the most important because the magnitude of the calcium loss from the body appears to be the deciding factor for the duration of the flight. Muscle atrophy and bone loss left Soviet cosmonauts of the 211-day Salyut 6/Soyuz mission in very weak condition. Experiments in which growing rats were exposed to weightlessness for 19 days, showed that the animals required about 25 days for adaptation to earth's gravity and for bone growth to begin again. Additional animal studies are reported, along with research into how weightlessness affects the bone

remodelling process. NASA has targeted several areas for study: the time required for bone loss to plateau, the possibility of irreversible bone loss, the toxic effects of calcium and phosphorus released from bone on soft tissue (particularly the kidneys), and the potential for fracture. Efforts to prevent bone demineralization have concentrated on diet and exercise, as with a treadmill device. D.H.

N87-20730*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

RADIATION PROTECTION GUIDELINES FOR SPACE MISSIONS

R. J. M. FRY (Oak Ridge National Lab., Tenn.) and D. S. NACHTWEY 1986 17 p Presented at the Hanford Life Sciences Symposium on Radiation Protection: A Look to the Future, Celebrating Four Decades of Research at Hanford, Richland, Wash., 21 Oct. 1986

(Contract DE-AC05-84OR-21400)

(NASA-TM-89278; NAS 1.15:89278; DE87-002815;

CONF-861044-5) Avail: NTIS HC A02/MF A01 CSCL 06R

NASA's current radiation protection guidelines date from 1970, when the career limit was set at 400 rem. Today, using the same approach, but with the current risk estimates, a considerably lower career limit would obtain. Also, there is considerably more information about the radiation environments to be experienced in different missions than previously. Since 1970 women have joined the ranks. For these and other reasons it was necessary to reexamine the radiation protection guidelines. This task was undertaken by the National Council on Radiation Protection and Measurements Scientific Committee 75 (NCRP SC 75). Below the magnetosphere the radiation environment varies with altitude and orbit inclination. In outer space missions galactic cosmic rays, with the small but important heavy ion component, determine the radiation environment. The new recommendations for career dose limits, based on lifetime excess risk of cancer mortality, take into account age at first exposure and sex. The career limits range from 100 rem (4.0Sv) for a 24 year old female to 400 rem for a 55 year old male compared to the previous single limit of 400 rem (4.0 Sv). The career limit for the lens of the eye was reduced from 600 to 400 rem (6.0 to 4.0 Sv.) DOE

N87-20731# Joint Publications Research Service, Arlington, Va. **USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 20, NO. 3, MAY - JUNE 1986**

O. G. GAZENKO, ed. 15 Aug. 1986 154 p Transl. into ENGLISH of *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina* (Moscow, USSR), v. 20, no. 3, May Jun. 1986 96 p (JPRS-USB-86-005) Avail: NTIS HC A08/MF A01

USSR Report: *Space Biology and Aerospace Medicine*, vol. 20, No. 3, May to June 1986 contains articles on the following: the 25th Anniversary of Soviet Manned Spaceflight; flight safety; space motion sickness; spacecrew work capacity; spacecrew blood lipids; vestibular stability; respiration restraints; effects of long term spaceflight; effect of hypoxia on DNA synthesis; electrodermal conductivity; human brain bioelectricity; and spatial orientation.

N87-20732# Joint Publications Research Service, Arlington, Va. **SPACE BIOLOGY AND MEDICINE ON THE TWENTY-FIFTH ANNIVERSARY OF THE FIRST SPACEFLIGHT OF YURI ALEKSEYEVICH GAGARIN**

O. G. GAZENKO, N. N. GUROVSKIY, and A. A. GYURDZHIAN *In its USSR Report: Space Biology and Aerospace Medicine*, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 1-11 15 Aug. 1986 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina* (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 4-12 Avail: NTIS HC A08/MF A01

Soviet Space exploration has come a long way in the quarter century that has elapsed after the historical day of the flight of Yu. A. Gagarin on 12 April 1961. The first flight, which lasted only 108 min, was to determine human capacities under conditions prevailing in space. As of 1 January 1986, Soviet cosmonauts had made 109 manned flights involving 60 people. Some of the

participants had been in space 2 to 3 and even 5 times (V. A. Dzhanibekov). The Salyut orbital stations became a permanent space research laboratory. The crew consisting of L. D. Kizim, V. A. Solovyev and O. Yu. Atkov worked in space for 237 days. V. A. Dzhanibekov and V. P. Savinykh were able to find and dock with the inactive Salyut-7 station in space, repair it and completely restore its work capacity. In the 25 years that have passed since the first flight, space science has become a solid part of life, an inseparable element of the scientific, economic and sociocultural life of mankind. The file of organizations that are planning spaceflights is full of applications for investigations in the interests of the most diverse scientific disciplines and the national economy. Author

N87-20733# Joint Publications Research Service, Arlington, Va.
STAGES OF DEVELOPMENT OF THE PROBLEM OF FLIGHT SAFETY IN AVIATION MEDICINE

V. A. PONOMARENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 12-20 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 12-19 Avail: NTIS HC A08/MF A01

Aviation medicine is a direct participant in technological progress in aviation. The high level of development of aviation equipment at the present stage would be inconceivable without adequate solution of problems of its control by man. In past years, aviation medicine was enriched with new theoretical conceptions and vast practical experience in the area of assuring flight safety. New growth points emerged, both in aviation medicine proper and at its boundaries with allied disciplines in engineering psychology and ergonomics. Organization of protection of man on the basis of providing an optimum environment was recognized as the key direction of scientific research at the first stage of development of aviation medicine, since in essence it determined the assurance of human vital functions and work capacity. Practical implementation of the basic ideas of protection of an individual connected into a technological system was based not only on advances in applied physiology, but new investigative methods that permitted gaining deeper understanding of the biological bases of adaptation to a unique environment and disclosure of mechanisms and patterns that control processes of interaction between the environment and man. Author

N87-20734# Joint Publications Research Service, Arlington, Va.
INTERLABYRINTHINE ASYMMETRY, VESTIBULAR DYSFUNCTION AND SPACE MOTION SICKNESS

G. I. GORGILADZE, G. I. SAMARIN, and I. I. BRYANOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 21-38 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 19-31

Avail: NTIS HC A08/MF A01

Data suggest that a disorder in the labyrinthine paired function can be regarded as the factor responsible for the initiation and development of space motion sickness. This concept is based on the assumption that in the norm the vestibular function is to a certain extent asymmetric which is made up for by a compensatory center in the central nervous system. Exposure to an unusual space environment leads to a disorder of this compensation and development of a new vestibular asymmetry. This exposure involves: elimination of the difference in the weight of otolith membranes, disorder of the canal-otolith interaction, asymmetric blood-CSF changes, distinct interhemispheric asymmetry, and general stress. Vestibular asymmetry developing in the weightless state may become sufficient for the generalization of afferent impulsion to normal stimuli and development of a strong reaction. Adaptation to weightlessness occurs due to rearrangements of the compensatory center responsible for lower vestibular asymmetry. The compensatory mechanisms evolved in weightlessness continue to function during a certain time interval after recovery. They facilitate a re-initiation of vestibular asymmetry

and motion sickness that is mainly provoked by head movements, as in the weightless state. Author

N87-20735# Joint Publications Research Service, Arlington, Va.
EVALUATION OF PHYSICAL WORK CAPACITY OF COSMONAUTS ABOARD SALYUT-6 STATION

V. A. TISHLER, A. V. YEREMIN, V. I. STEPANTSOV, and I. I. FUNTOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 39-45 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 31-35

Avail: NTIS HC A08/MF A01

Electrocardiograms of Salyut-6 prime crewmembers recorded during their exercises on a bicycle ergometer and treadmill are presented. ECG were recorded by a portable tape recorder Cardiocassette and transmitted to the Earth via the radiocommunication channel. This procedure helped to better understand cardiovascular adaptation to different workloads, including submaximal, as well as reserve abilities of the body at various flight stages. This can be used advantageously to correct and control the training process as well as to predict the cardiovascular status at the final flight stage. Author

N87-20737# Joint Publications Research Service, Arlington, Va.
BLOOD LIPIDS AND INCIDENCE OF LIPEMIA IN FLIGHT PERSONNEL

S. A. BUGROV, R. K. KISELEV, R. V. BELEDA, V. I. PLAKHATNYUK, N. N. ARTAMONOV, A. P. IVANCHIKOV, and V. A. TSYGANOK *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 52-57 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 39-43

Avail: NTIS HC A08/MF A01

The content of cholesterol and triglycerides was measured in healthy pilots. Over 1500 subjects were examined and age-related norms of the parameter were established. They were compared with published data. Physiological variations of cholesterol and triglycerides were related to age, height and body weight. The authors developed a method for diagnosing hyperlipidemia based on the agreement or disagreement between experimentally measured and theoretically calculated values. The authors maintain that hyperlipidemia can be diagnosed if the difference between the real and expected values is over 10%. The authors calculated the incidence of hyperlipidemia in all subjects examined (over 2100) and found that it was high: even in pilots of the age group 20 to 29 years hyperlipidemia occurred in 30% of the subjects. Author

N87-20738# Joint Publications Research Service, Arlington, Va.
LINK BETWEEN ASYMMETRY OF OPTOKINETIC NYSTAGMUS, OPTOVESTIBULAR AND VESTIBULOVEGETATIVE STABILITY

V. K. GRIGOROVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 58-61 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 43-45

Avail: NTIS HC A08/MF A01

Comparative quantitative analysis of physiological asymmetry of the optokinetic nystagmus produced predominantly by central optokinetic stimulation (field of vision = 30 deg) or peripheral stimulation (field of vision = 110 deg) reveals an objective correlation between the asymmetry coefficient of the central optokinetic nystagmus with respect to the angular velocity of its slow phase and susceptibility to motion sickness caused by Coriolis and pseudo-Coriolis acceleration, the nystagmus velocity being up to 4 deg/sec. Author

N87-20739# Joint Publications Research Service, Arlington, Va. **PHYSIOLOGICAL MECHANISMS LIMITING EXTERNAL RESISTANCE TO RESPIRATION**

M. A. TIKHONOV and N. M. ASYAMOLOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 62-68 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 45-50
 Avail: NTIS HC A08/MF A01

A study was performed on 8 healthy male subjects to investigate the effect of nonelastic resistance 6-40 GPa (the air flow velocity being 90 l/min) on the duration of proprioceptive reflexes of respiratory muscles, volume and velocity parameters of forced exhalation. Resistance of 15 and 25 GPa combined with a workload of 100 to 150 W increased the duration of proprioceptive reflexes from 0.18 + or - 0.015 to 0.29 + or - 0.012 sec and to 0.38 + or - 0.06 sec, respectively, which indicates fatigue of respiratory muscles. Resistance of 25 GPa reduced significantly (by 55%) the maximum volume velocity of forced exhalation and increased its duration by 31%, the exhalation volume decreasing insignificantly (by 6%). The major factor limiting man's tolerance to external respiration resistance is functional deficiency of proprioceptive regulation of respiration and strength and velocity of respiratory muscles. Author

N87-20740# Joint Publications Research Service, Arlington, Va. **EFFECT OF HEMADSORPTION ON RHEOLOGICAL PARAMETERS OF BLOOD DURING SEVEN-DAY ANTIORTHOSTATIC HYPOKINESIA AND IN VITRO STUDIES**

I. B. GONCHAROV, A. P. IVANOV, A. F. DAVYDKIN, and ZH. M. KUDRYASHOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 69-74 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, May - Jun. 1986 p 50-53
 Avail: NTIS HC A08/MF A01

The effect of hemosorption of blood rheology was examined in 9 healthy men exposed to head-down tilt (-8 deg). Venous-venous hemosorption was performed on tilt day 7 using activated charcoal SKN-2M. It was found that by tilt day 7 rheological parameters increased significantly and returned to the norm after 2-hour hemoperfusion through activated charcoal. This shows that hemosorption produces a beneficial effect on blood rheology and microcirculation which is indicated by a direct examination of eye microvessels. Experimental in vitro studies using oxygenated and nonoxygenated donor's blood demonstrated that hemosorption combined with blood oxygenation can noticeably increase the effectiveness of perfusion on the whole. Author

N87-20742# Joint Publications Research Service, Arlington, Va. **EFFECT OF HYPOXIA ON DNA SYNTHESIS AND COLLAGEN CONTENT OF REGENERATING SKIN**

G. V. KHOMULLO, V. I. LOTOVA, A. N. CHERNYAYEV, and I. N. VINOGRADOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 80-85 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 57-61
 Avail: NTIS HC A08/MF A01

During chronic hypoxia DNA synthesis in various areas of the regenerating skin decreased. Inhibition of epithelial and connective-tissue elements was accompanied by suppression of collagenogenesis, which finally led to longer-term wound healing. Author

N87-20743# Joint Publications Research Service, Arlington, Va. **ELECTRODERMAL CONDUCTIVITY IN MAN AND MONKEYS**

A. T. NEBORSKIY and G. S. BELKANIYA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 86-95 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 61-68
 Avail: NTIS HC A08/MF A01

The topographic and functional correlation of acupuncture skin zones on the limbs of humans (99 healthy subjects) and monkeys (64 adult hamadryas baboons and rhesus monkeys) was compared by measuring the electric conductivity of the skin (ECS). The profile of the ECS was found to be an informative and sensitive integrated indicator of the functional state of the body and of the autonomic nervous system. The ECS showed seasonal variations and relief differences with respect to the two phases of the menstrual cycle in women. It also displayed distinct differences between men and women as well as species differences between men, hamadryas baboons and rhesus monkeys. The high differential informativeness of the ECS is indicated by the functional differences of the primate body under various constraint conditions. The anatomical and topographic correlation of acupuncture skin zones and similarity of ECS characteristics in man and monkeys suggest that the formation of functional characteristics of the ECS in various types of primates has a common phylogenetic basis. It is concluded that monkeys can be used as an adequate experimental model for further evaluation of the ECS as a method to measure and diagnose functional and pathological changes in the body. Author

N87-20744# Joint Publications Research Service, Arlington, Va. **INTERPRETATION OF RIGHT HEART KINETOCARDIOGRAM**

V. A. DEGTYAREV, A. YA. KORMER, V. A. ROGOV, V. YE. TOLPEKIN, L. P. TSYGANOV, V. N. RAGOZIN, YE. YU. SHCHERBAKOV, and Z. A. KIRILLOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 96-99 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 69-71
 Avail: NTIS HC A08/MF A01

On the basis of ultrasonic Doppler valvulocardiography of 20 healthy men and catheterization of the right heart of 15 patients with acute large-focal myocardial infarction, the development of elements of the right kinetocardiograms (KCG sub r) is explored. Comparison of kinetocardiograms of the right heart with ultrasonic and catheterization data has demonstrated that KCG sub r can be used to examine right heart contractions of cosmonauts and pilots in flight and on the ground as well as of patients to diagnose pathologies of the right compartments of the heart. Author

N87-20745# Joint Publications Research Service, Arlington, Va. **DYNAMICS OF BIOELECTRIC ACTIVITY OF HUMAN BRAIN IN A CONTINUOUS WAKING STATE**

V. P. TYCHINA and A. P. NECHAYEV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 135-140 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), vol. 20, no. 3, May Jun. 1986 p 88-91
 Avail: NTIS HC A08/MF A01

Electroencephalographic parameters can be used to detect early signs of fatigue, which is of practical importance. Experiments were carried out on three healthy men to identify a limited number of symptoms allowing a rapid evaluation of operator's work capacity. The subjects were kept in long-term isolation. The study revealed general trends and individual variations in brain bioelectrical activities that reflected their performance during continuous work with natural sleep deprivation for three days. Author

N87-20746# Joint Publications Research Service, Arlington, Va.
NEW BOOK DEALS WITH SPATIAL ORIENTATION
 A. A. GYURDZHIAN and YU. YU. SHIPKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 141-144 15 Aug. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 91-93 Avail: NTIS HC A08/MF A01

The collection is compiled on the basis of the proceedings of a conference on spatial orientation (SO) and space perception, which convened at the University of Minnesota on 14 to 16 July 1980. The book consists of the following 5 sections: (1) comparative physiological, comparative psychological and age-related aspects of SO; (2) SO in some groups of people (the mentally retarded and elderly); (3) ability to use maps and space perception mechanisms; (4) language and space perception; (5) space perception and processing of information about space. Author

N87-21552* National Aeronautics and Space Administration, Washington, D.C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 297)

May 1987 45 p
 (NASA-SP-7011(297); NAS 1.21:7011(297)) Avail: NTIS HC A03 CSCL 06E

This bibliography lists 89 reports, articles and other documents introduced into the NASA scientific and technical information system in April, 1987. Author

N87-21553# Research Inst. for Road Vehicles, TNO, Delft (Netherlands).

PRELIMINARY DEVELOPMENT, HEAD-NECK SIMULATOR. VOLUME 1: ANALYSIS VOLUNTEER TESTS Final Report

J. S. H. M. WISMANS Aug. 1986 111 p Prepared in cooperation with National Highway Traffic Safety Administration, East Liberty, Ohio Sponsored by National Highway Traffic Safety Administration, East Liberty, Ohio (PB87-133245; DOT-HS-807-034) Avail: NTIS HC A06/MF A01 CSCL 06P

The initial work of an ongoing research program of which the objective is to develop a head-neck simulator with omni-directional biofidelity is documented. In Volume 1 of a two volume set, a detailed analysis is presented of a large number of human volunteer tests conducted by the Naval Biodynamics Laboratory in New Orleans. The human subjects were exposed to frontal, lateral and oblique impacts with an impact severity up to 15 g and 17 m/s. The analysis results for each impact direction in a simple analog system that completely specifies the observed dynamical behavior are presented. Author

N87-21554*# Howard Univ., Washington, D. C. Dept. of Physiology and Biophysics.

NEUROHUMORAL AND MECHANICAL FACTORS IN THE MODULATION OF LEFT VENTRICULAR MASS Final Report, 23 Sep. 1983 - 31 Oct. 1986

ELEANOR I. FRANKLIN and EDWARD W. HAWTHORNE 12 May 1987 8 p
 (Contract NAG2-250)
 (NASA-CR-180524; NAS 1.26:180524) Avail: NTIS HC A02/MF A01 CSCL 06P

The goals for the research were to define, describe, and study those neuroendocrine and mechanical mechanisms that may play a role in the initiation and maintenance of an increase in, or cause regression of, the mass of the left ventricle. Dynamic changes in heart mass have been observed to occur in man and animals: (1) enlargement of the heart is frequently encountered in patients with hypertensive disease, and (2) decrease in heart mass has been reported for men exposed to prolonged space flight. The basic physiologic processes which may explain how these changes occur, and the effects of gain or loss of myocardial mass on cardiac performance were considered significant questions to be answered for the benefit of the National Aeronautics and Space Administration. Author

N87-21555# Indiana Univ., Indianapolis. Research and Sponsored Programs.

SLEEP DEPRIVATION AND EXERCISE TOLERANCE Annual Report, 1 Feb. 1985 - 31 Jan. 1986

BRUCE J. MARTIN 31 Jan. 1986 10 p
 (Contract DAMD17-81-C-1023; DA PROJ. 3E1-62777-A-879)
 (AD-A176171) Avail: NTIS HC A02/MF A01 CSCL 06S

Sleep loss appears to influence subsequent exercise in a manner dependent upon the nature of that exercise. To investigate this, the author examined the effect of 24 sleepless hours on the ability to produce and maintain maximal ventilation, a form of exercise involving a limited muscle mass. It was found that sleep loss reduced maximal ventilatory output and also resulted in persistent mood changes. In addition, sleep loss worsened performance of both short- and long-term maximal ventilation, indicating that its influence was not limited to prolonged, boring tasks. It was concluded that those forms of exercise utilizing the largest muscle mass are most resistant to the influence of sleep deprivation. Author (GRA)

N87-21556# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

THE EFFECT OF ALTERED LEVELS OF CARBON DIOXIDE ON THE INCIDENCE OF ALTITUDE DECOMPRESSION SICKNESS Ph.D. Thesis

RONALD C. HILL 1987 140 p
 (AD-A176558; AFIT/CI/NR-87-25D) Avail: NTIS HC A07/MF A01 CSCL 06E

Goats were exposed to 30, 32, and 34 thousand ft simulated altitude while breathing carbon dioxide tensions of 15, 30, or 46 tor in oxygen during 15-min prebreathing and 30-min peak altitude exposures. Risk of decompression was determined by detecting venous gas emboli (VGE) in the pulmonary artery with an implanted Doppler cuff. VGE scores were calculated using the ratio of cardiac cycles containing VGE to total cardiac cycles. The VGE scoring methodology proved sensitive to other treatment effects (air versus oxygen prebreathing); however, no significant change in VGE scores occurred as a result of varying the carbon dioxide level in the inspired air. Furthermore, there was no significant change in cardiac index during the various carbon dioxide exposures and the VGE scores were not correlated with cardiac index. Ground level studies revealed that end-tidal carbon dioxide tensions were significantly elevated at all three levels of inspired carbon dioxide, but no change in cardiac index was observed. In a trial involving one animal, conditions producing high VGE scores did not produce arterial emboli. Short duration prebreathing of carbon dioxide in oxygen does not appear to affect DCS incidence. GRA

N87-21557# Research Inst. for Road Vehicles, TNO, Delft (Netherlands).

PRELIMINARY DEVELOPMENT HEAD-NECK SIMULATOR. VOLUME 2: MATHEMATICAL SIMULATIONS Final Report, Sep. 1982 - Oct. 1984

T. G. M. HOEN and J. S. H. M. WISMANS Aug. 1986 216 p Sponsored by National Highway Traffic Safety Administration (PB87-142196; DOT-HS-807-035) Avail: NTIS HC A10/MF A01 CSCL 06K

The report documents the initial work of an ongoing research program of which the objective is to develop a head-neck simulator with omni-directional biofidelity. Volume 2 documents the validation of the proposed analog systems and compares the behavior of the Part 572 and Hybrid 3 head-neck systems with the human volunteer behavior. It follows that both neck designs are stiffer than any of the volunteers in the impact ranges tested. Preliminary results are presented of computer aided design activities in order to improve existing designs in view of these new findings. GRA

N87-21558# Joint Publications Research Service, Arlington, Va. **USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 20, NO. 6, NOVEMBER - DECEMBER 1986**

O. G. GAZENKO, ed. 19 Mar. 1987 152 p Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina* (Moscow, USSR), Vol. 20, No. 6, Nov. - Dec. 1986 96 p
(JPRS-USB-87-001) Avail: NTIS HC A01/MF A01

Translations from a Russian language bimonthly journal are presented. The articles are mainly on the effects of long duration space flight on physiology of human beings. The contents range from the medical screening of cosmonauts to the effect of a stationary magnetic field on *escherichia coli*. Other effects examined are long term immobilization, hypokinesia and group dynamics under extreme conditions.

N87-21559# Joint Publications Research Service, Arlington, Va. **INCEPTION OF SOVIET SYSTEM OF MEDICAL SCREENING OF COSMONAUTS (HOSPITAL STAGE)**

M. D. VYADRO and I. I. BRYANOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 1-7 19 Mar. 1987 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina* (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 3-7
Avail: NTIS HC A01/MF A01

The system of medical selection of Soviet cosmonauts stemmed from that used in aviation medicine, particularly medical expertise of flying personnel. Selection in the hospital included two-stage detailed clinical and physiological examinations using various provocative tests. The system of medical selection and clarification of medical requirements was improved and refined through regular observations over candidates and cosmonauts and careful analysis of their grounding due to medical problems. The American and Soviet systems of selection used at an early stage of space programs are compared and similarities and differences between them are indicated. Author

N87-21560# Joint Publications Research Service, Arlington, Va. **EFFECT OF SPACEFLIGHT FACTORS ON HEMOPOIESIS**

M. P. KALANDAROVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 8-23 19 Mar. 1987 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina* (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 7-17
Avail: NTIS HC A01/MF A01

Published data concerning space flight effects upon hemopoiesis are discussed. Possible pathogenetic mechanisms of hemopoietic changes in response to space flight effects are described. Author

N87-21561# Joint Publications Research Service, Arlington, Va. **EVALUATION OF FUNCTIONAL STATE OF PILOTS ON THE BASIS OF INTERHEMISPHERIC ASYMMETRY**

V. A. BODROV and A. G. FEDORUK *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 24-28 19 Mar. 1987 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina* (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 18-21
Avail: NTIS HC A01/MF A01

The stability of the functional asymmetry of brain hemispheres (with respect to the right ear coefficient-REC) of pilots was investigated during their exposure to extreme flight factors. It was found that the functional asymmetry of brain hemispheres was sufficiently stable in the subjects whose initial REC was not less than 10%. After exposure the decline of the REC in some subjects was accompanied by deterioration of their health status and quality of their operational work. Author

N87-21562# Joint Publications Research Service, Arlington, Va. **INDIVIDUAL DISTINCTIONS OF FLUID-ELECTROLYTE METABOLISM DURING HYPOKINESIA WITH HEAD-DOWN TILT FOR 120 DAYS AND EFFICACY OF PREVENTIVE AGENTS**

T. M. SMIRNOVA, G. I. KOZYREVSAYA, V. I. LOBACHIK, V. V. ZHIDKOV, and S. V. ABROSIMOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 29-33 19 Mar. 1987 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina* (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 21-24
Avail: NTIS HC A01/MF A01

Sodium balance and circulating plasma, intracellular, extracellular and interstitial fluid volumes were measured in the test subjects exposed for 120 days to head-down tilt at -5 deg. The large scatter of the above parameters was associated with individual variations and with the use of different countermeasures against demineralization (exercise and drugs-xydiphone and glucamak). The effect of the counter-measures was different in both qualitative and quantitative terms. It appears that the target of their action was different. The best prophylactic effect was seen when exercise and drugs were used in combination. These findings suggest that individual variations of fluid-electrolyte metabolism during prolonged hypokinesia are related to the different capacity of tissues for water and electrolytes. Author

N87-21563# Joint Publications Research Service, Arlington, Va. **BIOELECTRICAL ACTIVITY OF THE HEART AND BLOOD ELECTROLYTES IN ESSENTIALLY HEALTHY SUBJECTS SUBMITTED TO ANTIORTHOSTATIC HYPOKINESIA FOR 120 DAYS**

N. P. ARTAMONOVA, T. S. ZAKHAROVA, B. V. MORUKOV, G. S. ARZAMAZOV, and V. YU. SEMENOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 34-38 19 Mar. 1987 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina* (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 24-27
Avail: NTIS HC A01/MF A01

Electrocardiographic parameters and serum concentrations of potassium, sodium, calcium (total and ionized) and magnesium in 6 essentially healthy men, aged 30 to 45 years, were measured before, during and after 120-day head-down tilt at -4.5 deg. A close correlation was demonstrated between T-wave depression and serum concentrations of potassium (direct correlation) and calcium and magnesium (inverse correlation). No consistent changes in the sodium content during the 120-day test were seen. In spite of electrolyte changes in blood induced by head-down tilt, ECG variations showed minor hypokaliemia that was not followed by any clinical symptoms. These data can be used to evaluate the status of healthy people exposed to prolonged hypokinesia and to develop adequate prophylactic measures. Author

N87-21564# Joint Publications Research Service, Arlington, Va. **EFFECT OF IMMERSION HYPOKINESIA ON SOME PARAMETERS OF HUMAN MUSCLE POTENTIALS**

L. G. KHRISTOVA, A. A. GIDIKOV, I. F. ASLANOVA, A. V. KIRENSKAYA, V. G. KOZLOVA, and I. B. KOZLOVSKAYA *In its* USSR Report: Space Biology and Aerospace Medicine Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 39-43 19 Mar. 1987 Transl. into ENGLISH from *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina* (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 27-31
Avail: NTIS HC A01/MF A01

During 3-day immersion hypokinesia stimulation, muscle potentials and averaged potentials of total EMG of m. biceps brachii were investigated in six test subjects. Stimulation potentials were obtained by exciting n. cutaneus with a train of square impulses. Potentials were recorded using a combined multi-electrode. Averaged potentials of total EMG were recorded by means of the same electrode. The propagation rate of the potentials, duration of their negative and end-positive phases as well as the length of their negative phase in space were measured. In addition,

vector-electromyographic images of the potentials were recorded. After immersion hypokinesia the propagation rate decreased significantly, the duration of the end-positive phase increased and the length of the depolarized zone of potentials in space shortened. The decrease of the rate of propagation of stimulation potentials was 28% and that of averaged potentials of total EMG was 31% per group. These changes developed rapidly enough, indicating shifts in the properties of potentials of action of myofibers during immersion. Factors responsible for these changes are discussed.

Author

N87-21565# Joint Publications Research Service, Arlington, Va.
CHANGE IN BILE ACID AND LIPID CONTENT OF HUMAN BILE DURING EXPOSURE TO ANTIORTHOSTATIC HYPOKINESIA AND ITS CORRECTION

I. L. MEDKOVA, O. V. ZHIZNEVSKAYA, K. V. SMIRNOV, V. I. LEBEDEV, and YE. M. ARTAMASOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, no. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 44-51 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 31-37

Avail: NTIS HC A01/MF A01

The spectrum of bile acids and bile lipids in men exposed to 120-day head-down tilt was investigated. The test subjects were subdivided into four groups: group 1-bed rest per se, group 2-bed rest + exercise, group 3-bed rest + drugs normalizing calcium metabolisms, and group 4-bed rest + exercise + drugs. It was anticipated that biliary concretions would primarily be formed in group 1 and 2 subjects. They showed a low level of bile acids and a high content of total Ca and cholesterol in the bile, which was more pronounced in the C portion. Group 2 subjects displayed a modified synthetic function of the liver: prevalence of tauroconjugates in the bile. Group 3 and 4 subjects showed a faster synthesis of bile acids in the liver and a lower content of total calcium and cholesterol in the bile, the latter being more distinct in group 4 subjects. Positive dynamics of these parameters is a factor responsible for a reduced lithogeny of the bile. However, the test subjects of these groups exhibited hazardous changes that may be responsible for concrement formation.

Author

N87-21566# Joint Publications Research Service, Arlington, Va.
QUANTITATIVE STUDY OF OSTEOBLASTS AND OSTEOCLASTS OF RAT BONES WITH SIMULATION OF WEIGHTLESSNESS

G. N. DURNOVA, Z. F. SAKHAROVA, A. S. KAPLANSKIY, V. M. IVANOV, and M. S. KHAYDAKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 52-57 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 37-41

Avail: NTIS HC A01/MF A01

Tibia and vertebrae of rats exposed to hypokinesia or head-down suspension were investigated by quantitative histomorphometry. It was found that 35- and 60-day hypokinesia as well as 35-day suspension caused osteoporosis in the tibial and vertebral spongiosa. The development of osteoporosis was accompanied by a significant reduction in the number of osteoblasts in the primary spongiosa of tibia and vertebrae whereas no noticeable changes in osteoclasts were observed either in hypokinetic or suspended rats. The only exception was lumbar vertebrae in which the amount of osteoclasts decreased as a result of 60-day hypokinesia. It is assumed that the reduction in the number and activity of osteoblasts plays the major part in the development of osteoporosis during hypokinesia and suspension.

Author

N87-21567# Joint Publications Research Service, Arlington, Va.
HYDROLYSIS, TRANSPORT AND UTILIZATION OF CARBOHYDRATES IN RATS WITH RESTRICTED MOTOR ACTIVITY

L. G. GOLAND-RUVINOVA, R. A. PECHENKINA, N. P. GONCHAROVA, and K. V. SMIRNOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 58-65 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 41-47

Avail: NTIS HC A01/MF A01

Carbohydrate hydrolysis, transport and utilization were investigated in rats exposed to diminished motor activity for 90 days. Glycemic curves were examined using provocative tests with equivalent quantities of poly-, oligo- and monosaccharides. Simultaneously, carbohydrases were measured in the homogenates of the pancreas, duodenal mucosa and small intestine as well as radioimmune insulin and glucagon were determined in blood. In the course of hypokinesia carbohydrate hydrolysis, transport and utilization varied in a different manner. At the beginning of exposure the activity of carbohydrases responsible for carbohydrate hydrolysis in the cavity and membranes increased which was accompanied by hyperglycemia and rapid utilization of carbohydrates. This is associated with nonspecific reactions to hypokinesia and higher requirements of the body for the energy substrate. By hypokinesia day 30 carbohydrate hydrolysis and transport were inhibited, hypoglycemia developed but glucose utilization remained unchanged.

Author

N87-21568# Joint Publications Research Service, Arlington, Va.
POSSIBILITY OF PHARMACOLOGICAL CORRECTION OF REGIONAL OSTEOPOROSIS IN NONBEARING EXTREMITY

I. V. ROGACHEVA, A. N. POLYAKOV, A. I. VOLOZHIN, and G. P. STUPAKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 66-71 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 47-51

Avail: NTIS HC A01/MF A01

In 20- and 40-day rat studies the prophylactic effect of retabolil and calcitriin (calcitonin) against hypodynamics-induced osteoporosis was investigated. Hypodynamics was produced by surgical amputation of the lower third of the leg and hence by loss of the support function of the limb. Retabolil was injected intramuscularly at a dose of 0.2 ml once a day for 10 days and calcitriin was injected subcutaneously at a dose of 2 units MRC in 0.5 ml distilled water once a day. The results indicate that osteoporosis in the supportless bone of the experimental animals and that seen during space flight developed in a similar way. In the experiment retabolil and calcitriin inhibited the progressive development of osteoporosis but the strongest effect was obtained upon a combined application of the two drugs.

Author

N87-21569# Joint Publications Research Service, Arlington, Va.
MORPHOLOGICAL AND BIOCHEMICAL ANALYSIS OF SOME RAT ORGANS AND TISSUES FOLLOWING EXPOSURE TO 1.1 AND 2.0 G GRAVITY

I. B. KRASNOV, I. I. BABICHENKO, B. V. AFONIN, and A. S. PANKOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 72-81 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 51-58

Avail: NTIS HC A01/MF A01

During 30 days rats were centrifuged at 1.1 and 2.0 G. On centrifugation days 30 the rats showed body mass losses, decrease of plasma ACTH, activation of the renin-angiotensin-aldosterone system (RAAS) and ultrastructural changes in the mossy fiber terminals in the nodulus cortex which were indicative of the state of excitation or excess excitation in the system of the utriculus receptor cell and vestibular ganglion neuron (RCN). On the 2d day after centrifugation the ultrastructural changes in the terminals

pointed to a lower activity of the RCN system which was below the physiological norm. As compared to centrifugation day 30, the RAAS became more active on the 2d day of recovery. On the 7th day of recovery the RCN ultrastructure, RAAS and ACTH concentrations returned to the normal. The general trends of the RAAS and RCN changes seen on the 2d day of recovery and identified by other authors at an acute stage of adaptation to microgravity suggest that the data obtained on the 2d day of recovery may be used to analyze certain effects which develop during an acute stage of adaptation to microgravity in mammalian organs and systems responsible for the perception of modified gravity and their adaptation to a new level of gravity. Author

N87-21570# Joint Publications Research Service, Arlington, Va.
EFFECT OF ALTERED CIRCULATION ON HUMAN NYSTAGMIC REACTIONS

V. V. ZARITSKIY and YU. V. KRYLOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 82-86 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 58-62

Avail: NTIS HC A01/MF A01

Optokinetic and vestibulo-optokinetic nystagmus in response to optokinetic and combined vestibulo-optokinetic stimulation applied during head-down tilt was investigated. Tilt-induced circulation changes produced a modifying effect on nystagmic reactions which included a decrease of optokinetic and vestibulo-optokinetic nystagmus and its subsequent recovery after return to the horizontal position. The absolute parameters of vestibulo-optokinetic nystagmus changed depending on the direction of head movements in the sagittal plane relative to the long axis of the body. Some aspects of the relationships between sensory and nystagmic components of vestibular reactions during conflict stimulation of the vestibular and visual sensory systems are discussed. Author

N87-21571# Joint Publications Research Service, Arlington, Va.
THRESHOLDS OF LONG-LATENCY-PERIOD POTENTIALS AND SENSATION OF MOTION EVOKED IN MAN BY LINEAR ACCELERATIONS

K. F. TRINUS *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 87-93 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 62-66

Avail: NTIS HC A01/MF A01

Forty-seven healthy test subjects were exposed several times each to linear acceleration of varying value. Depending on the acceleration value, they reported subjectively three types of sensations at the threshold level: nondiscriminated in terms of direction (P1), inverted (P2), and discriminated (P3). The acceleration value at which P2 was recorded caused most typical responses in different test subjects whereas that at which P3 was recorded induced greatest individual variations. Evoked potentials in response to linear acceleration were recorded in such a manner which excluded potential instrumental artefacts or possible contribution of eye movements, excitation of the hearing organ and muscle tone changes. The data obtained indicate that acceleration-induced evoked potentials are predominantly of vestibular origin and consist of three peaks, latencies of which are equal to 31.3 + or - 7.2, 69.1 + or - 9.1 and 157.6 + or - 10.5 msec at the threshold where they emerge. Author

N87-21572# Joint Publications Research Service, Arlington, Va.
MATHEMATICAL MODEL OF THE OTOLITH

A. V. KONDRACHUK, I. YE. SHCHECHKIN, and S. P. SIRENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 94-99 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 66-70

Avail: NTIS HC A01/MF A01

A mathematical model of the otolith of mammals represented as a system with parameters of distribution is described. Two versions of the model are analyzed and the lowest frequencies of natural oscillations of the system are evaluated. Author

N87-21573# Joint Publications Research Service, Arlington, Va.
REACTIVITY OF ADRENOSYMPATHETIC SYSTEM AND TOLERANCE TO EXERCISE LOAD DURING REPEATED EXPOSURE TO STATIONARY MAGNETIC FIELD

L. D. KLIMOVSKAYA and L. V. KOKOREVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 100-104 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 70-73

Avail: NTIS HC A01/MF A01

For 30 days, rats were exposed daily, 3 h a day, to a constant magnetic field of 1.6 T. The time within which the rats were swimming with a load until they were fatigued was measured and the concentration of catecholamines in blood and adrenals was determined. Two stages of the response to the magnetic field were identified. During the first stage (1-15 days) physical work capacity increased and the reactivity and reserve ability of the sympatho-adrenal system (SAS) grew. During the second stage (30th day and early recovery period) work capacity returned to normal and the SAS reactivity decreased, although the catecholamines stored in the adrenals remained unchanged. These findings indicate that the SAS is involved in mechanisms underlying changes in work capacity and adaptation processes during exposure to a constant magnetic field. Author

N87-21574# Joint Publications Research Service, Arlington, Va.
DIRECT AND INDIRECT EFFECTS OF STATIONARY MAGNETIC FIELD ON BIOLOGICAL SYSTEMS

T. P. PANTEV and M. I. MINKOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 105-110 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 73-76

Avail: NTIS HC A01/MF A01

The effect of a constant magnetic field (CMF) of $H = 2.3 \times 100,000$ A/m (2900 Oe) on the viability and radiosensitivity of *E. coli* B and the effect of magnetically activated water (MAW) on the radioresistance of rats were examined. The exposure did not influence the growth kinetics of *E. coli* B. Cell cultivation in the magnetically pretreated nutrient medium enhanced the bacterial growth. Preliminary exposure of bacterial cells to a CMF for 24 and 48 h increased and that for 72 h decreased their radioresistance. Twice a day the experimental weanlings were given MAW and the controls-tap water. The postirradiation longevity of the MAW rats proved extended as compared to that of the controls. The MAW rats showed a higher osmotic stability of erythrocytes, a higher concentration of nucleic acids, and a larger count of leukocytes. Author

N87-21577# Joint Publications Research Service, Arlington, Va.
**SOME PATHOLOGICAL SIGNS IN PELVIS MINOR ORGANS
 AFTER EXPOSURE TO LONG-TERM HIGH-LEVEL +GZ
 ACCELERATIONS**

A. S. BARER, A. A. OKHOBOTOV, YE. I. SOROKINA, and V. M. TARDOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 121-122 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 81-82

Avail: NTIS HC A01/MF A01

Circulatory conditions in the region of the human pelvis minor can be described as follows when performing maneuvers on modern aircraft involving long term accelerations of high levels. In the presence of an increasing hydrostatic component of blood pressure reaching about 27 to 32 kPa with 9 G accelerations, the antigravity gear effects compensatory mechanical compression of the anterior abdominal wall and lower extremities, forcing up to 700 cc blood from leg vessels to areas above them, which should ultimately lead to marked increase in blood volume. The first specific investigation revealed that adverse symptoms related to increased delivery of blood to organs of the pelvis minor can develop in the vascular system and, consequently, in organs situated in the region of the pelvis minor. In view of the clinical significance of the demonstrated phenomena, it is desirable to continue investigation of this matter from the standpoint of both diagnosis and development of a set of preventive measures.

Author

N87-21579# Joint Publications Research Service, Arlington, Va.
**MECHANISM OF ACTION OF LOCAL NEGATIVE PRESSURE
 APPLIED TO HUMAN BODY ON DYNAMICS OF CENTRAL
 CIRCULATION**

V. V. RUMYANTSEV and A. I. DYACHENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 126-129 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. - Dec. 1986 p 84-86

Avail: NTIS HC A01/MF A01

Researchers are very interested in the effects of local negative (sub-atmospheric) pressure on the human body because of its extensive use in both space medicine and clinical practice. Use of lower body negative pressure (LBNP) is well-known as a mean of preventing the adverse effect of weightlessness on man and as a functional test to evaluate resistance of the circulatory system to gravity factors after spaceflights. Other methods of local decompression have been studied less. The main factors that determine the response of central circulation to local negative pressure (LNP) on healthy man are demonstrated.

Author

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BEHAVIORAL SCIENCES

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

A87-31696
**SLOW OSCILLATIONS OF PSYCHOPHYSIOLOGICAL
 PARAMETERS IN HUMAN OPERATORS DURING MONOTONY**
 PAVEL V. SIMONOV and MIKHAIL V. FROLOV (AN SSSR, Institut Vyshei Nervnoi Deiatel'nosti i Neurofiziologii, Moscow, USSR) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, Feb. 1987, p. 132-135.

Objective estimation of the human operator's functional state is an urgent problem in applied psychophysiology. It helps to forecast the reliability and efficiency of the operator's activity. Slow (minute) changes in the functional state of 22 subjects were recorded and analyzed in experiments simulating the long-term

operator's activity. Spatial synchronization of the electroencephalogram (EEG) and the heart-rate (HR) served as parameters. It was shown that the time of detection and identification of visual signals (geometrical figures) amid visual 'noise' in a long-term observation naturally depends on the changes in a subject's state. These changes were estimated by slow (2-3 min) components of the changes in spatial synchronization of EEG and HR throughout 3 h of the experiment. These objective parameters of the human operator's state may be used to predict efficiency. The connection between minute oscillations of electrophysiological parameters and time of reaction is absent during the first 30 min of the experiment, then appears and increases throughout further stages, becoming clearly marked in its second half.

Author

A87-32631
**SIMULATOR SICKNESS - A REVIEW OF ITS COSTS,
 COUNTERMEASURES, AND PREDICTION**

LAWRENCE H. FRANK (Virginia Polytechnic Institute and State University, Blacksburg, VA) and JOHN G. CASALI SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Oct. 13-16, 1986. 13 p. refs

(SAE PAPER 861782)

The potential costs of vehicle simulators that induce operator discomfort and disorientation and feasible procedural countermeasures for reducing the effects of simulator sickness are discussed. A review of the ability to predict a person's susceptibility to simulator sickness based upon tests of perceptual style (field dependence-independence) reveals that there is little convincing evidence to support the contention that field-independent subjects are more susceptible than field dependent. A reevaluation of several studies reporting to show such a relationship indicated considerable contradictory evidence.

Author

A87-33007
**DEVELOPMENT OF THE CRITERION TASK SET
 PERFORMANCE DATA BASE**

ROBERT E. SCHLEGEL, KIRBY GILLILAND, and BETINA SCHLEGEL (Oklahoma, University, Norman) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 58-62. refs

(Contract F33615-82-D-0627)

The initial phase of a large-scale experimental study was conducted involving the training and testing of fifty human subjects on the Criterion Task Set (Version 1.0). Testing was performed under baseline conditions and the stressors of noise and sleep loss. The resulting data base includes CTS performance data and subjective ratings obtained using the Subjective Workload Assessment Technique (SWAT) for each task, along with information on subject individual differences. This paper presents the methodology used for the data collection and analysis efforts and provides a summary of the performance and subjective assessment information. In general, no performance differences were found under the noise stress condition. Following sleep loss, response times for the central processing tasks deteriorated as did performance on the Unstable Tracking and Interval Production tasks.

Author

A87-33008
**INDIVIDUAL DIFFERENCES IN CRITERION TASK SET
 PERFORMANCE**

KIRBY GILLILAND, ROBERT SCHLEGEL, and SHARON DANNELS (Oklahoma, University, Norman) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 64-68. refs

(Contract F33615-82-D-0627)

As part of a larger standardization study of the U.S. Air Force Criterion Task Set (CTS), a number of individual difference variables were assessed to evaluate their relationship to CTS performance. The selection of these individual difference variables was based

on their known or hypothesized relationship to performance or perceptual abilities. This paper reports some of the preliminary findings with regard to these individual difference variables. Of the variables measured, Stimulus Screening, Thrill and Adventure Seeking, Neuroticism, Type-A Behavior, and General Intelligence showed the most promising relationships to CTS performance variables. Author

A87-33009
LINGUISTIC PROCESSING - PHYSIOLOGICAL, PERFORMANCE AND SUBJECTIVE CORRELATES

GLENN WILSON (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), KATHY MCCLOSKEY, and IRIS DAVIS (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 72-75. refs

The CTS linguistic processing task, a standardized loading task that places variable demands upon mental resources associated with the manipulation and comparison of linguistic information, is studied. The mental processes occurring with the performance of this task are validated and explained. The cortical evoked potentials elicited by the task indicate that the resource allocation of the mental processes and the time needed for the comparison and decision processes both increase with an increase in the level of difficulty. The peripheral physiological indices were insensitive to the difficulty levels. K.K.

A87-33010
UTILITY AND UTILIZATION OF AIRCREW TRAINING DEVICE ADVANCED INSTRUCTIONAL FEATURES

DONALD J. POLZELLA and DAVID C. HUBBARD (Dayton, University, OH) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 139-143.

The utility and utilization of the Advanced Instructional Features (AIFs) capabilities of USAF Aircrew Training Devices (ATDs) was explored by means of a survey of 534 Simulator Instructors from Air Training Command, Military Airlift Command, Strategic Air Command, and Tactical Air Command training sites. The primary purpose of the survey was to provide a database that could be used in defining the requirements for ATD procurements and in developing future ATD training programs. In general, the features that were rated highest in utility and utilization were those used for training management, variation of task difficulty/fidelity, and monitoring student performance. The level of AIF use was affected somewhat by hardware and/or software deficiencies; however, the presumed training value of an AIF was the most important determiner of its use. Author

A87-33015
RESOLUTION LEVELS VS RECOGNIZABLE FEATURES IN PROGRESSIVE TRANSMISSION IMAGES

JEFFERSON KOONCE (Massachusetts, University, Amherst), SHEL WALKER, and REBECCA MCDEVITT (Peregrine Computer Systems, Inc., Moultonboro, NH) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 306-308.

The paper presents an aircraft map system which organizes terrain data in a hierarchical structure so that memory requirements are minimized and pilots are presented with course images containing 'fat pixels' to reduce presentation time. An experiment is carried out to determine the hierarchical level at which a subject viewing the image can discern features which can aid navigation and flight. It is concluded that a high resolution image (512 by 512 or larger) is not necessary to convey pertinent information to a pilot. K.K.

A87-33021
HUMAN PERFORMANCE IN SPACE

DAVID M. REGAL (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 365-369.

Space provides a unique living and working environment. Humans in space are, in many respects, different creatures than their earth-bound counterparts (e.g., they float). The paper describes some of the ways in which human capabilities in space are different from those on earth. Psychological and social factors that can affect crew performance on long-duration space missions are discussed. Author

A87-33024
ASYNCHRONOUS VISUAL DELAYS AND THE DEVELOPMENT OF SIMULATOR SICKNESS

KEVIN C. ULIANO, ROBERT S. KENNEDY (Essex Corp., Orlando, FL), and ELIZABETH Y. LAMBERT (U.S. Navy, Naval Training Systems Center, Orlando, FL) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 422-426. refs (Contract N61339-85-C-0044)

Three asynchronous visual throughput delays were investigated for possible relationship to the development of simulator sickness in a fixed-base flight trainer. The SH-60B Vertical Takeoff and Land (VTOL) Simulator, part of the Navy's Visual Technology Research Simulator (VTRS) program, was used to investigate this issue. Twenty-four experienced pilots flew two, 20-minute tasks under each delay condition for a total of three nonconsecutive hours over the course of three days. Objective and self-report indices were collected and, while results showed no differences between delay conditions, there was a high initial incidence of illness among all pilots followed by a rapid adaptation. Relationships between indices are presented along with suggested areas for future research. Author

A87-33025
UNITED STATES AIR FORCE EXPERIENCE WITH SIMULATOR SICKNESS, RESEARCH AND TRAINING

ROBERT S. KELLOGG (Dayton, University, OH) and KENT K. GILLINGHAM (USAF, School of Aerospace Medicine, Brooks AFB, TX) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 427-429.

With the advent of complex, wide-screen visual flight simulators in the United States Air Force, there has also developed a significant problem with simulator-induced sickness. This paper reviews the history of this problem in the Air Force as it is understood at present and discusses its possible impact on training. It also reviews preliminary studies conducted on one of the most advanced visual systems developed thus far, the General Electric Visual System Component Development Program (VSCDP) as well as future Air Force plans for research on this system. Author

A87-33026
DISPLAY PROXIMITY IN MULTICUE INFORMATION INTEGRATION

BARBARA J. BARNETT and CHRISTOPHER D. WICKENS (Illinois, University, Urbana) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 435-439. refs

(Contract F30602-81-C-0206; MDA903-83-K-0255)

This study investigates the ability of an individual to integrate probabilistic information from a number of sources, focusing particularly on the extent to which this integration is influenced by display proximity in space, and object configuration. In support of the principle of compatibility of proximity, the data indicated that performance was clearly ordered according to the degree of display integrality, those in the more integral rectangle conditions were significantly better at integration than those in the bargraph

condition. Proximity of space had little effect upon performance, while proximity in time significantly improved performance in all three format conditions. Speed stress significantly hindered performance in all three format conditions. Finally, memory for isolated, unintegrated attributes of a cue was not harmed by the increasing integrality of the rectangle formats. Author

A87-33027
THE PERCEIVED RELATIONS BETWEEN COLOR, DIRECTION, AND SPEED OF MOTION

KELLY HARWOOD, CHRISTOPHER WICKENS, and ARTHUR KRAMER (Illinois, University, Urbana) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1986, p. 440-444. refs

This study investigated the perceived relations between color, direction of motion, and speed of motion. According to formal definitions of integrality and separability (Garner and Fefoldy, 1970), direction and speed of motion are integral while color is separable. Ten individuals classified two levels of each dimension in a speeded classification task. Performance with redundant and orthogonal manipulations of all possible pair and triplet combinations was investigated. Results for classifying speed and direction showed that they are asymmetrically integral. That is, variations in direction affected the classification of speed far more than the converse. In addition, redundant color facilitated classification of speed and direction but orthogonal color did not interfere. Classification of color, however, is far from resistant to variations in direction. Both redundant and orthogonal manipulations of direction interfered with color classification. A second experiment demonstrated that the locus of interference for direction on color is at the perceptual level rather than the response stage of processing. It is more difficult to classify the color of a moving stimulus than a stationary one. Taken together, the findings of this study have important implications for the use of color in dynamic flight displays. Author

A87-33028
DISPLAY/CONTROL INTEGRALITY AND TIME-SHARING PERFORMANCE

PAMELA S. TSANG (Illinois, University, Urbana) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1986, p. 445-449. refs

Time-sharing performance was investigated as a function of the display and response integrality of the time-shared tasks. A manual step-tracking task was time-shared with a Stroop task that could be responded to manually or by speech. A secondary task technique was employed to manipulate the resource allocation between the two tasks. Display integrality was manipulated by: (1) contingent processing of the different dimensions of the Stroop task, and (2) the 'objectness' of the dual task display. Response integrality was manipulated by the number of responses required of the dual task and the response modality of the Stroop task. A prevalent resource competition effect between the manual responses of the two tasks were observed, supporting the concept of multiple resources. Results were also in concordance with Kahneman's object file model of attention; demonstrating that irrelevant elements within an object were difficult to ignore. The findings demonstrated the interactive effects of resource competition and task integrality on time-sharing performance. Author

A87-33029
DISPLAY FORMAT AND THE PERCEPTION OF NUMERICAL DATA

BARRY P. GOETTL, ARTHUR F. KRAMER, and CHRISTOPHER D. WICKENS (Illinois, University, Urbana) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1986, p. 450-454. refs
 (Contract F30602-81-C-0206; MDA903-83-K-0255)

This paper presents two experiments which test the principle of compatibility of proximity. This principle states that when a task requires the integration of information, the display should present the data in close proximity. When, however, the information must be selectively attended or processed, the information should be displayed with low proximity. In the first experiment, subjects were shown two-dimensional data for two hypothetical conditions and asked to extrapolate to a third condition. Performance on the task was more accurate when the data were displayed on a coordinate axis graph than when a bargraph display was used. The second experiment demonstrated that when cues in a multicue judgment task had to be selectively attended, performance was better with a bargraph display than with an integrated triangle display. No difference was observed when all the cues had to be attended. Discussion centers on display format and perception of relations between numerical data. Author

A87-33032
THE EFFECTS OF EXPERIENCE AND TRAINING ON THE ASSESSMENT OF PILOT SUBJECTIVE WORKLOAD

JANEEN ADRION (Ohio State University, Columbus) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1986, p. 619-623. FAA-supported research. refs

This paper presents the results of an experiment designed to evaluate the effectiveness of a pilot workload assessment technique called POSWAT. The motivation for this research arises from the need to evaluate the workload impact of complex cockpit systems being advanced for improved safety, efficiency and reduced pilot workload. In this study 36 experienced instrument pilots gave workload ratings at periodic intervals while making three LOFT type simulated instrument cross-country flights of varying levels of induced workload in a Frasca 141 simulator. Results indicate that the POSWAT workload evaluation method is highly correlated with induced workload. They are also correlated with some, but not all performance measures. Pilot currency was also reflected in POSWAT ratings. Author

A87-33033
EMPIRICAL WORKLOAD AND COMMUNICATIONS ANALYSIS OF SCOUT HELICOPTER EXERCISES

JOHN B. SHAFER (IBM Corp., Federal Systems Div., Bethesda, MD), MARGARET T. SHAFFER, and GEORGE B. KUTCHE IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1986, p. 628-632.

The objective was to find independent real-world data to validate results of paper-and-pencil analyses predicting workload savings by automating functions in an advanced scout-attack helicopter. Videotapes existed that had captured cockpit activities during force-on-force exercises. The videotapes were analyzed to determine the relative workload contribution of communications and crew station activities for the pilot and copilot observer. The findings indicated search activity was the single most time consuming mission-related function other than flying the aircraft. Further, data entry required a crewmember's undivided attention; therefore automated communications should consider the implications of manual data entry which may increase rather than decrease workload. Author

A87-33034

A METHODOLOGY FOR PREDICTING CREW WORKLOAD IN NEW WEAPON SYSTEMS

THEODORE B. ALDRICH and SANDRA M. SZABO (Anacapa Sciences, Inc., Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 633-637.

The Army currently is evaluating the feasibility of single-crewmember operation of a multipurpose, lightweight helicopter, designated the LHX. To determine if a single operator can perform the LHX scout and attack missions, 29 mission segments were analyzed for excessive workload. The mission segments were divided into performance elements (tasks) and were positioned on mission segment timelines. For each performance element, the man-machine interface was identified and estimates of the visual, auditory, cognitive, and psychomotor components of workload were assigned. The mission/task/workload data were used to build one- and two-crewmember computer models designed to predict total workload and to identify overloads in each mission segment. Two baseline analyses were conducted to predict workload under low-automation conditions for one- and two-crewmember LHX configurations. In addition, iterative analyses were conducted to predict the reduction in workload associated with each of 26 individual automation options and 16 combinations of options. The methodology provides a systematic means of predicting human operator workload in advance of system design. Author

A87-33043* Advanced Resource Development Corp., Columbia, Md.

EVIDENCE FOR GLOBAL PROCESSING OF COMPLEX VISUAL DISPLAYS

ROBERT C. MUNSON and RICHARD L. HORST (ARD Corp., Columbia, MD) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 776-780. refs

(Contract NAS2-12095)

'Polar graphic' displays, in which changes in system status are represented by distortions in the form of a geometric figure, were presented to subjects, and reaction time (RT) to discriminate system status was recorded. Of interest was the extent to which reaction time showed evidence of global processing of these displays as the number of nodes and difficulty of discrimination were varied. When discrimination of system status was easy, RT showed no increase with increasing number of nodes, providing evidence of global processing. When discrimination was difficult, systematic differences in RT as a function of the number of nodes suggested the invocation of other (local) processes, although the data were not consistent with a node-by-node search process. Author

A87-33044

EFFECTS OF DISPLAY PROXIMITY AND MEMORY DEMANDS ON THE UNDERSTANDING OF DYNAMIC MULTIDIMENSIONAL INFORMATION

KELLY HARWOOD, CHRISTOPHER WICKENS, ARTHUR KRAMER, DEANNA CLAY, and YILI LIU (Illinois, University, Champaign) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 786-789. refs

(Contract F30602-81-C-0206)

Two experiments explored the ability of individuals to integrate several sources of information about units or conceptual objects. The task domain might describe the air traffic controller's monitoring of the horizontal and vertical separation of several aircraft, the process controller's supervision of the temperature, pressure, and entropy of several energy systems, or any other multidimensional database. The first experiment examined working memory limits for different object-attribute combinations. When subjects monitored a display with a smaller number of objects with more attributes, responses were slower but significantly more accurate than for a larger number of objects with few attributes. In the second

experiment, interest centered on how variations of proximity affect the detection of events that occur within a multidimensional database. Results showed that the use of color and spatial position to define proximity facilitated information integration and thereby event detection. Author

A87-33053

IMPROVING VISUAL PERFORMANCE THROUGH VOLITIONAL FOCUS CONTROL

STANLEY N. ROSCOE and DONALD H. COUCHMAN (ILLIANA Aviation Sciences, Las Cruces, NM) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1047-1051. refs

Nine undergraduates at New Mexico State University were trained to control eye accommodation volitionally and, by exercising that acquired ability, to improve their visual acuity, contrast sensitivity, and flash target resolution by varying amounts. Performance improvements were elicited by each of two methods, one relatively complex and the other relatively simple, but larger gains were attained in far less time with the simpler approach in which training is mainly self-administered. Author

A87-33055* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THE RELATIONSHIP BETWEEN WORKLOAD AND TRAINING - AN INTRODUCTION

SANDRA G. HART (NASA, Ames Research Center, Moffett Field, CA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1116-1120.

This paper reviews the relationships among workload, performance, and training. Its goal is to introduce the concepts of workload and training and to suggest how they may be related. It suggests some of the practical and theoretical benefits to be derived from their joint consideration. Training effectiveness can be improved by monitoring trainee workload and the reliability of workload predictions, and measures can be improved by identifying and controlling the training levels of experimental subjects. Author

A87-33056* Toronto Univ. (Ontario).

PROGRESS IN MENTAL WORKLOAD MEASUREMENT

NEVILLE MORAY, BURHAN TURKSEN, PAUL AIDIE, DAVID DRASCIC, PAUL EISEN (Toronto, University, Canada) et al. IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1121-1123. refs

(Contract NAGW-429)

Two new techniques are described, one using subjective, the other physiological data for the measurement of workload in complex tasks. The subjective approach uses fuzzy measurement to analyze and predict the difficulty of combinations of skill based and rule based behavior from the difficulty of skill based behavior and rule based behavior measured separately. The physiological technique offers an on-line real-time filter for measuring the Mulder signal at 0.1 Hz in the heart rate variability spectrum. Author

A87-33057* Illinois Univ., Urbana-Champaign.

THE EFFECTS OF TASK DIFFICULTY AND WORKLOAD ON TRAINING

AMIR MANE and CHRISTOPHER D. WICKENS (Illinois, University, Urbana) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1124-1127. refs

(Contract NAG2-308)

Four hypotheses regarding the possible effects of workload and task difficulty on training are proposed. These are: (1) increased levels of task difficulty will facilitate learning to the extent that these increases are (a) resource loading and (b) intrinsic to the component task to be learned; (2) decrease of task difficulty will facilitate learning to the extent that these decreases (a) reduce the resource load and (b) are extrinsic of the component task to

be learned; (3) the learner's tendency to conserve resources may lead to the adoption of undesirable, short-term, low resource strategies early in training; and (4) the effect of changes in resource demand on learning will depend upon the similarity of the resource whose demand is changed to the resource involved in learning.

Author

A87-33058* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TRAINING AND SUBJECTIVE WORKLOAD IN A CATEGORY SEARCH TASK

MICHAEL A. VIDULICH (NASA, Ames Research Center, Moffett Field, CA) and PARIMAL PANDIT (San Jose State University, CA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1133-1136. refs

This study examined automaticity as a means by which training influences mental workload. Two groups were trained in a category search task. One group received a training paradigm designed to promote the development of automaticity; the other group received a training paradigm designed to prohibit it. Resultant performance data showed the expected improvement as a result of the development of automaticity. Subjective workload assessments mirrored the performance results in most respects. The results supported the position that subjective mental workload assessments may be sensitive to the effect of training when it produces a lower level of cognitive load.

Author

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INTERACTION BETWEEN WORKLOAD AND TRAINING - CONVERGING EVIDENCE FROM PSYCHOPHYSIOLOGY AND PERFORMANCE MEASUREMENT

ARTHUR F. KRAMER (Illinois, University, Champaign) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1137-1141. NASA-supported research. refs

(Contract F49620-83-C-0144)

Traditionally, the domains of mental workload and training have been studied in isolation even though they share many common characteristics. The present paper integrates findings from psychophysiological and performance-based studies which address both of these issues. By augmenting traditional indices of skill acquisition such as RMS error scores, reaction times, and accuracy measures with psychophysiological measures such as the event-related brain potential, it is shown that workload effects can be assessed throughout the training process. More specifically, it is argued that the development of skill and the effects of workload on the human operator can be modeled within the framework of resource theories of attentional allocation. Also described is how converging evidence from psychophysiological and behavioral studies can be used to examine subtle changes in operator strategies during training.

Author

A87-33061* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

EFFECTS OF STIMULUS CHARACTERISTICS AND TASK DEMANDS ON PILOTS' PERCEPTION OF DICHOTIC MESSAGES

ELIZABETH M. WENZEL (NASA, Ames Research Center, Moffett Field, CA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1177-1181. refs

The experiment is an initial investigation of pilot performance when auditory advisory messages are presented dichotically, either with or without a concurrent pursuit task requiring visual/motor dexterity. The dependent measures were percent correct and correct reaction times for manual responses to the auditory messages. Two stimulus variables which show facilitatory effects in traditional dichotic-listening paradigms, differences in pitch and semantic content of the messages, were examined to determine their effectiveness during the functional simulation of helicopter pursuit. In an effort to accumulate points for the advisory messages

for accuracy alone or for both accuracy and reaction times which were faster than their opponent's. In general, the combined effects of the stimulus and task variables are additive. When interactions do occur they suggest that an increase in task demands can sometimes mitigate, but usually does not remove, any processing advantages accrued from stimulus characteristics. The implications of these results for cockpit displays are discussed.

Author

A87-33062

EFFECTS OF A LOW BLOOD ALCOHOL LEVEL ON PILOT PERFORMANCE

LEONARD E. ROSS and JAMES C. MUNDT (Wisconsin, University, Madison) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1182-1186. Research supported by the National Institute on Alcohol Abuse and Alcoholism. refs

Pilots and nonpilots were tested on simulator flying tasks after attaining a .04 percent blood alcohol concentration and after ingestion of placebo drinks. Half of the pilots and half of the nonpilots were blind with respect to the contents of their drinks while half were informed. Two turbulence conditions were employed, and subjects were instructed to scan for aircraft silhouette targets that appeared on monitors in front and to the sides of the subject. The subject's task was to maintain straight and level flight, with the pilots given an additional flight segment during which the simulator's instruments and external horizon display gradually indicated an unusual attitude, either a banked steep climb or banked step descent, while the subject was performing other tasks such as copying weather information or changing radio settings. Head movements, control movements, time to detect targets, and simulator flight measures were digitized and computer recorded and analyzed. Alcohol affected the performance of pilots and nonpilots on several performance measures during straight and level flight. The performance of pilots during the divided attention unusual attitude flight segment was such that unsafe flight conditions would have resulted.

Author

A87-33063

EFFECTS OF CHEMICAL DEFENSE ANTIDOTES (ATROPINE) ON AVIATOR PERFORMANCE (SIMULATED FLIGHT AND ZERO INPUT TRACKING ANALYZER)

LEWIS W. STONE, RONALD R. SIMMONS, DAVID J. CARTER, ROGER S. CHRISTIANSEN, and HEBER D. JONES (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1187-1191. refs

A87-33066

STEADY STATE EEG AS A MEASURE OF PERIPHERAL LIGHT LOSS

RICHARD T. GILL (Idaho, University, Moscow), KEVIN M. KENNER (Systems Research Laboratories, Inc., Dayton, OH), and ANDREW M. JUNKER (USAF, Materials Research Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1249-1253. USAF-supported research. refs

The objective of this research was to assess the feasibility of using EEG to measure the extent of acceleration induced peripheral light loss (PLL). Two pilot studies were conducted to determine if an EEG response to peripherally localized stimuli could be detected and to establish the stimulus parameters that would yield a strong response. Results revealed: (1) identifiable EEG responses to stimuli located as far as + or - 60 degrees from the foveal line-of-sight; (2) higher stimulus intensity and, in particular, higher depth of modulation yielded stronger EEG responses; and (3) coherence was found to be a more sensitive measure than RMS power or gain. These findings were used to establish the experimental conditions that were used in a study whose objective was to estimate the minimum time necessary to detect the presence, or absence, of an EEG response to peripherally localized

stimuli. Results revealed a reliable determination for stimuli located at + or - 45 degrees could be made in 20 seconds or less.

Author

A87-33069

THE BASIC ATTRIBUTES TESTS (BAT) SYSTEM - A PRELIMINARY EVALUATION OF THREE COGNITIVE SUBTASKS

THOMAS R. CARRETTA (USAF, Human Resources Laboratory, Brooks AFB, TX) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1321-1325. refs

A computer based testing system, the Basic Attributes Tests (BAT) system, was developed to assess psychomotor skills as well as a variety of psychological and cognitive attributes that are believed to be related to flight training performance. This paper evaluated three subtests used to assess cognitive abilities: perceptual speed (information input efficiency), decision making speed (low level cognitive and high level sensory-perceptual motor involvement) and item recognition (short-term memory storage, search and comparison operations). Each of the subtests was evaluated in terms of its internal consistency and ability to predict flight training performance. An integrated model, based on results from the three cognitive subtests, was evaluated against flight training performance criteria.

Author

A87-33501

HANDBOOK OF PERCEPTION AND HUMAN PERFORMANCE. VOLUME 1 SENSORY PROCESSES AND PERCEPTION. VOLUME 2 - COGNITIVE PROCESSES AND PERFORMANCE

KENNETH R. BOFF, ED. (USAF, Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), LLOYD KAUFMAN, ED. (New York University, NY), and JAMES P. THOMAS, ED. (California, University, Los Angeles) New York, Wiley-Interscience, 1986. Vol. 1, 1443 p.; vol. 2, 1286 p. For individual items see A87-33502 to A87-33532.

Papers are presented on psychophysical measurement and theory; strategy and optimization in human information processing; and computer graphics. Consideration is given to basic sensory processes such as eye movements, temporal sensitivity, colorimetry and color discrimination, the vestibular system, and kinesthesia. Topics discussed include space and motion perception, information processing, perceptual organization and cognition, and human performance.

I.F.

A87-33502

STRATEGY AND OPTIMIZATION IN HUMAN INFORMATION PROCESSING

GEORGE SPERLING (New York University, NY) and BARBARA ANNE DOSHER (Columbia University, New York) IN: Handbook of perception and human performance. Volume 1. New York, Wiley-Interscience, 1986, p. 2-1 to 2-65. refs

Methods and theories for studying a subject's strategies in the performance of perceptual and cognitive tasks are discussed. Compound and concurrent tasks are defined and compared. The signal detection theory, attention, and economics are examined. Resource sharing and concurrent tasks, in particular simultaneous auditory two-channel detection, shadowing, concurrent visual search, and attention operating characteristics, are analyzed. Consideration is given to ideal performance in compound reaction-time tasks, the costs and benefits in reaction time tasks, and speed-accuracy trade-offs. Pure strategy, resource allocation, and strategy mixtures are described. Path dependence in performance operating characteristics and the dynamics of strategy switching are investigated. Examples of compound and concurrent tasks are presented.

I.F.

A87-33505* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TEMPORAL SENSITIVITY

ANDREW B. WATSON (NASA, Ames Research Center, Moffett Field, CA) IN: Handbook of perception and human performance. Volume 1. New York, Wiley-Interscience, 1986, p. 6-1 to 6-43. refs

Human visual temporal sensitivity is examined. The stimuli used to measure temporal sensitivity are described and the linear systems theory is reviewed in terms of temporal sensitivity. A working model which represents temporal sensitivity is proposed. The visibility of a number of temporal wave forms, sinusoids, rectangular pulses, and pulse pairs, is analyzed. The relation between spatial and temporal effects is studied. Temporal variations induced by image motion and the effects of light adaptation on temporal sensitivity are considered.

I.F.

A87-33506

SEEING SPATIAL PATTERNS

LYNN A. OLZAK and JAMES P. THOMAS (California, University, Los Angeles) IN: Handbook of perception and human performance. Volume 1. New York, Wiley-Interscience, 1986, p. 7-1 to 7-56. refs

The visual perception of two-dimensional spatial patterns is studied. Consideration is given to spatial tuning; stimulus patterns; the tasks of detection and identification; measuring performance; masking; pattern-selective adaptation; and the effects of mean luminance, retinal location, and stimulus uncertainty on performance. The detection task is examined in terms of detection sensitivity parameters and interaction phenomena, and models representing the mechanisms involved in detection are presented. Data on the factors which affect identification and the mechanisms involved in identification are discussed, and identification models are provided. Procedures for measuring visual acuity and factors affecting acuity are described.

I.F.

A87-33510

MOTION PERCEPTION IN THE FRONTAL PLANE - SENSORY ASPECTS

STUART ANSTIS (York University, Downsview, Canada) IN: Handbook of perception and human performance. Volume 1. New York, Wiley-Interscience, 1986, p. 16-1 to 16-27. refs

Some phenomena of visual motion are discussed. Direction-specified adaptation, motion aftereffect, and velocity aftereffect are examined. Consideration is given to motion perception in peripheral vision, real motion versus apparent motion, and the relationship between space and time and apparent motion. Motion perception models, such as the correlation and gradient models of directional selectivity, are described.

I.F.

A87-33511

PERCEPTUAL ASPECTS OF MOTION IN THE FRONTAL PLANE

ARIEN MACK (New School for Social Research, New York) IN: Handbook of perception and human performance. Volume 1. New York, Wiley-Interscience, 1986, p. 17-1 to 17-38. refs

Subject-relative and object-relative data are the two sets of perceived object motion determinants; subject-relative information is based on an egocentric coordination system and object-relative information is based on an external reference system. The relation between subject- and object-relative motion is discussed. Eye movement and pointing responses are examined under conditions in which the perceived position or motion of a target stimulus does not correlate with its actual position. Subject-relative motion perception, in particular head, saccadic eye, and pursuit eye movements, and induced motion, which represents perceived motion based on object-relative motion data, are analyzed. Configurational event perception and velocity perception are considered.

I.F.

A87-33512

THE PERCEPTION OF POSTURE, SELF MOTION, AND THE VISUAL VERTICAL

IAN P. HOWARD (York University, Toronto, Canada) IN: Handbook of perception and human performance. Volume 1 . New York, Wiley-Interscience, 1986, p. 18-1 to 18-62. refs

Postural reflexes and vertical posture control are examined. Consideration is given to vestibular nystagmus; the interaction between vestibular nystagmus and visual pursuit; the coordination of head and eye movements; eye movement in response to combined rotary and linear acceleration; counter torsion; and cervicoocular and arthroocular responses. The relation between motion perception and movements of the head and body, in particular the effects of self motion on the visual sensation of motion and of scene motion on self motion sensations, is studied. The adaptability of the vestibular system, judging the visual vertical, and visual direction and postural asymmetry are discussed. I.F.

A87-33513

MOTION IN DEPTH AND VISUAL ACCELERATION

DAVID MARTIN REGAN (Rutgers University, New Brunswick, NJ), LLOYD KAUFMAN, and JANET LINCOLN (New York University, NY) IN: Handbook of perception and human performance. Volume 1 . New York, Wiley-Interscience, 1986, p. 19-1 to 19-46. refs

Experimental data on motion that is nonuniform in time and is sensitive to the acceleration of targets moving in the frontal plane, and perceived motion in depth due to changing size and disparity are presented and analyzed. The direction of self-motion in depth and optical flow patterns are examined; data revealing that the human visual system is sensitive to certain relationships between the velocities at different locations in the retinal image are provided. Multiple sensitivities are studied in terms of channel theories of motion in depth, and the application of the multiple specific sensitivity concept to the study of flying performance in a simulator and a real aircraft is discussed. I.F.

A87-33514

VISUAL LOCALIZATION AND EYE MOVEMENTS

LEONARD MATIN (Columbia University, New York) IN: Handbook of perception and human performance. Volume 1 . New York, Wiley-Interscience, 1986, p. 20-1 to 20-45. refs

The role of extraretinal eye position in visual localization is studied and four procedures for measuring visual localization are described. The cancellation theory and two kernels of Helmholtz are examined in terms of visual localization. Local signs, reference directions, and spatial discriminations are analyzed. Consideration is given to localization with steady gaze, in the presence of voluntary saccades, and during pursuit eye movements. I.F.

A87-33515

SPACE PERCEPTION

H. A. SEDGWICK (New York, State University, New York) IN: Handbook of perception and human performance. Volume 1 . New York, Wiley-Interscience, 1986, p. 21-1 to 21-57. refs

Visual space perception is defined and various approaches for studying visual space perception are described. The basic characteristics of the perception of size, distance, shape, and slant of surfaces in the environment are discussed. The data provided by surface texture and linear perspective to be applied to spatial layout and motion-produced information for the perception of spatial layout are considered. I.F.

A87-33518

ADAPTATION OF SPACE PERCEPTION

ROBERT B. WELCH (Kansas, University, Lawrence) IN: Handbook of perception and human performance. Volume 1 . New York, Wiley-Interscience, 1986, p. 24-1 to 24-45. refs

The ability to modify perception and perceptual-motor coordination when confronted with a discrepancy between or within the spatial modalities is described and evaluated. Consideration is given to the ability of a person to adapt to prismatic displacement; visual transposition; tilt; loss of visual position constancy; size-depth, distance, and form distortions; auditory right-left reversal

and displacement; and underwater perception distortions. Individual differences in adaptation which may be attributed to personality and perceptual traits, sex, age, athletic and artistic skill, mental illness, and brain damage are discussed. It is concluded that human beings are capable of adapting to spatial perception rearrangement; however, it is not proven that these capabilities are acquired from experience by the newborn and developing infant. I.F.

A87-33519

INTERSENSORY INTERACTIONS

ROBERT B. WELCH (Kansas, University, Lawrence) and DAVID H. WARREN (California, University, Riverside) IN: Handbook of perception and human performance. Volume 1 . New York, Wiley-Interscience, 1986, p. 25-1 to 25-36. refs

Intersensory interactions are examined with respect to the multimodal perception tasks of detection, spatial perception, and temporal perception. The characteristics of various sensory and temporal modalities are described and compared. The effects of nonspecific accessory stimulation on detection threshold and of discrete signals in one modality on detection reaction time in second modality are investigated. Attention is given to spatial acuity, orientation, egocentric localization, shape, size, texture, and intersensory bias. Interactions involving temporal duration, rate, and pattern are studied. I.F.

A87-33520

MOTOR CONTROL

STEVEN W. KEELE (Oregon, University, Eugene) IN: Handbook of perception and human performance. Volume 2 . New York, Wiley-Interscience, 1986, p. 30-1 to 30-60. refs

The factors that influence the duration of the basic components of motor skill, decision and movements, are described. Simple and choice reaction times, the effects of movement and more than one response per stimulus on reaction time, the processing of signals, and procedures for minimizing the interference between multiple signal and response are examined. The time and accuracy of target-directed movements (movements controlled and not controlled by visual feedback) are analyzed. Movement sequences and rules that govern skill components are studied. Recent motor skill concepts, in particular the component-analysis view of skill learning, hierarchical conceptions of motor programs, synergies and motor learning, and the role of feedback in motor learning and performance, are discussed. Various approaches for improving skill are proposed. I.F.

A87-33521

AUDITORY PATTERN RECOGNITION

DIANA DEUTSCH (California, University, La Jolla) IN: Handbook of perception and human performance. Volume 2 . New York, Wiley-Interscience, 1986, p. 32-1 to 32-49. refs

The effects of perceptual and cognitive psychology and the music theory on auditory pattern recognition are studied. Auditory grouping phenomena, in particular perceptual fusion and separation of components of a complex sound spectrum, the grouping of sound elements emanating from different spatial locations, and the grouping of sounds that occur in rapid succession, are examined. The perception and recognition of patterns formed of pitch combinations are analyzed. Consideration is given to the perception of timbre, temporal order, and rhythm. I.F.

A87-33522

THE DESCRIPTION AND ANALYSIS OF OBJECT AND EVENT PERCEPTION

I. ROCK (Rutgers University, New Brunswick, NJ) IN: Handbook of perception and human performance. Volume 2 . New York, Wiley-Interscience, 1986, p. 33-1 to 33-71. refs (Contract NIH-MH-30865)

Objects and events which compose visual perception in daily life and in the laboratory are described. Perceptual organization is defined and examined. Attention is given to perception, recognition, and identification; factors affecting perceived object shape; form perception anomalies; visual dominance and visual capture; and illusions. Perceptual constancy, in particular dual modes of

perception, the proximal stimulus code, deviations from constancy, underconstancy, overconstancy, and constancy theories, are studied. The perception of events such as motion and events other than motion is discussed. I.F.

A87-33523

SPATIAL FILTERING AND VISUAL FORM PERCEPTION

ARTHUR P. GINSBURG (USAF, Aviation Vision Laboratory, Wright-Patterson AFB, OH) IN: Handbook of perception and human performance. Volume 2. New York, Wiley-Interscience, 1986, p. 34-1 to 34-41. refs

Data supporting the hypothesis that visual form perception is based on a form of spatial image processing are presented. The basic principles of the linear systems theory and filtering in the Fourier transform domain are discussed. The existence of spatial filtering in the mammalian visual system and the relation between spatial filtering, contrast sensitivity, and visual channel theory are studied. The manner in which spatial filters can predict perceptual phenomena characterized by the Gestalt laws of organization is described. The correlations between the concept of spatial filtering and the perception of texture and visual illusions, and between spatial filtering and multistable images are examined. The characteristics and performance of a multichannel model based on the existence of biological filters in the human visual system are considered. I.F.

A87-33524

VISUAL FUNCTIONS OF MENTAL IMAGERY

RONALD A. FINKE (New York, State University, Stony Brook) and ROGER N. SHEPARD (Stanford University, CA) IN: Handbook of perception and human performance. Volume 2. New York, Wiley-Interscience, 1986, p. 37-1 to 37-55. refs (Contract NSF BNS-80-05517)

Experiments relating mental imagery to visual perception are discussed. The functional equivalence, symbolic representation, tacit knowledge, experimental bias, and eye movement hypotheses are described and compared. Consideration is given to visual imagery comparison, identification, and resolution; visual imagery in determining distance, location, and visual-motor control; visual transformation; and visual attention. The individual differences in the ability to use imagery, the use of imagery modalities other than vision, and the application of mental imagery in perceptual learning are examined. It is determined that the functional equivalence hypothesis best explains the visual function of mental imagery. I.F.

A87-33525*

COMPUTATIONAL APPROACHES TO VISION

H. G. BARROW and J. M. TENENBAUM (Schlumberger Palo Alto Research, CA) IN: Handbook of perception and human performance. Volume 2. New York, Wiley-Interscience, 1986, p. 38-1 to 38-70. NSF-DARPA-NASA-supported research. refs

Vision is examined in terms of a computational process, and the competence, structure, and control of computer vision systems are analyzed. Theoretical and experimental data on the formation of a computer vision system are discussed. Consideration is given to early vision, the recovery of intrinsic surface characteristics, higher levels of interpretation, and system integration and control. A computational visual processing model is proposed and its architecture and operation are described. Examples of state-of-the-art vision systems, which include some of the levels of representation and processing mechanisms, are presented. I.F.

A87-33526

THE EFFECTS OF CONTROL DYNAMICS ON PERFORMANCE

CHRISTOPHER D. WICKENS (Illinois, University, Savoy) IN: Handbook of perception and human performance. Volume 2. New York, Wiley-Interscience, 1986, p. 39-1 to 39-60. refs

The relationship between control dynamics and human performance is studied. The tracking, manual control paradigm and methodological techniques which measure tracking performance are discussed. The human performance limits which

influence tracking and two human tracking performance models are described. Experimental results and data concerned with the effects of control dynamics on performance are presented and analyzed. Consideration is given to gain, system lags, control order, higher order tracking, the tracking of unstable systems, displays, multiaxis and multiloop control, and auditory displays. I.F.

A87-33527

MONITORING BEHAVIOR AND SUPERVISORY CONTROL

NEVILLE MORAY (Toronto, University, Canada) IN: Handbook of perception and human performance. Volume 2. New York, Wiley-Interscience, 1986, p. 40-1 to 40-51. refs

The general characteristics of supervisory control and mathematical models of monitoring behavior are described and empirical data supporting the models are presented. Data acquisition and the applications of optimal estimation theory and optimal control theory to modeling human intervention in process control are discussed. Particular attention is given to the general properties of human information processing; supervisory control; the detection and diagnosis of system failures; and the allocation of functions between operator and machine. I.F.

A87-33530

VIGILANCE, MONITORING, AND SEARCH

RAJA PARASURAMAN (Catholic University of America, Washington, DC) IN: Handbook of perception and human performance. Volume 2. New York, Wiley-Interscience, 1986, p. 43-1 to 43-39. refs

The processes underlying vigilance decrement, the identification of the factors controlling the overall level of vigilance, and the regulation and control of vigilance in operational settings are examined. Various methods for measuring vigilance include: detection rate, reaction time, self reports, changes in signal discriminability, and mental workload measures. The decision theory analysis of vigilance; the effects of signal probability, instructions, and the payoff matrix on the decision criterion; and criterion shifts over time are discussed. Consideration is given to task classification and vigilance, complex monitoring and search, vigilance in operational settings, and human factor principles for the control of vigilance. I.F.

A87-34532

THE EFFECTS OF AGE, SLEEP DEPRIVATION, AND ALTITUDE ON COMPLEX PERFORMANCE

HENRY W. MERTENS and WILLIAM E. COLLINS (FAA, Civil Aeromedical Institute, Oklahoma City, OK) Human Factors (ISSN 0018-7208), vol. 28, Oct. 1986, p. 541-551. refs

The performances of men ranging in age from 30-39 and 60-69 years at different altitudes (ground and 3810 m) and under various sleep conditions (sleep permitted and sleep deprived) are investigated. The multiple task performance battery consisted of: the monitoring of warning lights and meters, mental arithmetic, problem solving, target identification, and tracking. It is observed that there was a significant interaction between sleep deprivation and altitude that was enhanced by increasing work load. The performance of subjects sleep deprived was lower and the greatest decrease occurred at 3810 m. The data reveal that the performance of the 60-69 year old subjects was lower and more affected by an increase in work load than that of the younger subjects; however, sleep deprivation and altitude effects were not influenced by age. I.F.

A87-35072

FREQUENCY EFFECTS IN PROFILE ANALYSIS AND DETECTING COMPLEX SPECTRAL CHANGES

DAVID M. GREEN, ZEKIYE A. ONSAN, and TIMOTHY G. FORREST (Florida, University, Gainesville) Acoustical Society of America, Journal (ISSN 0001-4966), vol. 81, March 1987, p. 692-699. NIH-USAF-supported research. refs

Seven experiments on the detectability of intensity changes in complex multitone acoustic spectra are reported. Two general questions organize the experimental efforts. The first question is how the detectability of a change in a flat (equal energy) spectrum

depends on the frequency region where a single intensive change is made. The answer is that frequency region plays a relatively minor role. Frequency changes in the midregion of the spectrum are the easiest to hear, but thresholds increase by only about 5 dB over the range from 200 to 5000 Hz. For all frequencies, the psychometric function is of the form $d' = k(\Delta p)$, where k is a constant and Δp is the change in pressure. The second question is how can the detectability of complex changes over the entire frequency range be predicted from the detectability of change at each separate region. Thresholds for detecting a change from a flat spectrum to a spectrum whose amplitude varies in sinusoidal ('rippled') fashion over logarithmic frequency are measured at different frequencies of ripple. The thresholds are found to be independent of ripple frequency and are 7 dB higher than predicted on the basis of an optimum combination rule.

Author

N87-20326*# Medical Univ. of South Carolina, Charleston. Dept. of Pharmacology.

TO CATCH A COMET 2: TECHNICAL UPDATE ON CAN-DO

THOMAS J. OBRIEN *In* NASA. Goddard Space Flight Center The 1986 Get Away Special Experimenters' Symposium p 171-178 Feb. 1987

Avail: NTIS HC A11/MF A01 CSCL 051

Since the presentation of, To Catch a Comet, was given at the last G.A.S. Symposium, many events have impacted the CAN-DO Comet Halley program. This paper summarizes the changes to the payload and its mission, including improvements in camera control and CAN-DO's participation in the Halley Armada.

Author

N87-20327*# Medical Univ. of South Carolina, Charleston. Dept. of Pathology.

TO CATCH A CHILD'S IMAGINATION 2: EDUCATIONAL UPDATE ON CAN-DO

JAMES H. NICHOLSON *In* NASA. Goddard Space Flight Center The 1986 Get Away Special Experimenters' Symposium p 179-186 Feb. 1987

Avail: NTIS HC A11/MF A01 CSCL 051

At the G.A.S. Symposium last year, the Charleston County Public School CAN DO Project outlined an ambitious educational program revolving around the photography of Comet Halley from the Shuttle using a GAS canister. The target flight was STS 61-E scheduled for a March, 1986, launch. Such strict time constraints and highly specific mission requirements made the CAN DO program even more risky than normal. In spite of this, almost all of the planned educational goals were achieved, even after the postponement of all Shuttle activities in January of 1986. This follow-up paper summarizes the effects of events on the program as proposed and the attempts to carry out as many of the activities as possible. It is hoped that this paper will suggest constructive ways in which to cope with the delays and mishaps that are the invariable lot of pioneers who break new ground and attempt the new and untried.

Author

N87-20747*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

HUMAN-DISPLAY INTERACTIONS: CONTEXT-SPECIFIC BIASES

MARY KISTER KAISER and DENNIS R. PROFFITT (Virginia Univ., Charlottesville.) Apr. 1987 25 p

(NASA-TM-89430; A-87118; NAS 1.15:89430) Avail: NTIS HC A02/MF A01 CSCL 051

Recent developments in computer engineering have greatly enhanced the capabilities of display technology. As displays are no longer limited to simple alphanumeric output, they can present a wide variety of graphic information, using either static or dynamic presentation modes. At the same time that interface designers exploit the increased capabilities of these displays, they must be aware of the inherent limitation of these displays. Generally, these limitations can be divided into those that reflect limitations of the medium (e.g., reducing three-dimensional representations onto a two-dimensional projection) and those reflecting the perceptual

and conceptual biases of the operator. The advantages and limitations of static and dynamic graphic displays are considered. Rather than enter into the discussion of whether dynamic or static displays are superior, general advantages and limitations are explored which are contextually specific to each type of display.

Author

N87-21578# Joint Publications Research Service, Arlington, Va. **GROUP DYNAMICS AND PERFORMANCE EFFICIENCY UNDER EXTREME CONDITIONS**

JAN TERELJAK *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 123-125 19 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6, Nov. Dec. 1986 p 82-83 Avail: NTIS HC A01/MF A01

When psychologists analyze the process of social and emotional group dynamics of a small group spending the winter in Antarctica, they pay attention to the dynamics of psychophysiological responses related to this process. The behavioral disturbances discovered by a number of authors, which are elicited by long term natural isolation, form the so-called wintering syndrome. The most frequent manifestations of this syndrome are depression, hostility, irritability, impaired sleep, loss of interest on one's job, diminished intellectual capacities and interests. These signs are related to the duration of the stay in an isolated group, monotony of the environment (monotony, boredom) and absence of customary emotional stimuli. Analogous distinctions were also noted in many laboratory studies simulating spaceflight conditions, as well as during long term spaceflights.

Author

N87-21583 Civil Aviation Authority, London (England).

OBJECTIVE TESTING FOR THE PILOT'S INSTRUMENT RATING. SPECIMEN EXAMINATION MATERIAL: FLIGHT PLANNING AND NAVIGATION PROCEDURES, FLIGHT INSTRUMENTS AND RADIO AIDS, METEOROLOGY, AVIATION LAW, FLIGHT RULES AND PROCEDURES

Aug. 1986 28 p

(CAP-519; ISBN-0-86039-283-X; ETN-87-99500) Avail: Issuing Activity

Specimen examination papers for the United Kingdom pilot license are presented. ESA

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A87-31463

HEAD-PORTED DISPLAY ANALYSIS FOR SPACE STATION APPLICATIONS

KATHLEEN RADKE, PAMELA JAMAR, and LEE LEVITAN (Honeywell Systems and Research Center, Minneapolis, MN) *IN:* Digital Avionics Systems Conference, 7th, Fort Worth, TX, Oct. 13-16, 1986, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1986, p. 105-112.

This report describes the evaluation of the impact of using a head-ported display unit for Space Station activities. The technology survey identified applicable CRT and non-CRT display technologies suitable for a head-ported unit. A set of 14 crew task applications for head-ported displays was identified. A smaller set of high pay-off applications was then selected through analysis which included consideration for crew time spent in each activity, display requirements, visual, manual and verbal tasks performed while using the display, and the benefits a head-ported display would bring to the application compared to fixed or portable display configurations. Finally, the study evaluated the design impact that

head-ported displays would have on the overall Space Station system. Author

A87-31492
EFFECTS OF DISPLAY DENSITY AND FORMAT TYPE ON CONTROL DISPLAY UNIT FORMAT DESIGN

TERESA L. MANN (Lockheed-Georgia Co., Marietta) and JEFF G. MORRISON IN: Digital Avionics Systems Conference, 7th, Fort Worth, TX, Oct. 13-16, 1986, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1986, p. 330-337. Research supported by the Lockheed Independent Research and Development Funds. refs

Frequently, guidelines for displaying information do not exist for a specific type of hardware; i.e., a control/display unit (CDU). A study which addresses the issue of defining an optimal CDU display format design was completed. Seven formats of three display densities and three information types were evaluated to determine which combination of these factors facilitates information transfer from a CDU display to the user. Subjects searched alphanumeric displays visually for a single piece of information and indicated when it was found. Data was collected on the elapsed time to isolate the information as well as their accuracy in a tracking task. Results suggest that the optimal format for textual data is the serial (left-to-right) arrangement, while for numerical data, the optimal format is tabular with labels along the left hand column. As display densities approach 65 percent, the relative differences between the formats disappear and these recommendations become less applicable. In general, the design of display formats must be given careful consideration on the basis of specific hardware and information to be presented. Author

A87-31494*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

VIRTUAL INTERFACE ENVIRONMENT

SCOTT S. FISHER (NASA, Ames Research Center, Moffett Field, CA) IN: Digital Avionics Systems Conference, 7th, Fort Worth, TX, Oct. 13-16, 1986, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1986, p. 346-350. refs

A head-mounted, wide-angle, stereoscopic display system controlled by operator position, voice and gesture has been developed for use as a multipurpose interface environment. The system provides a multisensory, interactive display environment in which a user can virtually explore a 360-degree synthesized or remotely sensed environment and can viscerally interact with its components. Primary applications of the system are in telerobotics, management of large-scale integrated information systems, and human factors research. System configuration, application scenarios, and research directions are described. Author

A87-31749

THE EFFECT OF ANTIMICROBIAL UNDERWEAR ON THE AUTOMICROFLORA OF SEAMEN DURING A SEA VOYAGE [VLIANIE ANTIMIKROBNOGO BEL'IA NA SOSTOIANIE AUTOMIKROFLORY U MORIAKOV V PLAVANII]

B. I. ZHOLUS, V. N. BORTNOVSKII, and A. A. ARZUMANOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Oct. 1986, p. 41, 42. In Russian. refs

The effect of underwear made of cotton fibers containing a bactericidal chemical (Hexachloran) on the skin microflora of seamen and their health status during a seven-month sea voyage status was investigated. It was found that the use of antimicrobial underwear (changed daily after a shower) by the ten subjects of the experimental group prevented a build-up of microbial counts which was registered in ten controls of similar age and occupation who were issued regular underwear. While all subjects in the experimental group remained disease-free during the course of the voyage, four cases of influenza-like and/or skin infection were registered among the (ten) control subjects. I.S.

A87-32012

CORRECTED UNIPOSITIONAL LEAD SYSTEM FOR VECTOR MAGNETOCARDIOGRAPHY

HANNU J. ESKOLA (Tampere University Central Hospital, Finland), JAAKKO A. V. MALMIVUO (Tampere University of Technology, Finland), JUHA J. O. NOUSIAINEN, and JUKKA O. LEKKALA (Technical Research Centre of Finland, Tampere) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-34, Feb. 1987, p. 81-90. refs

Various corrected and combined vector magnetocardiographic (VMCG) lead systems have been designed and studied by using a physical, realistic torso model. Although having quite ideal lead fields, many of these new lead systems produce a low signal level, thus lowering the actual information capacity of the lead system. Furthermore, the combined lead systems are technically complex and slightly impractical to use. The corrected unipositional lead system was found to be free of all these disadvantages. This system has a simple geometry consisting of three coaxial detector coils located on the point V2 of the standard 12-lead ECG. On the other hand, its accuracy for the determination of the magnetic heart vector was concluded to be sufficient. Based on the VMCG measured on normal subjects, it was also stated that the lead system has a low sensitivity to the displacement of the detector. Author

A87-32232*# Systems Technology, Inc., Hawthorne, Calif.

INVESTIGATION OF LIMB-SIDE STICK DYNAMIC INTERACTION WITH ROLL CONTROL

DONALD E. JOHNSTON and DUANE T. MCRUER (Systems Technology, Inc., Hawthorne, CA) (Guidance, Navigation and Control Conference, Snowmass, CO, Aug. 19-21, 1985, Technical Papers, p. 47-57) Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol. 10, Mar.-Apr. 1987, p. 178-186. Previously cited in issue 22, p. 3229, Accession no. A85-45882. refs (Contract NAS2-11454)

A87-32455

PRELIMINARY EXPERIMENTAL STUDY ON THE OXYGEN SEPARATING AND CONCENTRATING SYSTEM FOR CELSS

SHUJI KANDA, HIROYUKI MATSUMURA, TAKATOSHI SHOJI (Kawasaki Heavy Industries, Ltd., Kobe, Japan), KEIJI NITTA, KOHJI OHTSUBO (National Aerospace Laboratory, Chofu, Japan) et al. IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1337-1341. refs

A system which uses Salcomine (ethoxy salicylaldehyde ethylene diamine cobalt) to separate and concentrate the oxygen produced in a CELSS for the Space Station is described. The Salcomine absorbs the oxygen under normal temperatures (less than 40 C) and desorbs oxygen under temperatures higher than 80 C. The concept of CELSS is reviewed and a diagram of a CELSS is provided. The operation of the gas recycle system, which is utilized as a reservoir in the CELSS to compensate for the difference between the gas production and consumption, is examined. The ability of the Salcomine to absorb or desorb oxygen is evaluated for Salcomine alone and Salcomine in a canister. It is observed that the oxygen absorbing capacity of the Salcomine is about 4.0 percent for Salcomine alone and about 2.7 percent for Salcomine in a canister. Diagrams of the proposed gas recycle system and oxygen separating and concentration system are presented. I.F.

A87-32456

DEVELOPMENT OF CARBON DIOXIDE REMOVAL SYSTEM - EXPERIMENTAL STUDY OF SOLID AMINES

KIYOSHI HIGUCHI (National Space Development Agency of Japan, Tokyo), SHUJI KANDA, HIROYUKI MATSUMURA, HIROAKI FUJIMORI, TAKATOSHI SHOJI (Kawasaki Heavy Industries, Ltd., Kobe, Japan) et al. IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1343-1348. Research supported by the National Space Development Agency of Japan. refs

This paper describes the carbon dioxide removal system in the Environmental Control and Life Support System for the Japanese Experiment Module of the Space Station. A solid amine, carbon dioxide removal substrate is under development at present to replace the consumptive adsorbent (LiOH). It is characterized by a regenerative agent which makes it possible to adsorb and desorb repeatedly. The other systems such as the electrochemical depolarized carbon dioxide concentration system and molecular sieves carbon dioxide removal system are also being developed.

Author

A87-32457

GAS AND WATER RECYCLING SYSTEM FOR IOC VIVARIUM EXPERIMENTS

KOJI OTSUBO, KEIJI NITTA, MITSUO OGUCHI, SIGERU HAYASHI, SHIGEKI HATAYAMA (National Aerospace Laboratory, Chofu, Japan) et al. IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1349-1354. Research supported by the Japanese CELSS Research Group. refs

A design for a gas and water recycling system to support life science missions at the initial operational capability of the Space Station is proposed. The gas recycling subsystem is composed of: prefilters to remove harmful gas; canister units for CO₂ and O₂ gas content control; humidifiers; gas bottles; and a controller. The operation of the subsystem, which is to remove CO₂ gas from the outlet air of the animal vivariums and to remove excessive O₂ gas from the outlet air of the phytotron and algae cultivator, is described. The water recycling subsystem is to use a high polymer membrane filtration unit and a distiller to purify the water; the roles of the microfilter, ultrafilter, and reverse osmosis filters of the membrane filtration unit are examined. Diagrams of the two subsystems are provided. I.F.

A87-32458

WATER RECYCLING SYSTEM USING THERMOPERVAPORATION METHOD

KATSUYA EBARA, HIDEAKI KUROKAWA, AKIRA YAMADA, YASUO KOSEKI (Hitachi, Ltd., Hitachi Research Laboratory, Japan), and AKIRA ASHIDA (Hitachi, Ltd., Space Systems Div., Tokyo, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1355-1359. refs

A space station water recycling system is evaluated on the basis of fundamental experiments and simulated calculations of absorption-type thermopervaporation. The specific electric conductivity of the treated water was below 10 microS/cm, and the coefficient of permeation through the membrane was more than 1 kg/sq m day mm Hg. The optimum operating conditions for the recycling system are presented. K.K.

A87-32459

WATER RECYCLING FOR SPACE STATION

KENJI MITANI, AKIRA ASHIDA (Hitachi, Ltd., Space Systems Div., Tokyo, Japan), KATSUYA EBARA (Hitachi, Ltd., Hitachi Research Laboratory, Japan), and KEIJI NITTA (National Aerospace Laboratory, Chofu, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 1361-1364.

A system configuration, based on membrane-based technology, for water recycling in the Space Station is proposed to purify water wastes produced by both the crew and the facilities of life science experiments. A three-step filtration process consisting of prefiltration, ultrafiltration and reverse osmosis provides water for showers and the life science experiments. A portion of the permeate from the reverse osmosis process is further processed by a thermopervaporation membrane technique to provide potable water. Ground experimental equipment for the water recycling system for the IOC Japanese life science experiments is described. R.R.

A87-32544

CONCEPT STUDY OF REGENERABLE CARBON DIOXIDE REMOVAL AND OXYGEN RECOVERY SYSTEM FOR THE SPACE STATION

K. OTSUJI, T. SAWADA (Mitsubishi Heavy Industries, Ltd., Nagoya Aircraft Works, Japan), S. SATOU, and M. MINEMOTO (Mitsubishi Heavy Industries, Ltd., Takasago Technical Institute, Japan) IN: International Symposium on Space Technology and Science, 15th, Tokyo, Japan, May 19-23, 1986, Proceedings. Volume 2. Tokyo, AGNE Publishing, Inc., 1986, p. 2007-2016. refs

Results are presented from Japanese studies of technologies for an atmosphere regeneration system (ARS) for the Space Station. The choice is between solid amine systems with either ion exchange resin (IER) or an amine impregnated adsorbant (AIA). IER Systems contain amino radicals that ion exchanges HCO₃(-) produced by CO₂ and atmospheric moisture. AIA systems holding a polyethylene-resin, potassium-n-methyl alaninate or other amine directly adsorb CO₂ from the air. In the IER, CO₂ is desorbed by steam heating, while in the AIA, CO₂ is desorbed by heating or vacuum sucking. Experimental versions of the two types of ARSs are described, along with data indicating a preferred steam canister configuration, a greater CO₂ absorbancy of the IER relative to the AIA system, and lower energy requirements with steam regeneration. The principles of the Bosch and Sabatier processes for oxygen recovery are reviewed, and test data which indicate areas requiring further development are identified. M.S.K.

A87-32643

DESIGN CHARACTERISTIC AND DESIGN FEATURE ANALYSIS OF THE SHUTTLE REMOTE MANIPULATOR ARM

DENNIS J. HEDLEY SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Oct. 13-16, 1986. 16 p. refs (SAE PAPER 861795)

The manipulator subsystem, an anthropomorphic device, has been analyzed in terms of features and characteristics that are peculiar to its application. Extensive preflight analysis and testing using various finite analysis methods, computer programs, and techniques has satisfied the unique and stringent constraints the remote manipulator system is required to operate under. The system is the pioneer of the space payload transportation system. Future generations will satisfy a diversity of needs through variations of design. Employment of this system will, through time, dictate the tolerances that may be relaxed or tightened. Author

A87-32667* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

ROLE OF THE MANNED MANEUVERING UNIT FOR THE SPACE STATION

C. E. WHITSETT (NASA, Johnson Space Center, Houston, TX) SAE, Aerospace Technology Conference and Exposition, Long Beach, CA, Oct. 13-16, 1986. 18 p. refs (SAE PAPER 861834)

The performance specifications to be realized in the Manned Maneuvering Unit (MMU) for Space Station operations will be the culmination of design efforts which began during the Gemini project. The types of MMUs which have been built and tested over the past two decades are described, including handheld, jet shoe, and initial rigid backpack configurations. Efforts to enhance the control laws and human factors aspects of the Skylab MMU to meet long-duration, flexible use Space Station requirements are summarized, noting the successes and deficiencies with the Shuttle MMU. The design requirements which must be met to allow the Space Station MMU to be used to perform rescue, transportation, inspection, assembly, contingency, and programmatic missions are explored. M.S.K.

A87-32746* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

SYSTEM ARCHITECTURE FOR THE TELEROBOTIC WORK SYSTEM

LYLE M. JENKINS (NASA, Johnson Space Center, Houston, TX) IN: Guidance and control 1986; Proceedings of the Annual Rocky Mountain Guidance and Control Conference, Keystone, CO, Feb. 1-5, 1986. San Diego, CA, Univelt, Inc., 1986, p. 343-348. (AAS PAPER 86-044)

The functional and performance requirements and design concepts for a telerobotic work system (TWS) being considered as an adjunct to the Shuttle Remote Manipulator System and other applications are described. The multiple-armed free-flyer would be controlled by an operator in the Orbiter cabin and would perform remote sensing and manipulative tasks that EVA crew otherwise carry out. The TWS could also perform hazardous tasks, construction operations, and be an asset to the Space Station. Alternative system architectures are described, including the man-machine interface, the types of manipulators and their stowage, and the controls and backup systems. Potential terrestrial applications of the TWS concept, augmented with AI capabilities, are discussed. M.S.K.

A87-33001 HUMAN FACTORS SOCIETY, ANNUAL MEETING, 30TH, DAYTON, OH, SEPT. 29-OCT. 3, 1986, PROCEEDINGS. VOLUMES 1 & 2

Meeting supported by the Human Factors Society, USAF, University of Dayton, et al. Santa Monica, CA, Human Factors Society, 1986. Vol. 1, 758 p.; vol. 2, 754 p. For individual items see A87-33002 to A87-33073.

The conference presents papers on the habitability and facilities of space environments, Forecast II, the validation and application of the criterion task set, visual display research, three-dimensional anthropometry, lifting, visual processes and visual detection, human factors in space, and simulator aftereffects. Other topics include the integration and display of multidimensional information, human factors applications in nonmilitary systems, aviation psychology, design applications in consumer products, and the evaluation of display characteristics. Particular attention is given to the super cockpit and its human factors challenges; individual differences in criterion task set performance; linguistic processing; the use of eye control to select switches; simulated daylight; multimodal interfaces in supervisory control; man/system integration standards for space systems; and USAF experience with simulator sickness, research, and training. K.K.

A87-33002 ISOKIN - A QUANTITATIVE MODEL OF THE KINESTHETIC ASPECTS OF SPATIAL HABITABILITY

DAVID B. LANTRIP (Washington, University, Seattle) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 33-37.

This paper describes a model of the kinesthetic aspect of spatial habitability which is being developed for NASA as a means of assessing the volumetric requirements for the Space Station. The quantitative model, called ISOKIN, defines the level and type of constraint that a confining space imposes on its occupant. An activity will be constrained either in the ways it can be performed (that is, performer adaptation may be required) or in the positions where it can be performed (no adaptation required). This model provides both the analyst and the designer the means to operationalize and measure formerly intuitive notions about the suitability of various proposed Space Station internal configurations for the activities being planned for them. Author

A87-33003* McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

THE USE OF MULTIDIMENSIONAL SCALING FOR FACILITIES LAYOUT - AN APPLICATION TO THE DESIGN OF THE SPACE STATION

THOMAS S. TULLIS, BARBRA BIED SPERLING, and A. L. STEINBERG (McDonnell Douglas Astronautics Co., Huntington Beach, CA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 38-42. refs (Contract NAS2-11723)

Before an optimum layout of the facilities for the proposed Space Station can be designed, it is necessary to understand the functions that will be performed by the Space Station crew and the relationships among those functions. Five criteria for assessing functional relationships were identified. For each of these criteria, a matrix representing the degree of association of all pairs of functions was developed. The key to making inferences about the layout of the Space Station from these matrices was the use of multidimensional scaling (MDS). Applying MDS to these matrices resulted in spatial configurations of the crew functions in which smaller distances in the MDS configuration reflected closer associations. An MDS analysis of a composite matrix formed by combining the five individual matrices resulted in two dimensions that describe the configuration: a 'private-public' dimension and a 'group-individual' dimension. Seven specific recommendations for Space Station layout were derived from analyses of the MDS configurations. Although these techniques have been applied to the design of the Space Station, they can be applied to the design of any facility where people live or work. Author

A87-33004 HUMAN FACTORS IMPLICATIONS OF PROJECT FORECAST. II - AIRCREW COMBAT MISSION ENHANCEMENT (ACME) TECHNOLOGY

EARL A. ALLUISI (USAF, Human Resources Laboratory, Brooks AFB, TX) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 45-47.

Aircrew combat mission enhancement (ACME) technology consists of the hardware, software, and associated interfaces and integration that will enable aircrews to reach the acme of tactical air combat performance. In time of peace, ACME technology provides the realistically complex scenarios necessary for effective combat mission training. In time of war, it provides the real-time, updated, combat-arena visual scenes of a combat mission rehearsal enhancer, especially when it is coupled to the capabilities envisioned with the virtual cockpit technology and its use in future tactical aircraft systems. Author

A87-33005

THE SUPER COCKPIT AND ITS HUMAN FACTORS CHALLENGES

THOMAS A. FURNESS, III (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 48-52.

A revolutionary virtual crew station concept titled the 'Super Cockpit' is introduced with its applications and operational advantages. Unique aspects of the virtual information portrayal and interactive medium of the super cockpit are discussed leading to a need for new areas of human factors research and engineering. Author

A87-33006

RAPIDLY RECONFIGURABLE CREWSTATION

JOHN M. REISING and LARRY C. BUTTERBAUGH (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 53-56. refs

The objective of the rapidly reconfigurable crewstation (RRC) program is the ability to create an entirely new crewstation within one working day. A system description is given with attention focused on the automated layout center (ALC), translation software, the graphics complex, the mission computer complex, and the all-glass crewstation (AGC). The user has two interface points with the RRC laboratory: the ALC and the AGC. The AGC will allow the pilot to evaluate individual control and display technologies as well as examine the synergistic relationships among various combinations of technologies. K.K.

A87-33011

USE OF EYE CONTROL TO SELECT SWITCHES

GLORIA L. CALHOUN (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), WILLIAM P. JANSON (Systems Research Laboratories, Inc., Dayton, OH), and CHRISTOPHER J. ARBAK (McDonnell Douglas Astronautics Co., Saint Louis, MO) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 154-158. refs
(Contract F33615-82-C-0511)

Eye-controlled switching has been proposed as a biocybernetic control approach which may increase system effectiveness while reducing pilot workload. In this experiment, six subjects selected discrete switches on the front panel of a cockpit simulator while manually tracking a target. In two eye-controlled methods, the subjects directed their gaze at the switch indicated by an auditory cue and then made a consent input (either a manual response or a verbal response). In a conventional manual condition, subjects selected the switches with their left hand. The analysis of mean switching time suggests that eye control is a feasible alternative when hands-off control is desired. Tracking performance was found to differ significantly among switching conditions, indicating the importance of quantifying the efficiency of candidate control methods in visual workload environments analogous to that of the application environment. Author

A87-33012

NAMING COLORS ON A CRT DISPLAY IN SIMULATED DAYLIGHT

KIRK MOFFITT, STEVEN P. ROGERS, and JOSEPH CIGINELLI (Anacapa Sciences, Inc., Santa Barbara, CA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 159-163. refs
(Contract DAAB07-85-C-F036)

The use of color CRT displays in daylight conditions is accompanied by problems of visibility and discriminability. A simulator was constructed, and six experiments were conducted to measure the color-naming performance for CRT-displayed

symbols. The effects of display and daylight luminance, and symbol chromaticity, size, and shape were studied. A reciprocal relationship was found between display and daylight luminance, and models of visual performance were constructed. In addition, color metrics based on the CIE 1976 space were found to be inconsistent predictors of performance. This finding was attributed to the dependency of these measures on symbol size and chromaticity. Finally, complex interactions involving symbol chromaticity and shape were discovered, suggesting that simplistic analytical models may not be viable substitutes for empirical research. Author

A87-33013

A COMPARISON BETWEEN SPACE SUITED AND UNSUITED REACH ENVELOPES

J. H. STRAMLER (Northrop Services, Inc., Houston, TX) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 221-224.

A comparison was made for the reach capability of Shuttle space suit vs unsuited. Graphics were generated and reach envelope volumes computed. The space suit reduces the reach envelope volume from about 64 to 97 percent, depending on the type of envelope measured. Author

A87-33014

MODELING OF MANUAL HANDLING IN UNUSUAL POSTURES

J. L. SELAN, M. M. AYOUB, J. L. SMITH, H. C. CHEN, Y. H. LEE (Texas Tech University, Lubbock) et al. IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 225-229.

Subjects performed a series of psychophysical lifting tasks simulating USAF aircrew maintenance activities. The tasks involved lifting while in unusual postures: lying prone, supine, sideways, and standing. Maximum acceptable weights on the tasks were then related to performance on a series of isoinertial and isometric strength tests. High correlations were obtained between lifting task and strength test performance. Prediction models developed indicated that an isoinertial 1.8 m lift and isometric one hand pull were the best predictors of task performance. The prediction models can be used in the establishment of design weights for aircrew maintenance tasks. Author

A87-33016

MULTI-MODAL INTERFACES IN SUPERVISORY CONTROL

M. G. FORREN and C. M. MITCHELL (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 317-321. refs

The need in a supervisory control environment to develop multimodal interfaces to exploit processing resources is discussed. In the present paper, consideration is given to speech input as a means of facilitating operator interaction. The performance of operators using voice-augmented and keyboard inputs was compared on the basis of an experiment incorporating speech input into a simulated control room environment. It is shown that speech input can actually hinder the operator's control performance. K.K.

A87-33017* Analytics, Inc., Willow Grove, Pa.

EYE-VOICE-CONTROLLED INTERFACE

FLOYD A. GLENN, III, HELENE P. IAVECCHIA, LORNA V. ROSS, JAMES M. STOKES, WILLIAM J. WEILAND (Analytics, Inc., Willow Grove, PA) et al. IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 322-326. (Contract NAS7-922; NAS7-932)

The Ocular Attention-Sensing Interface System (OASIS) is an innovative human-computer interface which utilizes eye movement and voice commands to communicate messages between the operator and the system. This report initially describes some technical issues relevant to the development of such an interface.

The results of preliminary experiments which evaluate alternative eye processing algorithms and feedback techniques are presented. Candidate interface applications are also discussed. Author

A87-33018* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

RESPONSE MODALITIES AND TIME-SHARING PERFORMANCE
MICHAEL A. VIDULICH (NASA, Ames Research Center, Moffett Field, CA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 337-341. refs

An experiment performed to investigate the role of resource competition and asymmetric transfer in dual-task performance is described. It is shown that there is an advantage to mixed manual/speech response modality configurations that cannot be accounted for by asymmetric transfer. The present results support the multiple resources approach to the application of speech technology. Once speech recognition achieves an acceptable level of operational reliability, speech controls can be used to reduce resource competition and improve performance in multitask environments. K.K.

A87-33020
MAN/SYSTEM INTEGRATION STANDARDS FOR SPACE SYSTEMS

KEITH H. MILLER (Boeing Aerospace Co., Seattle, WA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 358-362.

This paper presents an overview of the Man/System Integrations Standards (MSIS) program. The standards to be developed by this program provide specific information for use in the design of space systems to ensure proper integration of the man/system interface requirements with those of other aerospace disciplines. These man/system interface requirements apply to the launch, reentry, on-orbit, and extraterrestrial space environments. Concise design considerations, design requirements, and design examples are provided. The standards are being developed with broad government and industry collaboration via a Government/Industry Advisory Group (GIAG) that meets four times with the contractor team to critique the standards as they are being developed. The documentation (released in January 1987) will consist of four hardcopy volumes, a videotape, and a relational database. The videotape uses in-space film footage from Gemini, Skylab, and the Shuttle to illustrate specific man/system integration problems (scenes are cross-referenced to the MSIS topics). The relational database provides a means for storing and manipulating the MSIS data. Author

A87-33022
HUMAN FACTORS STANDARDS FOR SPACE HABITATION

BARRY TILLMAN (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 370-373.

NASA is developing a Man/System Integration Standard. It is to be a single source for human factors engineering standards for the design and development of space habitats. Included in this paper is a discussion of the Anthropometrics, Architecture, Activity Centers, and Health Management sections of the standard. There is a brief description of the general contents of each of these sections and some of the human factors considerations that are unique to the space environment. Author

A87-33023
HUMAN ENGINEERING DESIGN STANDARDS FOR EXTRAVEHICULAR ACTIVITY IN ADVANCED SPACE PROGRAMS

NICHOLAS SHIELDS, JR. (Essex Corp., Space Systems Group, Huntsville, AL) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 374-376.

The National Aeronautics and Space Administration is currently developing the Man/Systems Integration Standard which will detail the human factors engineering design requirements for future spacecraft. Several existing standards and guidelines from the Johnson Space Center and the Marshall Space Flight Center, along with human engineering standards from the Department of Defense will be superseded by this NASA wide standard. One chapter to be included in this human engineering standard, which is not usually included in general standards, will deal with extravehicular activity (EVA) where the human wears a pressurized life support system and operates in the microgravity environment. This paper details the development and contents of the EVA portion of the new NASA Man/System Integration Standard. Author

A87-33035
A COMPARISON OF THREE METHODS FOR CONTROLLING AIRCRAFT SYSTEMS

JOHN P. ZENYUH and JOHN M. REISING (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 638-641. refs

The objective of this study was to compare the relative effectiveness of three modes of subsystem control: a voice recognition system with visual feedback presented on the head-up display, a standard multifunction control device with tailored switching logic, and a remotely operated multifunction control with feedback presented on the head-up display. Comparisons were based on measures of interference with a loading task and overall speed and accuracy of the control operations performed. The working hypothesis was that the voice system and head-up multifunction control would manifest substantially lower interference with the primary task, while subsystem control operation times would remain unaffected by control mode. The results indicate that performance with the remote touch panel was significantly poorer than with the voice or standard multifunction control systems. Author

A87-33036
COCKPIT CURSOR CONTROL - EFFECTS OF TASK LOADING AND CONTROLLER LOCATION

DANIEL R. TUFANO and J. THOMAS GWYNNE (Grumman Advanced Crew Station Laboratory, Bethpage, NY) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 642-646.

Current trends in tactical aircraft missions and avionics require two-dimensional control of a display cursor by the pilot. This study varied cursor controller location (left hand: throttle; right hand: stick grip) and task loading (concurrent flight control) in a 2 x 2 within-subjects design. Nine test pilots, seated in a laboratory cockpit mockup, used an isometric rate controller to acquire targets on a head-up display with a cursor. This task was performed either alone or concurrently with compensatory pitch/roll tracking. There were no main effects for hand used (controller location) on any performance measures, nor did this factor interact with any other. As such, there is no evidence of design constraints on cursor controller location. Task loading increased time to initiate cursor control trials by 0.5 sec (p less than 0.01) and target acquisition time by 2.2 sec (p less than 0.01). Diagonally located targets took 0.92 sec longer to acquire than targets on the vertical or horizontal axes (p less than 0.05), and were more susceptible to task loading interference (p less than 0.05). The 'diagonal problem' and task loading decrements appear to be central effects and may not be amenable to equipment design solutions. These

perceptual-motor limitations will constrain the allocation of mission functions to the display cursor, which are time-critical and must be performed during air combat maneuvers. Author

A87-33037**EXPERT SYSTEM ADVICE - HOW SHOULD IT BE GIVEN?**

ANTHONY ARETZ, AL GUARDINO, THOMAS PORTERFIELD, and JIM MCCLAIN (U.S. Air Force Academy, Colorado Springs, CO) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 652-656. USAF-supported research.

The objective of this research was to investigate different alternatives for pilot-computer interaction with a simulated expert system. Three methods of advice presentation were investigated: automatic, subject requested, and a combination of the two. Also, three experience levels of the subjects were examined: novice, intermediate, and expert. The dependent variables were total score for successful missions completed during the experimental session and average time to complete a mission. The analysis of the data revealed that the automatic condition was the best overall method for advice presentation (p less than 0.1) and the experience level of the subjects was not a significant factor. Author

A87-33039**MODELING THE COGNITIVE COMPLEXITY OF VISUAL DISPLAYS**

ROBERT G. EGGLESTON (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), RICHARD A. CHECHILE, REBECCA N. FLEISCHMAN, and ANNMARIE SASSEVILLE (Tufts University, Medford, MA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 675-678.

An approach for measuring the cognitive complexity of visual display formats is presented. The approach involves modeling both the knowledge that can be extracted from a format and the knowledge an operator brings to a task. A semantic network formalism is developed to capture task-relevant knowledge, from which four orthogonal predictor measures of cognitive complexity are derived. In an experiment, seven different avionic missions, performed with the aid of a horizontal situation display, were studied, and three of the predictor measures were found to correlate significantly with observed task difficulty. The results indicate that a semantic network formalism can be used to produce an objective metric of format quality in terms of cognitive complexity. Author

A87-33040**AN EVALUATION OF MENU SYSTEMS FOR SPACE STATION INTERFACES**

JONATHAN F. ANTIN (Virginia Polytechnic Institute and State University, Blacksburg) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 679-683. refs

Menu systems are considered in terms of their ability to meet proposed basic requirements for Space Station interfaces. The following command modes are evaluated: (1) the direct mode, in which all commands are typed on a QWERTY keyboard (2) the menu mode, and (3) the hybrid mode which presented the same menus as were displayed in the menu mode, but commands could be selected from the menu via cursor control or typed in directly. It is concluded that the menu selection dialogue may be a useful and even preferred interactive environment for all levels of users; however, it must be well designed and flexible enough to meet their many needs. K.K.

A87-33042**AN EXPERT SYSTEM APPROACH TO WORKLOAD REDUCTION**

GILBERT G. KUPERMAN and DENISE L. WILSON (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 1. Santa Monica, CA, Human Factors Society, 1986, p. 702-706. refs
(Contract F33615-82-C-0500)

A research facility for the development of rule-based, expert systems was developed. Workload reduction was selected as an application area for demonstration. The specific crew function demonstrated was the employment of a high resolution radar in a navigation update task. Author

A87-33045**OPERATOR/MANAGER CLASSIFICATION AS A PRECURSOR TO FUNCTION ALLOCATION**

DAVID P. ROBERTS and VALERIE J. GAWRON (Calspan Corp., Buffalo, NY) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 857-860.

As part of the Cockpit Automation Technology program, a procedure was developed to classify functions into operator or manager roles. The functions were derived from sample air-to-air and air-to-ground tactical missions. Each function in these missions was classified as either operator or manager roles based on the action required by the function. This procedure provided guidelines for subsequent allocation of the function to a crew member or to a machine, depending on if a man or a machine is to be in the cockpit. Author

A87-33046**HUMAN FACTORS ENGINEERING ANALYSIS OF MARINE CORPS NIGHT ATTACK AIRCRAFT**

WILLIAM A. BREITMAIER (U.S. Navy, Air Development Center, Warminster, PA), JOHN LAZO (Essex Corp., Warminster, PA), and GRACE P. WALDROP IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 861-864. refs

The U.S. Marine Corps has proposed sensor and display improvements to provide night attack capability for the AV-8B and F/A-18 aircraft. The aircraft enhancements include the addition of a Forward Looking Infrared sensor displayed on a new raster Head-Up Display, Night Vision Goggle compatibility, and a color multipurpose display. A human factors engineering analysis was performed to identify the human factors impact of the cockpit changes involved. Included in the analysis were a literature review, interviews with pilots, design considerations reviews, and development of recommendations based on both human factors standards and lessons learned from similar projects. The primary areas researched were: cockpit lighting, color displays, and night vision sensor utilization. Author

A87-33048**PLANNING FOR UNANTICIPATED SATELLITE SERVICING TELEOPERATIONS**

JOHN R. RICE, JOHN P. YORCHAK, and CRAIG S. HARTLEY (Martin Marietta Corp., Denver, CO) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 870-874. refs

The role that man will play in the space-based servicing of satellites will change with standardization and automation of such operations. If history is any indication, man cannot be completely removed from servicing duties because unanticipated servicing operations occasionally will require his direct intervention and control through either extra-vehicular activities (EVA) or teleoperations. As a result, certain minimum user-system interface capabilities must be maintained, no matter how sophisticated future technology becomes. This paper discusses research related to

some of the basic human factors problems that will probably always have an impact on space-based teleoperated servicing operations. The implicit warning is that future advanced systems must implement solutions to these problems if humans are to provide effective backup support. Furthermore, it is believed that there are several critical gaps in the present knowledge of teleoperator human factors that must be closed before such backup operations can be effective. There is a danger that system developers may become so enamored of advanced teleoperator technology that they may fail to provide an adequate user/system interface for backup operations. Human factors issues discussed include: vision systems, control devices, and communication time delays.

Author

A87-33050
USER INTERFACE DESIGN GUIDELINES FOR EXPERT TROUBLESHOOTING SYSTEMS

DAVID R. EIKE, STEPHEN A. FLEGER, and ELIZABETH R. PHILLIPS (Carlow Associates, Inc., Fairfax, VA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1024-1028. refs

This paper describes the status and preliminary results of an ongoing research project to develop and validate user interface design guidelines for expert troubleshooting systems (ETS). The project is part of a larger research program to study the application of emerging user interface technologies to the design and development of user interfaces for Space Station-era systems. The project has two separate research thrusts. The first and central thrust is to develop and validate a set of human engineering guidelines for designing the user interface of an ETS. The second thrust is to design and implement an electronic data base to manage storage and retrieval of the guidelines. This paper discusses the human factors issues that are unique to the design of a user interface for an ETS.

Author

A87-33065
ASSESSING SATELLITE CONTROL CAPABILITY STATUS

CARRIE CHRISTENSEN, JOHN F. COURTRIGHT (BDM Corp., Albuquerque, NM), and MICHAEL L. FRAZIER (USAF, Operational Test and Evaluation Center, Kirtland AFB, NM) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1234-1238. (Contract F29601-85-C-0058)

As the status of space systems move from research and development into that of full operational systems, they are subject to operational test and evaluation. The objective of this paper is to examine the performance and workload levels of the satellite control operator as an effect of downtimes, anomalies, and malfunctions, all contributors to the reliability and availability of the satellite system. These observations are based on a review of the command and control operations centers for several Department of Defense (DOD) satellites.

Author

A87-33067
SAFETY EVALUATION OF HELMET AND OTHER MASS ADDITIONS TO THE HEAD

WILLIAM H. MUZZY, III, ALVAH C. BITTNER, JR., and GILBERT C. WILLEMS (U.S. Navy, Biodynamics Laboratory, New Orleans, LA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1301-1305. refs

The biodynamic effects of helmet and other mass additions to the head have been of concern for more than two decades. The Naval Biodynamics Laboratory (NBDL) has performed a series of -X acceleration exposure experiments using Navy volunteers in which the dynamic response of the head was measured as a function of mass distribution variations. The kinematic response was measured for each subject with no mass addition, a helmet and weight-carrying frame, and a helmet with weights positioned on the frame symmetrically about the midsagittal plane. There was approximately a 30 percent addition to the head mass with

these weights. Safety monitoring procedures for this investigation illustrate: (1) Computer-based methods which may apply during helmet design; and (2) experimental procedures which may be applied to assess helmet safety test and evaluation.

Author

A87-33068
HUMAN FACTORS ENGINEERING SIMULATION METHODOLOGY

BRETT A. STOREY (Lockheed Aircraft Corp., Burbank, CA) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1306-1310. refs

This report describes a methodology of simulation research which is designed to accomplish requirements of a human factors engineering simulation, plan. This approach, accompanied by detailed test plans and schedules will fulfill the data item DI-H-7052 (Human Engineering Dynamic Simulation Plan) for intended use of dynamic simulation techniques in support of human engineering analysis, design support and test and evaluation. This methodology will cover the need for dynamic simulation, evaluation techniques, procedures and guidelines, and the behavioral, subjective and physiological methods recommended for use in human engineering evaluations.

Author

A87-33071
HUMAN FACTORS DESIGN CRITERIA FOR SPACEFLIGHT INTRAVEHICULAR CREW RESTRAINTS

RUTHAN LEWIS (Lockheed Engineering and Management Services Co., Houston, TX) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1371-1375. refs

Proper design of devices to restrain and position astronauts in microgravity is essential for working and living in space. This paper traces the development of crew restraints throughout the history of the U.S. space program. The paper also examines the functioning of various restraints in their conditions of use. Finally, design issues and recommended design guidelines for intravehicular crew restraints are identified.

Author

A87-33072* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

RECENT SPACE SHUTTLE CREW COMPARTMENT DESIGN IMPROVEMENTS

JERRY R. GOODMAN (NASA, Johnson Space Center, Houston, TX) IN: Human Factors Society, Annual Meeting, 30th, Dayton, OH, Sept. 29-Oct. 3, 1986, Proceedings. Volume 2. Santa Monica, CA, Human Factors Society, 1986, p. 1376-1380. (Contract NAS9-17436; NAS9-14000)

Significant design changes to the Space Shuttle waste management system (WMS) and its related personal hygiene support provisions (PHSP) have been made recently to improve overall operational performance and human factors interfaces. The WMS design improvements involve increased urinal flow, individual urinals, and provisions for manually compacting feces and cleanup materials to ensure adequate mission capacity. The basic arrangement and stowage of the PHSP used during waste management operations were extensively changed to better serve habitability concerns and operations needs, and to improve the hygiene of WMS operations. This paper describes these changes and the design, development, and flight test evaluation. In addition, provisions for an eighth crewmember and a new four-tier sleep station are described.

Author

A87-33313

MEASURING HELMET SOUND ATTENUATION CHARACTERISTICS USING AN ACOUSTIC MANIKIN

ELIZABETH S. IVEY (Smith College, Northampton, MA), G. PATRICK NERBONNE (Massachusetts, University, Amherst), and GILBERT C. TOLHURST Acoustical Society of America, Journal (ISSN 0001-4966), vol. 81, Feb. 1987, p. 370-375. refs
(Contract DAAK60-80-C-0100)

The sound attenuation characteristics of two military helmets were measured using an acoustic manikin as the test apparatus. The manikin results are compared to the results of attenuation measurements made on human subjects wearing identical helmets. The testing room and instrumentation were the same for both the manikin and human subjects. Procedures in ANSI S3.19-1974 were used in the real-ear attenuation at threshold (REAT) part of this study. The results are encouraging as they suggest that the manikin may be used in place of a panel of human subjects to evaluate the hearing protection characteristics of military head gear.

Author

A87-33336

G-LOC - NEW IDEAS BUT NO EASY CURES

BILL SWEETMAN Interavia (ISSN 0020-5168), vol. 42, Feb. 1987, p. 121, 122.

G-induced loss of pilot consciousness, or 'G-loc', has become a frequently encountered and not easily remediable aeromedical problem as high performance fighter maneuverability reaches the point where the body's normal defenses against high-G, such as increased heart rate and blood pressure, cannot maintain blood pressure in the brain. Upon falling below a critical level, brain blood pressure loss leads to sudden and complete loss of pilot consciousness. The USAF Armstrong Aerospace Medical Research Laboratory is approaching this problem from the standpoints of both a reduction of the G-vs.-time envelope in which it may occur, and the minimization of its consequences when it does occur despite precautionary measures. G-suits are a major focus of R&D, and attention has been given to the addition of CO₂ to the pilot's breathing air.

O.C.

A87-33389

ATMOSPHERIC POLLUTANTS IN AIRCRAFT WITH PRESSURIZED CABINS SEARCH FOR A STUDY METHOD [LES POLLUANTS ATMOSPHERIQUES DANS LES AVIONS A CABINE PRESSURISEE - RECHERCHE D'UNE METHODE D'ETUDE]

V. H. DEMARIA PESCE and C. REMONDON (Institut National de la Sante et de la Recherche Medicale, Le Vesinet, France) Medecine Aeronautique et Spatiale, vol. 25, 4th Quarter, 1986, p. 294-298. In French. refs

Sources of air pollution (atmospheric, human, and aircraft-related) in aircraft with pressurized cabins are examined, and a method for the study of atmospheric pollutants, based on a physicochemical analysis of various environmental and biomedical parameters, is proposed. The pressurization, climatization, and ventilation of the cabin environment are first considered, following which the human physiological constraints related to the normal flight environment are discussed. It is suggested that a method based on the advantages of each of the three current areas of pollution-related research (epidemiological research, animal experimentation, and the in vitro study of noxious substances) be used to better understand the action mechanisms of the different pollutants.

R.R.

A87-33395

PILOT SEAT INCLINATION - ADVANTAGE AND LIMITS [L'INCLINAISON DU SIEGE PILOTE - INTERET ET LIMITES]

J. L. POIRIER, J. M. CLERE, and H. VIEILLEFOND Medecine Aeronautique et Spatiale, vol. 25, 4th Quarter, 1986, p. 318-323. In French. refs

The reduction of the hydrostatic column value (represented by the heart-brain distance) by the reduction of the cosine of the inclination angle of the pilot seat is investigated, with application to minimizing the acceleration effects experienced by fighter pilots. An experiment using angles of inclination between 30 and 60 deg

and accelerations up to 9 Gz demonstrates the protection from acceleration provided by increased angle, though problems associated with the optimum angle of 60 deg, including the difficulty of pilot ejection and the obscuration of vision, make this solution nonoptimum. The effectiveness of pressure pants as a function of increased pressure gradient is found to improve with seat inclination.

R.R.

A87-33475

LIVING IN SPACE: A HANDBOOK FOR SPACE TRAVELLERS

PETER SMOLDERS (Wonen in de ruimte, Bussum, Netherlands, Unieboek, 1985) Blue Ridge Summit, PA, Tab/Aero, 1986, 159 p. Translation.

The state of the art in manned space flight as of 1985 is surveyed and illustrated with extensive drawings and photographs, with an emphasis on the on-orbit living conditions and activities of astronauts on the Space Shuttle and the planned Space Station. Consideration is given to the Shuttle launch facilities; the Shuttle Orbiter; a typical mission profile; the habitat modules for the Space Station; eating, drinking, sleeping, etc. in space; space manufacturing; past Salyut, Skylab, and Spacelab missions; and proposals for colonizing the moon, Mars, and Venus.

T.K.

A87-33528* Technion - Israel Inst. of Tech., Haifa.

WORKLOAD - AN EXAMINATION OF THE CONCEPT

DANIEL GOPHER (Technion - Israel Institute of Technology, Haifa) and EMANUEL DONCHIN (Illinois, University, Champaign) IN: Handbook of perception and human performance. Volume 2. New York, Wiley-Interscience, 1986, p. 41-1 to 41-49. USAF-Navy-DARPA-supported research. refs.

(Contract NAGW-494)

The relations between task difficulty and workload and workload and performance are examined. The architecture and limitations of the central processor are discussed. Various procedures for measuring workload are described and evaluated. Consideration is given to normative and descriptive approaches; subjective, performance, and arousal measures; performance operating characteristics; and psychophysiological measures of workload.

I.F.

A87-33529

WORKLOAD ASSESSMENT METHODOLOGY

ROBERT D. O'DONNELL (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) and F. THOMAS EGGEMEIER (Wright State University; Systems Research Laboratories, Inc., Dayton, OH) IN: Handbook of perception and human performance. Volume 2. New York, Wiley-Interscience, 1986, p. 42-1 to 42-49. refs

(Contract F33615-82-K-0522)

Various methods for evaluating workload are described. The criteria for selecting a workload assessment technique include: sensitivity, diagnosticity, primary task intrusion, implementation requirements, and operator acceptance. Subjective workload assessment techniques are examined. Consideration is given to primary and secondary task measures. Physiological measures, such as brain, eye, cardiac, and muscle functions, are discussed.

I.F.

A87-33531

CHANGES IN OPERATOR EFFICIENCY AS A FUNCTION OF ENVIRONMENTAL STRESS, FATIGUE, AND CIRCADIAN RHYTHMS

GLYN ROBERT JOHN HOCKEY (Sheffield, University, England) IN: Handbook of perception and human performance. Volume 2. New York, Wiley-Interscience, 1986, p. 44-1 to 44-49. refs

The effects of physical stressors, social stress, drugs, fatigue states, and cyclical changes on performance are studied. The stress state variables are examined in terms of information-processing models and the arousal theory. Consideration is given to evaluating the influences of impulse, intermittent, and continuous noise; heat effects; incentives; anxiety; stimulants; depressants; boredom; fatigue; and sleep disturbances on performance. The characteristics of bodily rhythms, diurnal

variations in performance, adaptation to altered schedules, and non-24-hour periodicities are analyzed. Performance response to multiple stresses and factors which help to alleviate stress are investigated. The need for a taxonomy of performance, field testing, and the consideration of coping strategies is discussed. I.F.

A87-33532

THE MODEL HUMAN PROCESSOR - AN ENGINEERING MODEL OF HUMAN PERFORMANCE

STUART K. CARD, THOMAS P. MORAN (Xerox Research Center, Palo Alto, CA), and ALLEN NEWELL (Carnegie-Mellon University, Pittsburgh, PA) IN: Handbook of perception and human performance. Volume 2. New York, Wiley-Interscience, 1986, p. 45-1 to 45-35. refs

A human processor model of the human mind is proposed. The model is composed of a set of memories and processors combined with a set of operating principles, and it represents three interacting subsystems. The functions of the perceptual, motor, and cognitive systems are described. Consideration is given to the performance of tasks such as perception, motor skill, simple decision, learning and retrieval, and problem solving; examples of these tasks are presented. The limitations of the human processor model are discussed. I.F.

A87-33867*# National Aeronautics and Space Administration, Washington, D.C.

OVERVIEW OF THE NASA AUTOMATION AND ROBOTICS RESEARCH PROGRAM

LEE HOLCOMB and RON LARSEN (NASA, Washington, DC) IN: Association for Unmanned Vehicle Systems; Annual Meeting, 12th, Anaheim, CA, July 15-17, 1985, Preliminary Proceedings. Washington, DC, Association for Unmanned Vehicle Systems, 1985, 20 p. refs

NASA studies over the last eight years have identified five opportunities for the application of automation and robotics technology: (1) satellite servicing; (2) system monitoring, control, sequencing and diagnosis; (3) space manufacturing; (4) space structure assembly; and (5) planetary rovers. The development of these opportunities entails two technology R&D thrusts: telerobotics and system autonomy; both encompass such concerns as operator interface, task planning and reasoning, control execution, sensing, and systems integration. O.C.

A87-34579* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

QUANTITATIVE EVALUATION OF PERSPECTIVE AND STEREOSCOPIC DISPLAYS IN THREE-AXIS MANUAL TRACKING TASKS

STEPHEN R. ELLIS (NASA, Ames Research Center, Moffett Field; California, University, Berkeley), MITCHELLE E. TYLER, BLAKE HANNAFORD, LAWRENCE W. STARK, and WON S. KIM (California, University, Berkeley) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. SMC-17, Jan.-Feb. 1987, p. 61-72. refs
(Contract NCC2-86)

Optimal presentation of three-dimensional information on a two-dimensional display screen requires careful design of the projection to the display surface. Monoscopic perspective projection alone is usually not sufficient to represent three-dimensional spatial information. It can, however, be improved by the adjustment of perspective parameters and by geometric visual enhancements such as reference lines and a background grid. Stereoscopic display is another method of providing three-dimensional information to the human operator. Two experiments are performed with three-axis manual tracking tasks. The first experiment investigates the effects of perspective parameters on tracking performance. The second experiment investigates the effects of visual enhancements for both monoscopic and stereoscopic displays. Results indicate that, although stereoscopic displays do generally permit superior tracking performance, monoscopic displays can allow equivalent performance when they are defined with optimal perspective parameters and provided with adequate visual enhancements.

Author

A87-34775* California Univ., Berkeley.

TELEROBOTICS - DISPLAY, CONTROL, AND COMMUNICATION PROBLEMS

LAWRENCE STARK, WON-SOO KIM, FRANK TENDICK, BLAKE HANNAFORD, STEPHEN ELLIS (California, University, Berkeley) et al. IEEE Journal of Robotics and Automation (ISSN 0882-4967), vol. RA-3, Feb. 1987, p. 67-75. refs
(Contract NCC2-86; JPL-956873)

An experimental telerobotics simulation is described suitable for studying human operator (HO) performance. Simple manipulator pick-and-place and tracking tasks allowed quantitative comparison of a number of calligraphic display viewing conditions. An enhanced perspective display was effective with a reference line from target to base, with or without a complex three-dimensional grid framing the view. This was true especially if geometrical display parameters such as azimuth and elevation were arranged to be near optimal. Quantitative comparisons were made possible, utilizing control performance measures such as root mean square error. There was a distinct preference for controlling the manipulator in end-effector Cartesian space for the primitive pick-and-place task, rather than controlling joint angles and then, via direct kinematics, the end-effector position. An introduced communication delay was found to produce decrease in performance. In considerable part, this difficulty could be compensated for by preview control information. The fact that neurological control of normal human movement contains a sampled data period of 0.2 s may relate to this robustness of HO control to delay. Author

N87-20736# Joint Publications Research Service, Arlington, Va.
OPERATOR WORK CAPACITY IN TRACKING SYSTEM WHEN SUBMITTED TO ANTIORTHOSTATIC HYPOKINESIA

L. S. KHACHATURYANTS and A. K. YEPISHKIN *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 3, May - Jun. 1986 (JPRS-USB-86-005) p 46-51 15 Aug. 1986
Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 3, May Jun. 1986 p 36-39

Avail: NTIS HC A08/MF A01

It is shown that the work capacity of head-down tilted operators performing sensorimotor pursuit depends on the health of their central nervous system (CNS). The operators who react to the exposure showing moderate predominance of excitation processes display the best work capacity. Author

N87-20748 Department of the Navy, Washington, D. C.
AUTOMATED ANTHROPOMETRIC DATA MEASUREMENT SYSTEM Patent

WILLIAM F. MORONEY, inventor (to Navy), JAMES C. BARTHOLOMEW, inventor (to Navy), CLIFFORD M. CAGLE, inventor (to Navy), and ROBERT E. HUGHES, inventor (to Navy) 5 Aug. 1986 8 p Supersedes N86-33017, AD-D012299 (24 - 24, p 3777)

(AD-D012575; US-PATENT-4,603,486; US-PATENT-APPL-SN-788371; US-PATENT-CLASS-33-512)

Avail: US Patent and Trademark Office CSCL 06N

An automated anthropometric data measurement system is described which includes a standing measuring assembly and a seated measuring assembly to determine pertinent anthropometric features of aviators being screened for assignment to particularly suitable aircraft. Both assemblies have a plurality of position sensors and measuring probes which are selectively placed by an operator upon the aviator, each measuring probe producing a digital data signal indicative of the particular feature measured when selective position sensors indicate body contact. The signals are then collected by a microcomputer which compares them to a predetermined population and outputs the compared data to magnetic storage media. GRA

N87-20749# Oak Ridge National Lab., Tenn.
**INTEGRATED DIGITAL CONTROL AND MAN-MACHINE
 INTERFACE FOR COMPLEX REMOTE HANDLING SYSTEMS**

J. C. ROWE, R. F. SPILLE, and S. D. ZIMMERMANN Dec. 1986
 24 p Presented at the International Topical Meeting on Remote
 Systems and Robotics in Hostile Environments, Pasco, Wash., 29
 Mar. 1987

(Contract DE-AC05-84OR-21400)
 (DE87-003002; CONF-870301-7) Avail: NTIS HC A02/MF A01

The Advanced Integrated Maintenance System (AIMS) is part
 of a continuing effort within the Consolidated Fuel Reprocessing
 Program at Oak Ridge National Laboratory to develop and extend
 the capabilities of remote manipulation and maintenance
 technology. The AIMS is a totally integrated approach to remote
 handling in hazardous environments. State-of-the-art computer
 systems connected through a high-speed communication network
 provide a real-time distributed control system that supports the
 flexibility and expandability needed for large integrated maintenance
 applications. A Man-Machine Interface provides high-level human
 interaction through a powerful color graphics menu-controlled
 operator console. An auxiliary control system handles the real-time
 processing needs for a variety of support hardware. A pair of
 dedicated fiber-optic-linked master/slave computer system control
 the Advanced Servomanipulator master/slave arms using powerful
 distributed digital processing methods. The FORTH language was
 used as a real-time operating and development environment for
 the entire system, and all of these components are integrated
 into a control room concept that represents the latest
 advancements in the development of remote maintenance facilities
 for hazardous environments. DOE

N87-20750# Oak Ridge National Lab., Tenn.
**ADVANCED REMOTE HANDLING FOR FUTURE APPLICA-
 TIONS: THE ADVANCED INTEGRATED MAINTENANCE SYS-
 TEM**

J. N. HERNDON, C. T. KRING, and J. C. ROWE 1986 26 p
 Presented at the International Topical Meeting on Remote Systems
 and Robotics in Hostile Environments, Pasco, Wash., 29 Mar.
 1987

(Contract DE-AC05-84OR-21400)
 (DE87-003004; CONF-870301-5) Avail: NTIS HC A03/MF A01

The Consolidated Fuel Reprocessing Program at Oak Ridge
 National Laboratory has been developing advanced techniques
 for remote maintenance of future US fuel reprocessing plants.
 The developed technology has a wide spectrum of application for
 other hazardous environments. These efforts are based on the
 application of teleoperated, force-reflecting servomanipulators for
 dexterous remote handling with television viewing for large-volume
 hazardous applications. These developments fully address the
 nonrepetitive nature of remote maintenance in the unstructured
 environments encountered in fuel reprocessing. This paper covers
 the primary emphasis in the present program; the design,
 fabrication, installation, and operation of a prototype remote
 handling system for reprocessing applications, the Advanced
 Integrated Maintenance System. DOE

N87-20751# Joint Publications Research Service, Arlington, Va.
**USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND
 BEHAVIORAL SCIENCES**

10 Feb. 1987 86 p Transl. into ENGLISH from various Russian
 articles

(JPRS-UBB-87-003) Avail: NTIS HC A05/MF A01

Topics addressed include: agrotechnology; biochemistry;
 radiation biology; psychology; public health; physiology;
 pharmacology and toxicology; microbiology; medicine; laser
 bioeffects; immunology; genetics; epidemiology; and
 environments.

N87-20752# Joint Publications Research Service, Arlington, Va.
**INVESTIGATION OF MICROSTRUCTURE OF ARBITRARY
 MOTIONS OF OPERATOR**

G. G. TSULAYA, M. V. KHVINGIYA, I. F. CHEKIRDA, and V. V.
 DANILOVTSSEV *In its* USSR Report: Life Sciences. Biomedical
 and Behavioral Sciences (JPRS-UBB-87-003) p 16-19 10 Feb.
 1987 Transl. into ENGLISH from Soobshcheniya Akademii Nauk
 Gruzinskoy SSR (Tbilisi, USSR), v. 121, no. 2, Feb. 1986 p
 369-372

Avail: NTIS HC A05/MF A01

Under normal conditions, alternating micromotor processes are
 inherent to the human body in any physiological and functional
 state. These processes are mainly connected with changes in the
 joint angle (physiological tremor). The purpose of the present
 research is to study the spectral composition of a tremor and the
 microstructure of random motions connected with the control tasks
 of an operator. Operator activity tasks involved the execution of
 multidimensional tracking of a dynamic object with different dynamic
 characteristics. It was shown that the activity of an operator
 executing a control process is accompanied by tremors and
 microoscillations during any conscious movement. The tremors
 correspond to a fixed position or a shift of the control stick. In
 addition, these oscillations embrace a wide frequency spectrum
 with a changing frequency and amplitude of the harmonics. There
 is every basis to propose that the oscillations depend on the
 physiological and psychological states of the operator. B.G.

N87-21575# Joint Publications Research Service, Arlington, Va.
**DERIVATION OF WORKING EQUATIONS OF
 CO₂-CO-H₂O-H₂-N₂ GAS MIXTURE FOR CATHODE SPACE OF
 ELECTROLYZER WITH SOLID ELECTROLYTE WITH
 CONSIDERATION OF EXTRACTED OXYGEN**

B. G. GRISHAYENKOV, V. K. VASILYEV, N. G. ZORINA, and A.
 K. ZHUKOV *In its* USSR Report: Space Biology and Aerospace
 Medicine, Vol. 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p
 111-116 19 Mar. 1987 Transl. into ENGLISH from
 Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow,
 USSR), v. 20, no. 6, Nov. - Dec. 1986 p 76-79

Avail: NTIS HC A01/MF A01

Equations of thermodynamic equilibrium of the gas mixture
 CO₂-CO-H₂O-H₂-N₂ for the cathode space of the electrolyzer
 containing a solid electrolyte with extracted oxygen taken into
 consideration were derived. Equilibrium partial gas pressures,
 thermal effect of reactions, theoretical voltage of dissociation (the
 system of equations included 11 unknown parameters) were
 determined. These parameters are functions of temperature, total
 pressure of the gas mixture, initial gas composition, and the
 coefficient characterizing the degree of oxygen transfer from the
 cathode cell to the anode cell of the electrolyzer. Author

N87-21576# Joint Publications Research Service, Arlington, Va.
**CALCULATION OF EQUILIBRATED CONCENTRATIONS OF
 CONSTITUENTS OF CO₂-CO-H₂O-H₂-N₂ GAS MIXTURE FOR
 CATHODE SPACE OF ELECTROLYZER WITH SOLID
 ELECTROLYTE AND CORRESPONDING VALUES OF
 THEORETICAL VOLTAGE OF DISSOCIATION**

B. G. GRISHAYENKOV, N. G. ZORINA, and V. K. VASILYEV *In
 its* USSR Report: Space Biology and Aerospace Medicine, Vol.
 20, No. 6, Nov. - Dec. 1986 (JPRS-USB-87-001) p 117-120 19
 Mar. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya
 i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 6,
 Nov. - Dec. 1986 p 79-81

Avail: NTIS HC A01/MF A01

Calculation of thermodynamic equilibrium of a
 CO₂-CO-H₂O-H₂-N₂ gas mixture in the cathode space of an
 electrolyzer with solid electrolyte shows that theoretical voltage of
 dissociation of gas mixture $E_{sub t}$ as a function of oxygen content
 of the mixture $(O/C+H) - (\epsilon_{sub n})$ is represented by
 S-shaped curves for all tested temperatures. Elevation of
 electrolyzer temperature shifts the curves in the direction of decline
 of theoretical dissociation voltage, without changing their
 appearance. An increase in $(H/C)_{sup 00}$ causes insignificant shift

(0.018 V) of theoretical dissociation voltage at all tested temperatures. Author

N87-21584*# Elore Corp., Palo Alto, Calif.
IMPACT VERIFICATION OF SPACE SUIT DESIGN FOR SPACE STATION

RICHARD H. FISH 12 May 1987 16 p
 (Contract NCC2-347)
 (NASA-CR-180456; NAS 1.26:180456) Avail: NTIS HC A02/MF A01 CSCL 06Q

The ballistic limits of single sheet and double sheet structures made of 6061 T6 Aluminum of 1.8 mm and larger nominal thickness were investigated for projectiles of 1.5 mm diameter fired in the Vertical Gun Range Test Facility and NASA Ames Research Center. The hole diameters and sheet deformation behavior were studied for various ratios of sheet spacing to projectile diameter. The results indicate that for projectiles of less than 1.5 mm diameter the ballistic limit exceeds the nominal 10 km/sec orbital debris encounter velocity, if a single-sheet suit of 1.8 mm thickness is behind a single bumper sheet of 1 mm thickness spaced 12.5 mm apart. Author

N87-21585*# Southern California Inst. of Architecture, Santa Monica. Inst. for Future Studies.

SPACE STATION GROUP ACTIVITIES HABITABILITY MODULE STUDY Final Report

DAVID NIXON Washington NASA 1986 109 p
 (Contract NCC2-356)
 (NASA-CR-4010; NAS 1.26:4010) Avail: NTIS HC A06/MF A01 CSCL 06K

This study explores and analyzes architectural design approaches for the interior of the Space Station Habitability Module (originally defined as Habitability Module 1 in Space Station Reference Configuration Description, JSC-19989, August 1984). In the Research Phase, architectural program and habitability design guidelines are specified. In the Schematic Design Phase, a range of alternative concepts is described and illustrated with drawings, scale-model photographs and design analysis evaluations. Recommendations are presented on the internal architectural, configuration of the Space Station Habitability Module for such functions as the wardroom, galley, exercise facility, library and station control work station. The models show full design configurations for on-orbit performance. Author

N87-21586# Anacapa Sciences, Inc., Fort Rucker, Ala.
HUMAN FACTORS RESEARCH IN AIRCREW PERFORMANCE AND TRAINING Annual Summary Report, Sep. 1983 - Aug. 1984

KENNETH D. CROSS Nov. 1986 139 p
 (Contract MDA903-81-C-0504; DA PROJ. 2Q2-63731-A-792; DA PROJ. 2Q2-63739-A-793)
 (AD-A176099; ASI-479-061-84; ARI-RN-86-97) Avail: NTIS HC A07/MF A01 CSCL 05I

This report presents a summary of the work performed by Anacapa Sciences, Inc. (ASI) for the Army Research Institute (ARI) Field Unit at Fort Rucker Alabama, under the contract Human Factors Research in Aircrew Performance and Training. This research note contains summary descriptions of each of the projects on which ASI personnel worked during the third contract year -- September 1983 to August 1984. Each summary description contains: a background section that described the rationale for the research and the research objectives; a research approach section that described the tasks and activities required to fulfill the project objectives; and a project status section that describes the work completed, the preliminary findings (if available), and the anticipated project completion date. GRA

N87-21587# Naval Air Development Center, Warminster, Pa.
CENTRIFUGE TESTING OF A G COMPENSATED/PRESSURE DEMAND OXYGEN REGULATOR Interim Report
 PHILIP E. WHITLEY and LEONID HREBIEN Apr. 1986 13 p
 (AD-A176117; NADC-86139-60) Avail: NTIS HC A02/MF A01 CSCL 06K

Six subjects were exposed to unassisted positive pressure breathing at levels not exceeding 30 mmHg breathing pressure while riding on a centrifuge. Acceleration in the +Gz direction was applied as either a ramp or a plateau and conditions ranged from relaxed to unassisted positive pressure breathing with an anti-G suit. The purpose of this study was to evaluate the performance of a G compensated positive pressure breathing regulator with respect to stated output pressure versus +Gz level, the pressure control concept/schedule employed, and subject acceleration tolerance. The regulator was found to perform as stated given the pressure range of interest and the experimental conditions. The pressure control concept/schedule and acceleration tolerance were related factors. It was found that the subjects who rode to higher =Gz levels received higher levels of breathing pressure and in turn an increase in acceleration tolerance. GRA

N87-21588# Analytics, Inc., Willow Grove, Pa.
THEORETICAL DEVELOPMENT FOR IDENTIFYING UNDERLYING INTERNAL PROCESSES. VOLUME 1. THE THEORY OF UNDERLYING INTERNAL PROCESSES Interim Report

R. J. WHERRY, JR. Aug. 1986 74 p
 (Contract N62269-82-D-0131; PROJ. WR0-4210)
 (AD-A176466; NAMRL-SR-86-1; NADC-86105-60-VOL-1) Avail: NTIS HC A04/MF A01 CSCL 05E

The theory of Underlying Internal Processes (UIPs) is basically a framework for discussing possible causes of good and poor human task performance and discovering what internal processes may underlie that behavior. The theory assumes speed and accuracy of task performance is a direct result of the speed and accuracy of the various internal processes being used during the performance of that particular task. The UIP theory requires no arbitrary distinction between various traditionally recognized process categories (e.g., sensory perceptual, cognitive, memory, or motor). Nor is the theory directly concerned with either the site of, or the mechanisms needed for, the internal processes. It may well be that the UIP theory will be useful in addressing these concerns, but the theory is primarily concerned with identifying the number and nature of the different internal processes involved in the performance of various tasks. GRA

N87-21589# Navy Personnel Research and Development Center, San Diego, Calif.
FY86 INDEPENDENT RESEARCH/INDEPENDENT EXPLORATORY DEVELOPMENT Annual Special Report, Oct. 1985 - Sep. 1986

ALICE M. CRAWFORD and MARGEN H. METCALFE Jan. 1987 65 p
 (AD-A176944; NPRDC-SR-87-1) Avail: NTIS HC A04/MF A01 CSCL 05I

This report provides summaries of FY86 Independent Research (IR) and Independent Exploratory Development (IED) efforts and the IR/IED funding profile, and presentations and publications based on IR/IED efforts. The following IR efforts are described: models for calibrating multiple-choice items, enhancing approaches to multiple objective assignment, performance on computer-based cognitive task, knowledge and process in adult language competence, analysis of cognition in natural settings, and brain mechanisms for human color vision. The following IED efforts are described: development of graphic design aids, trend analysis for real-time stochastic problems, and changes in cognitive structures training. GRA

N87-21590# Atomic Energy of Canada Ltd., Pinawa (Manitoba).
Nuclear Research Establishment.

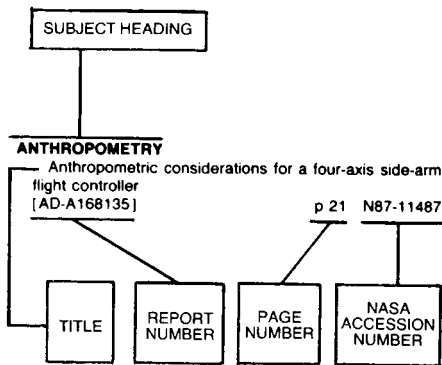
**EWAM: A MODEL FOR PREDICTING FOOD AND WATER
INGESTION, AND INHALATION RATES OF MAN**

R. ZACH and J. W. BARNARD Sep. 1985 59 p
(DE86-900117; AECL-8401) Avail: NTIS (US Sales Only) HC
A04/MF A01

A computer model, EWAM (Energy, Water and Air Model), was designed and implemented for predicting food and water ingestion, and inhalation rates of man for use in environmental assessment models. EWAM uses physiological, energetic, nutritional and physical relationships in combination with activity time budgets, and mass and energy balances. The calculated ingestion and inhalation rates are closely related. Various age and sex classes of man are taken into account. EWAM is best described as a deterministic equilibrium or steady state model, operating on a daily time scale with both detailed research and more general assessment model features. The parameters of EWAM are reviewed and suitable values recommended to allow biologically meaningful predictions.

DOE

Typical Subject Index Listing



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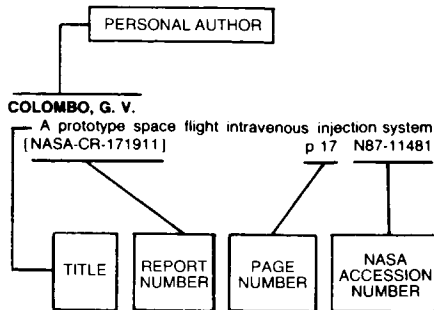
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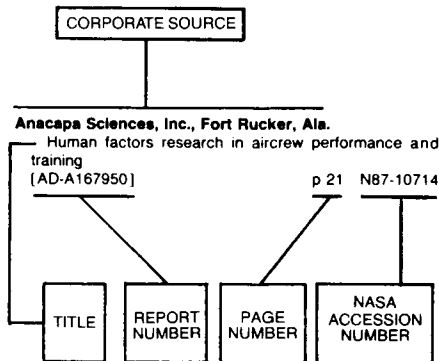
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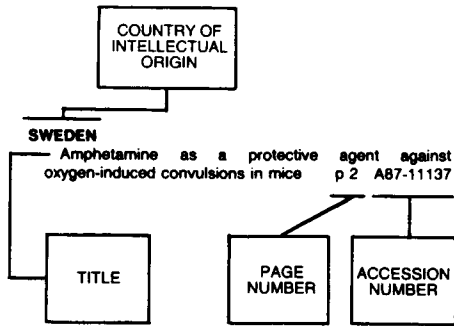
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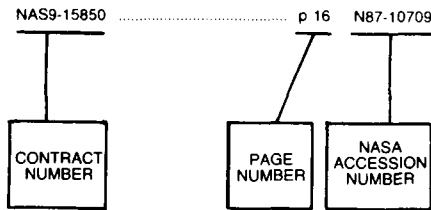
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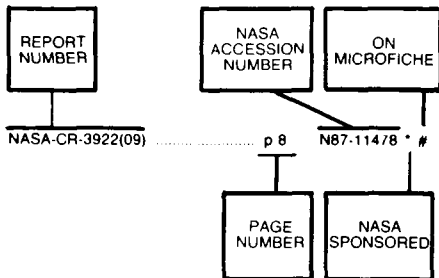
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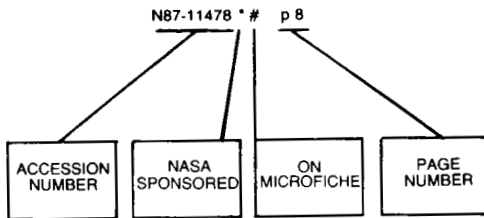
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