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Aerospace Medicine and Biology
A Continuing Bibliography with Indexes

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NASA SP-7011(303)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 303)

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 October 1987 in

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

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 187 reports, articles and other documents announced during October 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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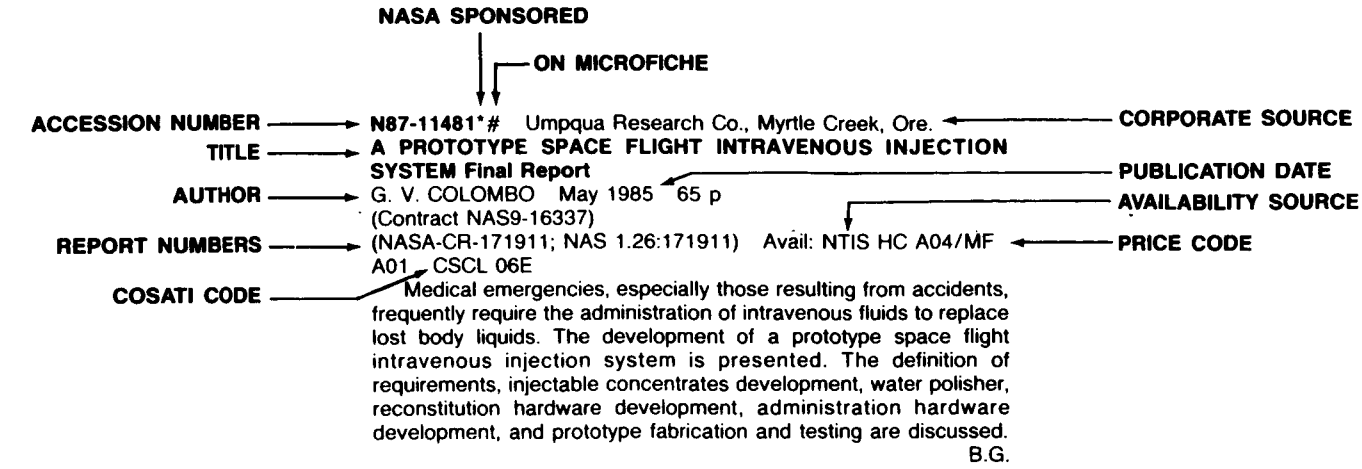
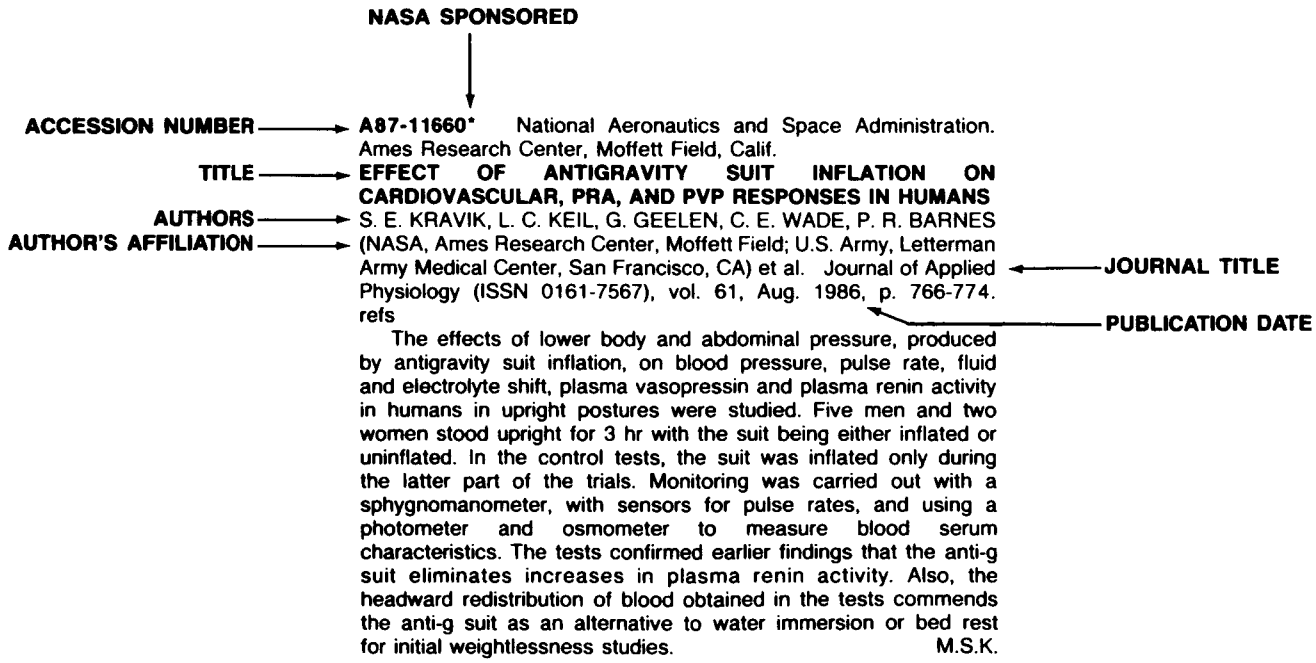
TYPICAL REPORT CITATION AND ABSTRACT



TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 303)

NOVEMBER 1987

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LIFE SCIENCES (GENERAL)

Includes genetics.

A87-43295
ENTRAINMENT OF RESPIRATORY FREQUENCY TO EXERCISE RHYTHM DURING HYPOXIA
DAVID J. PATERSON, GRAEME A. WOOD, ROBERT N. MARSHALL, ALAN R. MORTON, and A. B. C. HARRISON (Western Australia, University, Nedlands) Journal of Applied Physiology (ISSN 0161-7567), vol. 62, May 1987, p. 1767-1771. refs

The effect of hypoxia during exercise on the relationship of breathing frequency (f) to rhythmic limb movement (entrainment) was studied in Nepalese porters tested during a 4-week ascent in Himalayas to the altitude of 5,030 m, recording the breathing and gait signals on an FM tape. In addition, seven subjects were tested on a treadmill run in the atmospheres of O2/N2 mixtures with diminishing O2 content; the expired gas was analyzed for O2 and CO2, and the heart rate was simultaneously measured by ECG. The relationships between signals were determined from the Fourier analysis. In both studies, the entrainment was subharmonic, with the ratio 2:1 being the most common integer-multiple. The entrainment decreased linearly during increasing hypoxia. Moreover, a significant linear increase in f occurred during hypoxia, whereas stride frequency and metabolic rate remained constant, suggesting that the observed increases in f lowered the degree of entrainment. I.S.

A87-43296
CONSUMPTION OF PLATELETS IN DECOMPRESSION SICKNESS OF RABBITS
K. TANOUE, Y. MANO, K. KUROIWA, H. SUZUKI, M. SHIBAYAMA (Tokyo Metropolitan Institute of Medical Science; Tokyo Medical and Dental University, Japan) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 62, May 1987, p. 1772-1779. refs

Changes in platelet behavior due to decompression sickness were studied in rabbits exposed to 6 ATA followed by rapid decompression. Blood was sampled by means of an elastic catheter, and the platelet counts, volume, morphological changes, and the contents of ADP and ATP were determined before the experiment, during the high-pressure exposure, and after decompression. The platelet survival time was examined using In-111-oxine-labeled platelets. Decompression was found to bring about decreases in platelet count and shortened survival rates, and decreases in whole and releasable contents of adenine nucleotides. Platelet trombi were found in pulmonary arteries, together with the accumulation of radioactivity found in this tissue by autoradiography. There was also a transient appearance in blood of circulating fragmented platelets. The findings suggest that circulating air bubbles interact with platelets causing the platelet release reaction and the formation of platelet trombi. I.S.

A87-43297
REDUCTION IN METABOLIC HEAT PRODUCTION DURING EXPOSURE TO RADIO-FREQUENCY RADIATION IN THE RAT
CHRISTOPHER J. GORDON (EPA, Health Effects Research Laboratory, Research Triangle Park, NC) Journal of Applied Physiology (ISSN 0161-7567), vol. 62, May 1987, p. 1814-1818. refs

The effect of deep-penetrating radio frequency (RF) radiation on the thermoregulatory control was studied in rats maintained at an ambient temperature of 10 C and exposed to 600-MHz radiation in a cage placed inside a waveguide; the waveguide-type system permitted continuous control of specific absorption rate (SAR). Metabolic rate (MR) was measured by indirect calorimetry. Exposure at a SAR of 2-5 W/kg was found to cause significant reduction in MR, which accounted for about 37 percent of the total RF heat load. There was also a clear trend for an increase of colonic temperature with increasing SAR, indicating that the response time and the efficiency of MR response were not adequate to prevent an increase in body temperature. I.S.

A87-43298
CAROTID BODY CHEMOSENSORY FUNCTION IN PROLONGED NORMOBARIC HYPEROXIA IN THE CAT
S. LAHIRI, E. MULLIGAN, S. ANDRONIKOU, M. SHIRAHATA, and A. MOKASHI (Pennsylvania, University, Philadelphia) Journal of Applied Physiology (ISSN 0161-7567), vol. 62, May 1987, p. 1924-1931. refs
(Contract NIH-HL-19737-11; NIH-5-T-32-HL-07027)

A87-43595
THE CHARACTERISTICS OF CYANIDE-SENSITIVE AND CYANIDE-RESISTANT RESPIRATION IN THE BRAIN IN THE PRESENCE OF MYOCARDIAL NECROSIS AND THE ROLE OF EMOTIONAL STRESS IN THEIR ORIGIN [OSOBENNOSTI TSIANIDCHUVSTVITEL'NOGO I TSIANIDREZISTENTNOGO DYKHANIIA V MOZGU PRI NEKROZE MIOKARDA I ZNACHENIE EMOTSIONAL'NOGO STRESSA V IKH VOZNIKNOVENII]
V. V. DAVYDOV and V. S. IAKUSHEV (Zaporozhskii Gosudarstvennyi Meditsinskii Institut, Zaporozhe, Ukrainian SSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 33, Mar.-Apr. 1987, p. 69-72. In Russian. refs

The effect of emotional stress preceding the onset of myocardial damage on the functions of cyanide-sensitive (mitochondrial) and cyanide-resistant (microsomal) respiration in brain homogenates was studied using rats with experimental ischemic myocardial necrosis. The respiration reactions were measured by the rates of oxygen uptake with succinate, malate, NADH, and NADPH as substrates. It was found that in the brain homogenates from rats subjected to miocardial necrosis alone, the respiration rates in the presence and in the absence of cyanide were similar to those measured in homogenates from intact controls. On the other hand, the development of ischemic myocardial necrosis after emotional stress was accompanied by a decrease in the mitochondrial respiration rate and an increase in the microsomal respiration rate, suggesting that the stress factor plays a significant role in the adaptation reactions of an organism subjected to myocardial damage. I.S.

A87-43596
THE STATE OF THE KALLIKREIN-KININE SYSTEM AND THE ANTIPROTEINASE ACTIVITY IN RAT BLOOD UNDER THE EFFECT OF A WEAK LOW-FREQUENCY MAGNETIC FIELD [SOSTOIANIE KALLIKREINKININOVOI SISTEMY I ANTIPROTEINAZNOI AKTIVNOSTI KROVI KRYS PRI DEISTVII SLABOGO NIZKOCHASTOTNOGO MAGNITNOGO POLIA]
A. V. KUBYSHKIN (Institut Fizicheskikh Metodov Lecheniia i Meditsinskoi Klimatologii, Yalta, Ukrainian SSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 33, Mar.-Apr. 1987, p. 87-89. In Russian. refs

A87-43681
INVESTIGATION OF THE FUNCTIONAL AND MORPHOLOGICAL CHARACTERISTICS OF THE PHOTOSYNTHETIC APPARATUS IN PEA SPROUTS CULTIVATED FOR 42 DAYS ABOARD THE SALYUT-7 STATION [ISSLEDOVANIE FUNKTSIONAL'NYKH I MORFILOGICHESKIKH OSOBENNOSTEI FOTOSINTETICHESKOGO APPARATA PROROSTKOV GOROKHA, V TECHENIE 42 SUTOK, KUL'TIVIRUEMYKH NA STANTSII'SALIUT-7']
Z. K. ABILOV, A. A. ALIEV, A. L. MASHINSKII, and U. K. ALEKPEROV (AN ASSR, Institut Botaniki, Baku, Azerbaidzhan SSR) Akademiia Nauk Azerbaidzhanskoi SSR, Doklady (ISSN 0002-3078), vol. 42, no. 8, 1986, p. 68-71. In Russian. refs

The effect of weightlessness on the structure and physiology of the chloroplasts in leaves of pea sprouts cultivated aboard the Salyut-7 station was investigated using electron microscopy and fluorescence measurements. Compared with ground controls, the space-grown sprouts contained more chlorophyll (by a factor of 1.67). Their chlorophyll spectra have exhibited a shift of the low-temperature fluorescence that indicated a relative increase of aggregated forms. Microscopic examinations showed vesiculation, stratification, and other modifications in the granum thylakoid system of chloroplasts. I.S.

A87-44087* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CARDIOVASCULAR RESULTS FROM A RHESUS MONKEY FLOWN ABOARD THE COSMOS 1514 SPACEFLIGHT
H. SANDLER, J. HINES, B. A. BENJAMIN, B. M. HALPRYN (NASA, Ames Research Center, Moffett Field, CA), V. P. KROTOV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 529-536. refs

The results of the Cosmos 1514 cardiovascular experiment, in which the blood flow to the head and the carotid pressure of a rhesus monkey were measured during the 5-d spaceflight, are reported. A single cylindrical probe containing both pressure and flow transducers was chronically implanted as a cuff around the left common carotid artery; measurements were obtained for 4 min every 2 h and compared to identical recordings obtained during a preflight control period and during 12 h on a launch pad. Immediately on its insertion into orbit, mean arterial pressure increased by 10 percent and has maintained a 16-27 percent increase over the first few hours of flight before returning to baseline level. Blood flow showed reciprocal changes to pressure on orbital insertion. Cardiovascular system changes persisted into the second day of flight, with the signs of adaptation appearing on days 3-5. I.S.

A87-44088
EFFECTS OF CONSTANT MAGNETIC FIELDS ON THE B-CELLS AND INSULIN TARGET CELLS IN THE RAT
B. CH. J. SUTTER, B. BILLAUDEL, M.-TH. SUTTER-DUB (Bordeaux I, Universite, Talence, France), and A. BELLOSSI (Rennes I, Universite, France) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 537-540. refs

A87-44089
ENDOGENOUS OPIOIDS ARE NOT INVOLVED IN THE PATHOLOGY INDUCED BY HYPERBARIC OXYGEN TREATMENT
DANA JAMIESON and JOHN CARMODY (New South Wales, University, Kensington, Australia) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 541-544. refs

In mice, oxygen at hyperbaric pressures (515 kPa; 5 ATA) induces convulsions and lung damage (edema and hemorrhage). Morphine treatment (15 mg/kg, i.p.) significantly protects against the development of this pathology. The protection is abolished by naloxone (1 mg/kg, i.p.). Electric footshock, which induces diverse opioid effects, affords no protection against hyperbaric oxygen damage. Possible mechanisms of the morphine action are discussed. Author

A87-44091
THE THYROID AND HYPOXIC MODERATION OF SYSTEMIC HYPERTENSION IN THE SPONTANEOUSLY HYPERTENSIVE RAT
WILLIAM N. HENLEY, ALAN TUCKER, THU NGA TRAN, and JOEL M. STAGER (Colorado State University, Fort Collins) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 559-567. Research supported by the Colorado Heart Association and USDA. refs

The effect of altered thyroid metabolism on hypoxic moderation of hypertension was investigated, using three groups of spontaneously hypertensive rats: (1) surgically thyroidectomized (TX), (2) euthyroid (EU), and (3) TX with dietary hormone replacement (RPL). Each group was subdivided into hypoxic (H, 28 d at 3658 m simulated altitude) and normoxic (N, at 1525 m altitude). In all TX-H and TX-N rats, systolic blood pressure was attenuated. Thyroidectomy also decreased vessel responsiveness to KCl and isoproterenol, but hypoxia did not significantly change vessel responsiveness in either TX or EU rats. Vessels from RPL-N rats appeared to be 'euthyroid' with respect to both isoproterenol and KCl responsiveness, while vessels from RPL-H showed a hyporesponsiveness characteristic of TX rats. It is argued that hypoxia and thyroidectomy mitigate systemic hypertension by different mechanisms. I.S.

A87-44119
CATALYSIS OF SPLICING-RELATED REACTIONS BETWEEN DINUCLEOTIDES BY A RIBOZYME
PETER S. KAY and TAN INOUE (Salk Institute for Biological Studies, San Diego, CA) Nature (ISSN 0028-0836), vol. 327, May 28, 1987, p. 343-346. Research supported by the Alfred Krupp von Bohlen und Halbach-Stiftung and NIH. refs

The minimum requirement for the self-splicing of intervening sequence (IVS) RNAs has been analyzed in order to improve understanding of the mechanism of this RNA catalysis. It is shown that a fragment of the IVS RNA of Tetrahymena can mediate a simple transesterification reaction between the substrate GpN (where N is A, C, G, or U) and the nucleophile CpU. This newly discovered reaction and its reverse reaction represent the fundamental catalytic activity of the self-splicing Group I IVSs, which contain several conserved sequences and possess a common secondary structure. C.D.

A87-44121 Illinois Univ., Urbana.
A POSSIBLE BIOCHEMICAL MISSING LINK AMONG ARCHAEBACTERIA
LAURIE ACHENBACH-RICHTER, CARL R. WOESE (Illinois, University, Urbana), and KARL O. STETTER (Regensburg, Universitaet, West Germany) Nature (ISSN 0028-0836), vol. 327, May 28, 1987, p. 348, 349. Navy-NASA-DFG-supported research. refs

The characteristics of the newly discovered strain of archaebacteria, VC-16, the only archaebacterium known to reduce sulfate, suggest that VC-16 might represent a transitional form between an anaerobic thermophilic sulfur-based type of metabolism and methanogenesis. It is shown here, using a matrix of

evolutionary distances derived from an alignment of various archaebacterial 16S rRNAs and the phylogenetic tree derived from these evolutionary distances, that the lineage represented by strain VC-16 arises from the archaebacterial tree precisely where such an interpretation would predict that it would, between the Methanococcus lineage and that of Thermococcus. C.D.

A87-44298
POLY/(DG-DT).(DC-DA)/, POLY/(DG-DA).(DC-DT)/, POLY/(DG).-(DC)/ AND POLY/(DA).(DT)/ SEQUENCES IN THE GENOMES OF ARCHAEBACTERIA [POSLEDOVATEL'NOSTI POLI//DG-DT/./DTS-DA//, POLI//DG-DA/.DTS-DT/,POLI/DG/./DTS// I POLI//DA/./DT// V GENOMAKH ARKHEBAKTERII]

R. P. VASHAKIDZE and D. A. PRANGISHVILI (AN GSSR, Institut Molekuliarnoi Biologii i Biologicheskoi Fiziki, Tbilisi, Georgian SSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 293, no. 5, 1987, p. 1243-1245. In Russian. refs

A87-44320
VARIATION OF MUSCLE EFFICIENCY AND REGULATION OF HEAT PRODUCTION IN AN ORGANISM [IZMENENIE KOEFFITSIENTA POLEZNOGO DEISTVIIA MYSHTS I REGULIATSIIA TEPLOPRODUKTSII ORGANIZMA]

K. P. IVANOV (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 73, March 1987, p. 305-316. In Russian. refs

The results of over twenty years of studies on the mechanism of heat production during muscle contraction in homoiothermic organisms are presented. The mechanisms regulating energy exchange during contractile (or shivering) thermogenesis and 'noncontractile' muscle thermogenesis are examined, with special consideration given to the efficiency coefficients (ECs) of muscle work related to the processes of muscle contraction and ATP synthesis, and to relative changes in these ECs. Special attention is given to the effect of acclimatization to cold on muscle energetics, when the EC of the muscle contraction falls, while the heat production increases; the mechanism of this phenomenon is considered to be related to the increasing degree of uncoupling between the oxidation and phosphorylation processes. The role of hormones and of the sympathetic nervous system in thermoregulation is discussed. I.S.

A87-44321
THE EFFECT OF SOME MONOAMINE OXIDASE INHIBITORS ON THE WAKEFULNESS-SLEEP CYCLE IN CATS [VLIIANIE NEKOTORYKH INGIBITOROV MONOAMINOKSIDAZY NA STRUKTURU TSIKLA BODRSTVOVANIE-SON KOSHKI]

T. N. ONIANI and G. R. AKHVLEDIANI (AN GSSR, Institut Fiziologii, Tbilisi, Georgian SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 73, March 1987, p. 332-337. In Russian. refs

The effects of monoamine oxidase (MAO) inhibitors, phenelzine, transamine, and nialamide, on the wakefulness-sleep cycle were studied by electroencephalography in cats, with electrodes implanted in different brain regions. It was found that the MAO inhibitors increased the slow-wave sleep while inhibiting all components of the paradoxical (REM) sleep and decreasing the duration of wakefulness. The magnitude of the effects increased with the inhibitor dose, leading to complete inhibition of REM. During the period of the wearing off of the inhibitor effect, there was an increase of the wakefulness period, reaching a level above that of the control time, although the REM sleep remained either completely or partially inhibited. The normal wakefulness-sleep cycle was restored 18-96 h after injection, the time being dependent on the type and dose of the inhibitor. I.S.

A87-44322
DIURNAL NEUROPHYSIOLOGICAL CHARACTERISTICS OF THE WAKEFULNESS-SLEEP CYCLE IN WHITE RATS [VNUTRISUTOCHNAIA NEIROFIZIOLOGICHESKAIA KHARAKTERISTIKA TSIKLA BODRSTVOVANIE-SON U BELYKH KRYS]

M. M. BOGOSLOVSKII, I. G. KARMANOVA, and T. V. PISKAREVA (AN SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 73, March 1987, p. 338-346. In Russian. refs

EEGs of male rats, Rattus norvegicus, with electrodes implanted into different brain regions, were studied during the phases of the wakefulness-sleep cycle. It was found that, in these rats, the periods of wakefulness and sleep were about equal. The duration of sleep during the day (lighted) period was twice that of the night period; the phase of paradoxical sleep during the day period was longer, by a factor of 1.78, than in the night. Rats exhibited periodic jaw movements during sleep, accompanied by high-amplitude low-wave periods. These activation phenomena were observed during various stages and phases of the wakefulness-sleep cycle. In addition, a dissociation of electrographic sleep and wakefulness symptoms from the the lid slit status was observed in these rats: the eyes could be open during a period of low-wave sleep and could be closed during a period of electrographic wakefulness. It is argued that the sleep structure in white rats reflects evolutionary irregularities. I.S.

A87-44323
THE EFFECTS OF INHIBITION AND STIMULATION OF ADRENORECEPTORS ON THE CARDIAC PUMP FUNCTION IN ANIMALS ADAPTED AND UNADAPTED TO PHYSICAL EXERCISE [VLIIANIE BLOKADY I STIMULIATSII ADRENORETSEPTOROV NA NASOSNUIU FUNKTSIIU SERDTSA U ZHIVOTNYKH, ADAPTIROVANNYKH I NEADAPTIROVANNYKH K FIZICHESKOI NAGRUZKE]

A. S. CHINKIN (Kazanskii Gosudarstvennyi Pedagogicheskii Institut, Kazan, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 73, March 1987, p. 389-395. In Russian. refs

A87-44803
A FAST ATOM BOMBARDMENT STUDY ON THE INTERACTION OF ANTICODONIC NUCLEOTIDES AND THEIR COGNATE AMINO ACID

MIKIO SHIMIZU (Tokyo, University, Japan) Physical Society of Japan, Journal (ISSN 0031-9015), vol. 56, March 1987, p. 893-896. refs

A87-45650#
EXPERIMENTAL STUDY OF THE WHOLE-BODY RESPONSE IN A VIBRATIONAL ENVIRONMENT. I - EFFECT OF WHOLE-BODY VIBRATION ON THE RESPIRATORY AIRFLOW, RESPIRATORY RATE AND HEART RATE IN DOGS

AKIHIKO ONOZAWA Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 27, Dec. 1986, p. 139-145. In Japanese, with abstract in English. refs

A87-45749* Chicago Univ., Ill.
PERIODIC EXTINCTION OF FAMILIES AND GENERA

DAVID M. RAUP and J. JOHN SEPKOSKI, JR. (Chicago, University, IL) Science (ISSN 0036-8075), vol. 231, Feb. 21, 1987, p. 833-836. refs
(Contract NAG2-37; NAG2-82)

Eight major episodes of biological extinction of marine families over the past 250 million years stand significantly above local background (P less than 0.05). These events are more pronounced when analyzed at the level of genus, and generic data exhibit additional apparent extinction events in the Aptian (Cretaceous) and Pliocene (Tertiary) Stages. Time-series analysis of these records strongly suggests a 26-million-year periodicity. This conclusion is robust even when adjusted for simultaneous testing of many trial periods. When the time series is limited to the four best-dated events (Cenomanian, Maestrichtian, upper Eocene, and

middle Miocene), the hypothesis of randomness is also rejected for the 26-million-year period (P less than 0.0002). Author

A87-46075
NEUROPHYSIOLOGICAL ANALYSIS OF HYPOTHALAMIC MECHANISMS FOR THE REGULATION OF PRIMARY SLEEP AND HYPOBIOSIS [NEIROFIZIOLOGICHESKII ANALIZ GIPOTALAMICHESKIKH MEKHANIZMOV REGULIATSII PERVICHNOGO SNA I GIPOBIOZA]
I. G. KARMANOVA, E. A. ARISTAKESIAN, and N. V. SHILLING (AN SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 294, no. 1, 1987, p. 245-248. In Russian. refs

Studies were carried out to investigate the influence of the hypothalamus on seasonal variations of the primary sleep/wakefulness cycle and to identify the nature of the effect of both sections of the hypothalamus on the formation of the electrical activity of the primordial hippocampus of amphibians. EEG studies were performed in different seasons in frogs Rana temporaria with electrodes implanted in the primordial hippocampus. Particular consideration is given to the influence of the destruction of the two sections of the hypothalamus on the sleep/wakefulness cycle. B.J.

A87-46081
THE THEORETICAL ASPECTS OF BRAIN ONTOGENESIS [O TEORETICHESKIKH ASPEKTAKH ONTOGENEZA MOZGA]
O. S. ADRIANOV (AMN SSSR, Institut Mozga, Moscow, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 73, Feb. 1987, p. 184-189. In Russian. refs

The structural and functional features of a developing brain are discussed from the viewpoints of several evolutionary theories. Special consideration is given to the author's concepts of the structural organization of cerebral functions and to the functional roles and the development of the five major cortical regions (i.e., neocortex, archicortex, paleocortex, periarchicortex, and peripaleocortex). The ability of these regions to be multifunctional, that is, to be able to engage in functions not genetically specific for the particular region, is considered to contribute to the efficiency of a brain function that is dominant at the moment. The potential for such functional plasticity of cerebral regions is considered to be genetically determined and to be connected with the heterochronia of various cerebral structures. I.S.

A87-46082
MODULES AS THE FUNCTIONAL UNITS OF THE VISUAL CORTEX AND THEIR ROLE IN VISUAL PERCEPTION [MODULI - FUNKTSIONAL'NYE EDINITSY ZRITEL'NOGO MOZGA - I IKH ROL' V ZRITEL'NOM VOSPRIIATII]
V. D. GLEZER (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 73, Feb. 1987, p. 202-210. In Russian. refs

The concept of a module as a functional unit of visual cortex is examined together with various theoretical schemes of the visual unit structure. Special consideration is given to the 'space-frequency' model of the visual module proposed earlier by Glaser et al. (1973), in which every neuron is characterized by specific orientation and frequency. Glaser's concept is supported by experimental data obtained by the author and other investigators. I.S.

A87-46083
THE MEANS OF PERCEPTION OF THE BIOLOGICAL SPACE (INTERNAL ENVIRONMENT) AND TIME [BIOLOGICHESKOE PROSTRANSTVO /VNUTRENNIAIA SREDA/, ORGANIZMENNOE VREMIA I SPOSOBY IKH VOSPRIIATIIA]
B. S. KULAEV (AN SSSR, Nauchno-Issledovatel'skii Vychislitel'nyi Tsentr, Pushchino, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 73, Feb. 1987, p. 254-259. In Russian. refs

The concepts of the internal biological space and biological time are examined together with the physiology or their perception by an organism. Special consideration is given to the role of interoreceptors, defined by Chernigovskii (1960) as the mechanoreceptors imbedded in the walls of hollow internal organs (including the organs of the cardiovascular system), in the control of the inner environment and in the perception of temporal and spacial changes in this environment. A hypothesis that assigns the role of a time mark for the central nervous system to the heart beat, which controls the behavior of the organism and its individual regions, is discussed and the results of experiments supporting this hypothesis are presented. I.S.

A87-46084
THE ROLE OF PERIPHERAL AND DEEP-LAYING COLD RECEPTORS OF THE BODY SURFACE IN THERMOREGULATORY RESPONSES [O ROLI POVERKHNOSTNYKH I GLUBOKIKH KHOLODOVYKH RETSEPTOROV OBOLOCHKI TELA V REAKTSIIAKH TERMOREGULIATSII]
O. P. MINUT-SOROKHTINA (Petrozavodskii Gosudarstvennyi Universitet, Petrozavodsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 73, Feb. 1987, p. 290-294. In Russian. refs

The role of the peripheral (subepidermal) and the deep-laying (deep skin layers and the walls of cutaneous and subcutaneous vessels) in the thermoregulatory responses of animals is discussed. It is argued that the information received from the peripheral receptors is carried to the brain ahead of the impulses from the deeper-laying receptors and thus has a character of a 'warning'. The activation of the peripheral receptors stimulates specific behavioral reactions in all animals, both homoiotherms and poikilotherms; in mammals, these reactions are preserved even after destruction of the preoptic hypothalamus. The cold receptors of deeper cutaneous and subcutaneous layers, on the other hand, induce vegetative thermoregulatory responses, such as changes in the respiration rate and shivering. I.S.

A87-46573* California Univ., Los Angeles.
SIZE AND METABOLIC PROPERTIES OF SINGLE MUSCLE FIBERS IN RAT SOLEUS AFTER HINDLIMB SUSPENSION
EDWARD O. HAUSCHKA, ROLAND R. ROY, and V. REGGIE EDGERTON (California, University, Los Angeles) Journal of Applied Physiology (ISSN 0161-7567), vol. 62, June 1987, p. 2338-2347. refs
(Contract NCA2-IR-390-502)

The effect of 28-day-long hind-limb suspension (HS) combined with 10 daily forceful lengthening contractions of the limb on the morphological and metabolic properties of individual fibers of the soleus was studied in rats, using quantitative histochemical techniques. Compared with nonsuspended controls (CON), soleus wet weights of HS rats were decreased by 49 percent; the fibers staining lightly for myosin ATPase ('light-ATPase' fibers) atrophied more than the 'dark-ATPase' fibers. Single-fiber alpha-glycerophosphate dehydrogenase (GPD) and succinate dehydrogenase (SDH) activities were higher in HS than in CON rats. Daily forceful lengthening contractions did not prevent the HS-induced changes. The results support the view that the soleus fibers can change from a slow-twitch oxidative to a fast-twitch glycolytic profile, but rarely to a fast-twitch glycolytic one, and that the SDH and GPD activities per volume of tissue can be increased even when there are severe losses of contractile proteins. I.S.

A87-46574* California Univ., Los Angeles.
SIZE AND METABOLIC PROPERTIES OF FIBERS IN RAT FAST-TWITCH MUSCLES AFTER HINDLIMB SUSPENSION
ROLAND R. ROY, MAUREEN A. BELLO, PHILLIP BOUISSOU, and V. REGGIE EDGERTON (California, University, Los Angeles) Journal of Applied Physiology (ISSN 0161-7567), vol. 62, June 1987, p. 2348-2357. refs
(Contract NCA2-IR-390-502)

The effect of hind-limb suspension (HS) on single fibers of the medial gastrocnemius (MG) and the tibialis anterior (TA) muscles were studied in rats. Fiber area and the activities of succinate dehydrogenase (SDH) and alpha-glycerophosphate dehydrogenase (GPD) were determined in tissue sections using an image analysis

system. After 28 days of HS, the MG atrophied 28 percent, whereas the TA weight was maintained. Both dark- and light-ATPase fibers in the deep region of the MG had decreased cross-sectional areas following HS, with the atrophic response being twice as great in the light-ATPase fibers than in the dark-ATPase fibers. Following HS, mean SDH activities of both fiber types were significantly lower in the MG and TA than in the CON; by contrast, mean GPD activities were either maintained at the CON level or were higher in both MG and TA muscles. The data suggest an independence of the mechanisms determining the muscle fiber size and the metabolic adaptations associated with HS. I.S.

N87-25705*# Tuskegee Inst., Ala. Dept. of Biology.
MORPHOMETRICS OF CELLULAR DAMAGE IN MICE TESTIS RECEIVING X-RAY AND HIGH-ENERGY PARTICLE IRRADIATION Final Technical Report
WALTER J. SAPP Jun. 1987 27 p
(Contract NCC2-12)
(NASA-CR-180994; NAS 1.26:180994) Avail: NTIS HC A03/MF A01 CSCL 06B

Murine tests were exposed to single, low doses of either X-ray, helium, or argon radiation. Animals were sacrificed seventy-two hours later. Testes were fixed for transmission electron microscopy (TEM) and sectioned at either 60 nm for TEM observation or at 2 micron for counting using routine light microscope methods. Counts of the total population of surviving spermatogonia, including all type A cells, intermediate, and type B cells, were taken from tubule cross sections identified as Stage 6 and Stage 1 according to spermatogonial configuration. The surviving fraction of spermatogonia as compared to control, S/S sub o, was calculated for each dose. For both ions and X-rays, there was a rapid decline in survival at dose levels of .10 to .15 Gy in Stage 6 tubules. This was followed by a more gradual decrease in population. At higher doses, 0.30 Gy for argon and 0.80 Gy for helium and X-rays, the cell survival rates declined rapidly. Pre-leptotene spermatocytes in Stage 1 tubules exhibited a different survival curve indicating the extreme radio-sensitivity of type B spermatogonia. Data verify that the seminiferous tubules are composed of a heterogeneous population of cells with different radio-sensitivities and that these differences are manifested even at very low doses. Author

N87-25706# Harvard Univ., Cambridge, Mass.
UNRAVELING PHOTOSYSTEMS
L. BOGORAD 1986 47 p
(Contract DE-AC02-82ER-12085)
(DE87-009258; DOE/ER-12085/T1) Avail: NTIS HC A03/MF A01

A central problem in photosynthesis is to identify the proteins of the energy transducing membranes and to understand their physical and functional relationships to one another. In the course of sequencing stretches of chloroplast DNA of various plants, ORFs (open reading frames) for unidentified proteins have been found. Through the use of antibodies against synthetic peptides that correspond to amino acid sequences in some of these UORFs (unidentified ORFs), that one such open reading frame codes for a component of PSII (photosystem II), that the product of another is associated with thylakoid membranes but can be found in both PSI and PSII particles, and that a third, from preliminary experiments, appears to be probably associated with PSII. None of these had been known to be components of the photosynthetic apparatus before. DOE

N87-25707*# Houston Univ., Tex. Dept. of Biology.
GROWTH OF PLANT TISSUE CULTURES IN SIMULATED LUNAR SOIL: IMPLICATIONS FOR A LUNAR BASE CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM (CELSS) Semiannual Status Report, 1 Feb. - 31 Jul. 1987
S. VENKETESWARAN Aug. 1987 45 p
(Contract NAG9-214)
(NASA-CR-181131; NAS 1.26:181131) Avail: NTIS HC A03/MF A01 CSCL 06B

Experiments to determine whether plant tissue cultures can be grown in the presence of simulated lunar soil (SLS) and the effect of simulated lunar soil on the growth and morphogenesis of such cultures, as well as the effect upon the germination of seeds and the development of seedlings were carried out . Preliminary results on seed germination and seedling growth of rice and calli growth of winged bean and soybean indicate that there is no toxicity or inhibition caused by SLS. SLS can be used as a support medium with supplements of certain major and micro elements. Author

N87-25708*# Louisville Univ., Ky. Dept. of Microbiology and Immunology.
DEVELOPMENT AND TESTING OF A MOUSE SIMULATED SPACE FLIGHT MODEL Final Report, Nov. 1982 - Jul. 1987
GERALD SONNENFELD 7 Aug. 1987 11 p
(Contract NCC2-213)
(NASA-CR-181155; NAS 1.26:181155) Avail: NTIS HC A02/MF A01 CSCL 06B

The development and testing of a mouse model for simulating some aspects of weightlessness that occurs during space flight, and the carrying out of immunological experiments on animals undergoing space flight is examined. The mouse model developed was an antiorthostatic, hypokinetic, hypodynamic suspension model similar to one used with rats. The study was divided into two parts. The first involved determination of which immunological parameters should be observed on animals flown during space flight or studied in the suspension model. The second involved suspending mice and determining which of those immunological parameters were altered by the suspension. Rats that were actually flown in Space Shuttle SL-3 were used to test the hypotheses. Author

N87-25715# Cologne Univ. (West Germany). Neurobiologische Forschung.
PHARMACOLOGICAL APPROACHES TO PERFORMANCE ENHANCEMENT IN ANIMALS
D. G. SPENCER, JR., T. SCHUURMAN, U. BENZ, E. HORVATH, and J. TRABER *In* AGARD Biochemical Enhancement of Performance 11 p Mar. 1987
Avail: NTIS HC A07/MF A01

Drug effects were studied on learning and working memory performance in young, normal rats, as well as on reactions to hypoxia and stress. While some of the treatments reduced cognitive parameters under normal conditions, none improved them in a meaningful way. However, several substances were found to improve performance distrupted by exposure to hypoxia. These substances included piracetam, nimodipine, and ipsapirone (TVX Q 7821). An additional characteristic of ipsapirone was an amelioration of negative responses to stress. Due to the well-understood mechanisms of action of nimodipine and ipsapirone, their low toxicity, and their lack of negative effects on normal cognitive performance, it is suggested that these drugs could prove to be useful therapeutic agents under conditions of high information processing loads. Author

N87-25743# Joint Publications Research Service, Arlington, Va.
FLUID AND ELECTROLYTE CONTENT IN PREGNANT RATS AND THEIR OFFSPRING FOLLOWING FLIGHT ABOARD COSMOS-1514 BIOSATELLITE
YE. I. SHAKHMATOVA, YE. A. LAVROVA, YU. V. NATOCHIN, L. V. SEROVA, and L. A. DENISOVA *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 56-63 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 42-47
Avail: NTIS HC A08/MF A01

Female rats were flown on Cosmos 1514 for five days during gestation days 13 through 18. The rats showed a significant reduction of the Ca concentration in the liver and kidneys, a smaller decrease in the skin, and no changes in bones. The weight of the fetus decreased, its water content increased, and the Na, K, Ca and Mg remained the same. The 15 and 30 day pups of the rats did not exhibit any differences in the water and electrolyte content in the bones, skin, liver or kidneys compared to the controls. These data indicate that water and electrolyte homeostatis of growing fetuses was highly stable and the deviations that emerged under the influence of spaceflight factors quickly returned to normal. Author

N87-25744# Joint Publications Research Service, Arlington, Va.
EFFECT OF DIPHOSPHONATES ON DEVELOPMENT OF OSTEOPOROSIS IN HYPOKINETIC RATS
A. S. KAPLANSKIY, G. N. DURNOVA, Z. F. SAKHAROVA, and B. V. MORUKOV *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 64-68 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), vol. 21, no. 1, Jan. - Feb. 1987 p 47-51
Avail: NTIS HC A08/MF A01

Using histomorphometric methods, the effect of diphosphonates (hydroxydimethylamino-propylene diphosphonic acid and hydroxy-ethylene diphosphonic acid) on the development of osteoporosis in spongy matter of tibia and vertabrae of rats exposed to hypokinesia for 60 days was investigated. It was found that aminop-rophlene diphoshonic acid in the dose 6 mg phosphorus/kg/day prevented osteoporosis. Ethylene diphosphonic acid in the dose 9 mg phosphorus/kg/day reduced the severity of osteoporosis, but did not prevent it. Author

N87-25745# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF INCIDENCE OF MORPHOLOGICAL CHANGES IN RAT CEREBRAL CORTEX NEURONS UNDER THE EFFECT OF ACCELERATED CARBON IONS
B. S. FEDORENKO, R. A. KABITSYNA, G. N. KRIVITSKAYA, V. I. DEREVYAGIN, and N. I. RUZHOV *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 69-74 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 51-55
Avail: NTIS HC A08/MF A01

Structural lesions in neurons of the brain cortex of rats were investigated 1 to 3 months after their exposure to accelerated carbon ions with the energy 320 MeV/nuclon 10,000 particles/square cm as well as to gamma radiation in the dose 1.0 Gy. The irradiated animals showed morphofunctional, dystrophic and reparative lesions in neurons. The rats exposed to carbon ions developed more distinct changes than the animals exposed to gamma radiation. It is postulated that similar fluxes of cosmic radiation will not produce deleterious effects upon the central nervous system of cosmonauts. Author

N87-25747# Joint Publications Research Service, Arlington, Va.
CENTRAL HEMODYNAMICS OF MONKEYS IN POSTOPERATIVE PERIOD AS RELATED TO HANDLING PRIOR TO SURGICAL INTERVENTION
R. T. KAZAKOVA, V. P. KROTOV, and I. O. GIRYAYEVA *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 81-84 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 58-60
Avail: NTIS HC A08/MF A01

Cardiac function of monkeys was examined at different time intervals after electrode and transducer implantation. The study was carried out using 26 rhesus monkeys under ketalar anesthesia. The effect of this surgical intervention depended upon the initial health of the monkeys. Prior to the operation the pumping function declined due to diminished motor activity of the animals. It decreased to a greater extent 10 to 15 days after the operation. When normal activity was allowed for even a short time before surgical implantation, this was sufficient for normalization of the cardiovascular function. Author

N87-25896*# Texas Univ., Austin. Dept. of Occupational Health.
EVALUATION OF AN AUTOMATED KARYOTYPING SYSTEM FOR CHROMOSOME ABERRATION ANALYSIS
HOWARD M. PRICHARD *In* NASA. Lyndon B. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1986, Volume 2 10 p Jun. 1987
Avail: NTIS HC A13/MF A01 CSCL 06B

Chromosome aberration analysis is a promising complement to conventional radiation dosimetry, particularly in the complex radiation fields encountered in the space environment. The capabilities of a recently developed automated karyotyping system were evaluated both to determine current capabilities and limitations and to suggest areas where future development should be emphasized. Cells exposed to radiometric chemicals and to photon and particulate radiation were evaluated by manual inspection and by automated karyotyping. It was demonstrated that the evaluated programs were appropriate for image digitization, storage, and transmission. However, automated and semi-automated scoring techniques must be advanced significantly if in-flight chromosome aberration analysis is to be practical. A degree of artificial intelligence may be necessary to realize this goal. Author

N87-26494*# RCA Government Services, Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 12
LYDIA RAZRAN HOOKE, ed., MIKE RADTKE, ed., RONALD TEETER, ed., and JOSEPH ROWE, ed. (Library of Congress, Washington, D. C.) Washington NASA Jul. 1987 110 p (Contract NASW-3676)
(NASA-CR-3922(14); NAS 1.26:3922(14)) Avail: NTIS HC A06/MF A01 CSCL 06B

This issue contains 42 papers recently published in Russian language periodicals and bound collections of four Soviet monographs. Also included is a review of a recent Soviet congress on space gastroenterology. Author

N87-26495# Research Inst. of National Defence, Umea (Sweden). Dept. 4.
SURVIVAL OF MICROORGANISMS IN THE AEROSOL PHASE: A LITERATURE REVIEW
EVA HENNINGSON and ROGER ROFFEY Dec. 1986 75 p In SWEDISH; ENGLISH summary
(FOA-A-40053-4.4; ISSN-0281-0220; ETN-87-99769) Avail: NTIS HC A04/MF A01; Research Institute of National Defence, Stockholm, Sweden KR 200

Airborne bacteria and virus survival rate was reviewed. Studies of 75 different organisms, including Escherichia coli and Serratia marsescens are discussed. The death rate expressed as the time after which only 10% of the original microorganisms survive, varies

from 1 min to greater than 2 wk. No simple relationship between the survival mechanisms and the external environmental factors is found. The most important external factors seem to be the relative humidity and the temperature. Survival at high and low relative humidity seems to be higher than in the interval between. ESA

N87-26496*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RESULTS OF THE LIFE SCIENCES DSOS CONDUCTED ABOARD THE SPACE SHUTTLE 1981-1986
MICHAEL W. BUNGO, TANDI M. BAGIAN, MARK A. BOWMAN, and BARRY M. LEVITAN (Krug International, Houston, Tex.) May 1987 191 p
(NASA-TM-58280; S-561; NAS 1.15:58280) Avail: NTIS HC A09/MF A01 CSCL 06C

Results are presented for a number of life sciences investigations sponsored by the Space Biomedical Research Institute at the NASA Lyndon B. Johnson Space Center and conducted as Detailed Supplementary Objectives (DSOs) on Space Shuttle flights between 1981 and 1986. An introduction and a description of the DSO program are followed by summary reports on the investigations. Reports are grouped into the following disciplines: Biochemistry and Pharmacology, Cardiovascular Effects and Fluid Shifts, Equipment Testing and Experiment Verification, Microbiology, Space Motion Sickness, and Vision. In the appendix, the status of every medical/life science DSO is presented in graphical form, which enables the flight history, the number of subjects tested, and the experiment results to be reviewed at a glance. Author

N87-26703*# Galveston Coll., Tex. Div. of Mathematics and Science.
EXPANSION OF SPACE STATION DIAGNOSTIC CAPABILITY TO INCLUDE SEROLOGICAL IDENTIFICATION OF VIRAL AND BACTERIAL INFECTIONS
KELLY E. HEJTMANCIK *In* NASA. Lyndon B. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1986, Volume 1 22 p Jun. 1987
Avail: NTIS HC A16/MF A01 CSCL 05A

It is necessary that an adequate microbiology capability be provided as part of the Health Maintenance Facility (HMF) to support expected microbial disease events during long periods of space flight. The applications of morphological and biochemical studies to confirm the presence of certain bacterial and fungal disease agents are currently available and under consideration. This confirmation would be greatly facilitated through employment of serological methods to aid in the identification for not only bacterial and fungal agents, but viruses as well. A number of serological approached were considered, particularly the use of Enzyme Linked Immunosorbent Assays (ELISAs), which could be utilized during space flight conditions. A solid phase, membrane supported ELISA for the detection of Bordetella pertussis was developed to show a potential model system that would meet the HMF requirements and specifications for the future space station. A second model system for the detection of Legionella pneumophilia, an expected bacterial disease agent, is currently under investigation. Author

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A87-42901
THE EFFECT OF THE HELIOGEOPHYSICAL FACTORS ON THE HUMAN ORGANISM [VOZDEISTVIE GELIOGEOFIZICHESKIKH FAKTOROV NA ORGANIZM CHELOVEKA]
NATALIIA IVANOVNA MOISEEVA and ROSTISLAV EVGEN'EVIC LIUBITSKII Leningrad, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 53), 1986, 136 p. In Russian. refs

The characteristics of various heliogeophysical phenomena known to affect the human organism, such as cosmic rays, solar activity, geomagnetic activity, and weather, are examined together with periodic changes of these factors and the physiological parameters of human biorhythms that are affected. The mechanisms underlying the biochemical effects of solar radiation, the effects of EMF on the ferromagnetic particles of muscle, heart tissue, and the brain, and the effects of climatic and weather changes on the cardiovascular system and the skin are discussed. Consideration is given to the methods for the analysis of these effects, with emphasis on a method which makes it possible to determine both linear and nonlinear correlations between the heliogeophysical factors and the biological changes induced. I.S.

A87-42902
WATER-SALT HOMEOSTASIS AND SPACE FLIGHT [VODNO-SOLEVOI GOMEOSTAZ I KOSMICHESKII POLET]
O. G. GAZENKO, A. I. GRIGOR'EV, and IU. V. NATOCHIN Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 54), 1986, 240 p. In Russian. refs

The results of 20-year-long studies on the water and salt metabolism in the space crews of manned spacecraft as well as the results of biological experiments aboard the Cosmos satellites are presented. Consideration is given to the characteristics of the water/electrolyte metabolism under the extreme conditions of space flight and to the development and application of functional-load tests for studying the effects of these conditions on osmoregulators, with special attention given to the role of endocrine factors in the adaptation from earth gravity to weightlessness and vice versa. The results of laboratory studies using simulations of space-flight conditions (e.g., water-immersion, bed rest in horizontal or antiorthostatic conditions) to study kidney functions are discussed. Special attention is given to the prevention of space-flight effects by training programs and pharmacological agents. I.S.

A87-43220#
AN EXPERIMENTAL STUDY ON THE EFFECTS OF UNILATERAL ACOUSTIC STIMULUS ON THE FEELING OF INCLINATION
KIYOSHI MIZUMOTO, ASTUSHI KADOO, MIKIO ONO, and YUKO NAGASAWA Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 27, Sept. 1986, p. 65-78. In Japanese, with abstract in English. refs

The use of acoustic stimuli to prevent lean illusion during flight is considered. In one experiment, five subjects identified the directions of 108 kinds of stimuli which were applied to each ear in an anechoic chamber. In another experiment, the effects of an acoustic stimulus (1000 Hz, 90 dB, 1 sec) applied to each ear on the EMG (electromyogram), ENG (electronystagmography), and weight balance were analyzed for eight subjects standing upright with their eyes open or closed. In this latter experiment, five of the eight subjects felt the effect of the acoustic stimulus on the inclination sensation, especially when their eyes were closed. It is noted that the use of an acoustic stimulus to prevent lean illusion requires that its effects be the same for all subjects. The sound

pressure level of the stimulus may have to be less than 90 dB.
K.K.

A87-43221#
A STATISTICAL ANALYSIS OF BLOOD PRESSURE CHANGES DURING THE PERIOD OF 23 YEARS ON JASDF PILOTS
YOSHINORI KURIHARA and AZUSA KIKUKAWA Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 27, Sept. 1986, p. 79-90. In Japanese, with abstract in English. refs

A retrospective survey of blood pressure changes over 23 years in aircraft pilots was conducted in order to investigate the relationship between blood pressure changes and various physical indices and blood chemistry values, and a similar cross sectional analysis was performed on a group of normotensive and nonnormotensive pilots. The retrospective survey showed that the muscular strength and respiratory function were better, and the blood free fatty acid, glucose, and gamma-GTP were lower in pilots whose blood pressure did not change than in those whose blood pressure increased over time. Similar advantages were seen in the normotensive group as compared to the nonnormotensive group in the cross-sectional survey. C.D.

A87-43222#
ELECTRO-PHYSIOLOGICAL MEASUREMENT SYSTEM FOR T2/CCV FLIGHT TEST
ATSUSHI KADOO and MIKIO ONO Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 27, Sept. 1986, p. 101-109. In Japanese, with abstract in English. refs

Pilot psychophysiological responses during direct lift control and direct side force control (DSC) flight maneuvers by T2/CCV research aircraft were measured in order to develop electrophysiological measurement devices and to determine psychophysiological effects during DSC flight maneuvers. The electrocardiograph and electromyograph responses were determined, and the sitting pressure index representing lateral deviations of the body axis due to Gy forces was ascertained. The electrophysiological measurement devices developed were useful in actual flight, except for the EMG measurement device, which experienced electrical noise interference. The noise reduction problem was solved, however. No remarkable trend caused by Gy forces during test flights was detected from mean heart rate changes and sitting pressure changes, so long as the Gy force was not too high. C.D.

A87-43582
THE CIRCADIAN RHYTHM OF THE BIOELECTRIC ACTIVITY INDICES IN BRAIN [SUTOCHNYI RITM POKAZATELEI BIOELEKTRICHESKOI AKTIVNOSTI GOLOVNOGO MOZGA]
N. V. TUROVA and I. E. ORANSKII (Nauchno-Issledovatel'skii Institut Kurortologii i Fizioterapii, Sverdlovsk, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 225-228. In Russian. refs

The circadian variability of EEG-rhythm components in normal humans were studied together with the age dependence of these components and the correlations among them during the course of 24 hours. It was found that, in the morning, the delta activity increases (with the maximal value at 10.30) with subsequent increases in the beta-1 activity (max. at 13.28) and alpha activity (max. at 13.30). In the afternoon, there is a rise in the theta activity (max. at 16.50), while in the evening and the night periods there is a rise in the beta-2 activity (max. at 21.40) and gamma activity (max. at 23.18). In subjects with cerebral atherosclerosis, the circadian rhythm of bioelectric cerebral activity is disrupted, as evidenced by the changed amplitudes and the levels of the EEG indices, and the acrophase shifts towards later day times.
I.S.

A87-43583
INCREASING THE FUNCTIONAL RESERVES OF THE HUMAN ORGANISM BY MEANS OF RESPIRATORY TRAINING USING AN ACCESSORY DEAD SPACE [POVYSHENIE FUNKTSIONAL'NYKH VOZMOZHNOSTEI ORGANIZMA CHELOVEKA PUTEM TRENIROVOK DYKHAMIEM CHEREZ DOPOLNITEL'NOE MERTVOE PROSTRANSTVO]
L. TS. IOFFE, R. I. LIUBOMIRSKAIA, V. S. SVERCHKOVA, A. G. REKHTMAN, and G. I. ISRAILOVA (AN KSSR, Institut Fiziologii i Nauchno-Issledovatel'skii Institut Klinicheskoi i Eksperimental'noi Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 241-244. In Russian. refs

The effect of breathing through an accessory dead space (ADS) on the respiratory and cardiovascular systems of humans was studied by measuring changes in the parameters of the two systems effected by the ADS respiratory training. Lung ventilation indices, O2 and CO2 exchange volumes (measured during periods of rest, physical activity, and recovery), and indices of cardiovascular activity were assessed before and after 20 days (20 min each) of training by breathing through an ADS device described by Sverchkova and Liubomirskaia (1984). Subjects who have undergone the ADS training exhibited increased physical endurance. Compared with untrained controls, these subjects exhibited increases in the values of minute blood volume, stroke volume, heart index, and maximal and reserve lung ventilation.
I.S.

A87-43584
THE EFFECT OF BODY POSITION ON HEMODYNAMICS CHANGES CAUSED BY EMOTIONAL STRESS [O VLIIANII POLOZHENIIA TELA NA IZMENENIIA GEMODINAMIKI, VOZNIKAIUSHCHIE PRI EMOTSIONAL'NOM NAPRIAZHENII]
G. S. BELKANIIA, V. A. DARTSMELIIA, M. V. GALUSTIAN, A. N. DEMIN, A. T. NEBORSKII (Nauchno-Issledovatel'skii Institut Eksperimental'noi Patologii i Terapii, Sukhumi, USSR) et al. Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 245-251. In Russian. refs

The effect of body position on hemodynamic changes caused by emotional stress (ES) was investigated in healthy men subjected to verbal and numerical tests taken when lying down or standing and under stress of the time limit and critique. In addition, hemodynamic shifts were studied in rhesus monkeys during the period of recovery from anesthesia. It was found that, in both humans and monkeys in supine position, ES causes significant increases in the minute blood volume and the stroke volume, and in intestinal, cutaneous, and limbic blood flow. The ES in the orthostatic position causes opposite reactions: decreases were observed in the minute and the stroke blood volumes and in the limbic and intestinal blood flow. It is argued that orthostatic position modifies the hemodynamic reaction to ES, imparting to it hypodynamic and hypertonic characteristics. I.S.

A87-43585
CHARACTERISTICS OF CARDIAC RHYTHM REGULATION DURING THE DEVELOPMENT OF ERGOTHERMIA [OSOBENNOSTI REGULIATSII SERDECHNOGO RITMA V USLOVIIAKH RAZVITIIA RABOCHEI GIPERTERMII]
A. S. PAVLOV and V. V. SHIGALEVSKII (Voroshilovgradskii Mashinostroitel'nyi Institut, Voroshilovgrad, Ukrainian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 252-258. In Russian. refs

The effect of ergothermic load on cardiac rhythm was investigated in three groups of men at various stages of physical training. The components of cardiac rhythm were analyzed, performing the ECG and rhythmography simultaneously and using the method of mathematical analysis described by Baevskii et al. (1981, 1984). It was found that as the level of training increased, the magnitudes of the mode value and the delta R-R value increased, while the magnitudes of the mode amplitude, alpha index, stress index, vegetative equilibrium index, and the functional status index decreased. During physical activity and with increasing hyperthermia, the physically trained subjects displayed an

intensification of the mechanisms regulating cardiac rhythms. I.S.

A87-43586
ANALYSIS OF THE RELATIONSHIP BETWEEN PULSE-WAVE PROPAGATION VELOCITY AND ARTERIAL PRESSURE CHANGES IN HUMANS SUBJECTED TO FUNCTIONAL LOADS [ANALIZ VZAIMOSVIAZI SKOROSTI RASPROSTRANENIIA PUL'SOVOI VOLNY S IZMENENIIAMI ARTERIAL'NOGO DAVLENIIA U CHELOVEKA PRI FUNKTSIONAL'NYKH NAGRUZKAKH]
V. G. MARKMAN and E. L. KOROLEVA (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 259-264. In Russian. refs

The possibility of using the pulse-wave propagation velocity (PWPV) as an index of changes in the arterial pressure (AP) during functional tests was investigated, measuring the systolic and diastolic AP values and the ECG, pneumogram, and sphygmogram indices before and during applications of a physical load and a psychoemotional test. Among the subjects tested, the character and the magnitude of linear correlations between various AP and PWPV parameters varied. However, a significant correlation was observed in 12 (out of 18 total) subjects between the values of the systolic AP and the time interval between the ventricle depolarization and the appearance of the pulse wave in the carotid artery. I.S.

A87-43587
THE IMMUNOGENIC SYSTEM OF HUMANS DURING ADAPTATION TO HIGH-ALTITUDE HYPOXIA [IMMUNOKOMPETENTNAIA SISTEMA CHELOVEKA PRI ADAPTATSII K VYSOKOGORNOI GIPOKSII]
M. M. MIRRAKHIMOV, M. I. KITAEV, and A. G. TOKHTABAEV (Kirgizskii Nauchno-Issledovatel'skii Institut Kardiologii, Frunze, Kirgiz SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 265-269. In Russian. refs

The effects of rapid or stepwise ascents to 3200-3600 m altitudes on the immune system were studied in 18-20 year-old men transported to these altitudes directly or after a 8-10-d stop at 2200 m. Quantization of T and B lymphocytes was performed on the 3-5th and 30th days of arrival at final altitudes on cells separated by means of phycoll-urotrast gradients. Rapid elevation was found to cause early (3-5 d) immunological shifts that were expressed in decreased numbers of T-mu lymphocytes and of their potential blast transformation ability and in increased contents of T-gamma cells, as well as in increases of plasma corticosteroid concentrations. These indices returned to their normal levels 25-30 days after adaptation. I.S.

A87-43588
DYNAMICS OF NEUTROPHYL PHAGOCYTOSIS AND THE COMPOSITION OF WHITE BLOOD CELLS IN METAL WORKERS CAUSED BY SHIFT WORK [DINAMIKA FAGOTSITOZA NEITROFILOV I KLETOCHNOGO SOSTAVA BELOI KROVI U OPERATOROV METALLURGICHESKOGO ZAVODA V SVIAZI SO SMENNOI RABOTOI]
S. A. KLESHCHENOGOV and N. V. IAGNIUKOVA (Institut Kompleksnykh Problem Gigieny i Professional'nykh Zabolevanii, Novokuznetsk, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 270-277. In Russian. refs

A87-43589
THE EFFECT OF MODERATE ALTITUDE-HYPOXIA ON THE FUNCTIONAL STATUS AND THE WORK CAPACITY OF HUMANS AS A FUNCTION OF THE AMBIENT TEMPERATURE [VLIIANIE UMERENNOI VYSOTNOE GIPOKSII NA FUNKTSIONAL'NOE SOSTOIANIE I RABOTOSPOSOBNOST' CHELOVEKA V ZAVISIMOSTI OT TEMPERATURY OKRUZHAIUSHCHEI SREDY]
IU. V. BUSHOV, A. F. ERSHOV, A. P. PISANKO, F. V. OS'MININ, and B. A. NIBUSH (Nauchno-Issledovatel'skii Institut Biologii i Biofiziki, Tomsk, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 284-289. In Russian. refs

The effect of simultaneously applied moderate altitude hypoxia (MAH) and hyperthermia on the physiological status and the work capacity of humans was studied using normal male subjects placed for 60 min in an altitude chamber (at 3500 m) that was maintained at 20 or 40 C. Arterial pressures (APs), pulse rate (PR), minute blood volume (MBV), systolic blood volume (SBV), body temperature (T), oxygen blood saturation, and EEG parameters were measured at rest and during bicycle ergometer rides or a mental test. Control subjects were exposed to altitude-only or high-temperature-only conditions. At 20 C, exposure to MAH led to lowering of O2 saturation and systolic AP, as well as to a decrease in physical-work capacity and to an increase in PR; the mental-work capacity and body T were not affected. The exposure to MAH at 40 C was accompanied by lesser decreases of O2 saturation levels and by increases of PR and systolic AP, while the physical work capacity was not affected. I.S.

A87-43590
CHANGES IN LIVER FUNCTIONS DURING THE ADAPTATION OF HUMANS TO CONDITIONS IN THE NORTH [IZMENENIE FUNKTSII PECHENI PRI ADAPTATSII CHELOVEKA V USLOVIIAKH SEVERA]
IU. P. GICHEV (Institut Kompleksnykh Problem Gigieny i Professional'nykh Zabolevanii, Novokuznetsk, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 296-306. In Russian. refs

The effect of adaptation to the conditions of the far north on liver physiology was studied in eight subjects transferred in the winter time from Novosibirsk to Norilsk, USSR, and tested periodically for the activities of enzymes and other metabolic indices of protein and lipid metabolism. It was found that the principal biochemical indices of the liver functions undergo changes in the first days of the adaptation period; these changes have a phase character, pointing to the participation of the liver in the adaptive reorganization of the organism. After long residence in the far north, the adaptive shifts of some of these indices stabilize and become permanent. The long-term changes in the liver functions might lead to conditions predisposing to chronic liver lesions and to an increased risk of atherosclerosis. I.S.

A87-43591
ENDOCRINE-HUMORAL ASPECTS OF SPORT PHYSIOLOGY [ENDOKRINNO-GUMORAL'NYE ASPEKTY FIZIOLOGII SPORTA]
G. N. KASSIL' Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 307-316. In Russian. refs

The paper discusses changes in the metabolism of hormones, hormone mediators, and metabolites in the blood of athletes and the significance of these shifts for the maintenance of homeostasis and energy reserves. It is concluded that the sympathoadrenal and the hypothalamic-hypophyseal-adrenal systems are the principal systems effecting the adaptation to increased stresses of physical exercise. The observed shifts in the hormonal metabolism are specific for different types of sport and are significantly affected by the baseline values and by the levels of motivation. I.S.

A87-43592
SEASONAL DYNAMICS OF ENDOCRINE FUNCTIONS IN PEOPLE RESIDING IN THE NORTH [SEZONNAIA DINAMIKA ENDOKRINNYKH FUNKTSII U CHELOVEKA NA SEVERE]
A. V. TKACHEV and A. N. ZOLKINA (Institut Morfologii Cheloveka, Arkhangel'sk, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 328-330. In Russian. refs

A87-43594
THE PERIOD OF THE INFRADIAN INTENSITY BIORHYTHMS OF THE PHYSIOLOGICAL PROCESSES IN THE HUMAN ORGANISM [PERIOD INFRADIANNYKH BIORITMOV INTENSIVNOSTI FIZIOLOGICHESKIKH PROTSESSOV V ORGANIZME CHELOVEKA]
N. N. SHABATURA, V. G. TKACHUK, V. A. FED'KO, and S. B. PALIENKO (Kievskii Gosudarstvennyi Pedagogicheskii Institut, Kiev, Ukrainian SSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 33, Mar.-Apr. 1987, p. 10-15. In Russian. refs

Individual and group variability in the duration of infradian biorhythm periods in humans was studied using groups of male subjects with various regimes of vital activity (60 or more days under conditions of normal, decreased, or increased daily activity). Physiological parameters (including body temperature, respiration rate, minute respiration volume, pulse rate, EKG parameters, and parameters of neuromuscular activity) were determined every morning. Data were treated statistically to detect rhythms and to determine the median period, standard deviation, and variation coefficient of a period. Circaseptadian (6.5 d) and circadiseptadian (13 d) rhythms were shown to exist in all groups. It was found that a relatively stable average duration of the rhythms was maintained in spite of considerable variability in the periods of individual waves. I.S.

A87-43684
THE EFFECT OF ACCELERATION OVERLOAD DURING PILOTING HIGHLY-MANEUVERABLE AIRCRAFT (LITERATURE REVIEW) [VLIIANIE PEREGRUZOK PRI PILOTIROVANII VYSOKOMANEVRENNYKH SAMOLETOV /OBZOR LITERATURY/]
G. D. GLOD, V. A. KORZHEN'IANTS, L. S. PLAKHOTNIUK, and E. P. KOSTRUB Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Feb. 1987, p. 43-45. In Russian. refs

The biophysical and physiological effects of +Gz overload on the pilot of a highly-maneuverable aircraft are discussed together with measures designed to protect the pilot from the sharp physical pain and the loss of consciousness during rapidly accumulating +Gz load. Among the foremost measures considered are: (1) introducing an inclined seat-back and reconstructing the pilot's equipment, (2) optimizing the pressure-respiration methods, and (3) introducing special training programs consisting of breathing and physical exercises. Special attention is given to equipment and training designed to protect and strengthen the muscles of the neck. I.S.

A87-43685
THE CORRELATION OF ANNUAL BIORHYTHMS IN THE LEUKOCYTE NUMBERS IN THE PERIPHERAL BLOOD OF HEALTHY HUMANS WITH HELIOGEOPHYSICAL RHYTHMS. I [SVIAZ' GODOVYKH BIORITMOV CHISLA LEIKOTSITOV V PERIFERICHESKOI KROVI ZDOROVYKH LIUDEI S GELIOGEOFIZICHESKIMI RITMAMI. I.]
F. I. KOMAROV, E. N. CHIRKOVA, L. S. SUSLOV, and V. V. NEMOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), March 1987, p. 27-32. In Russian. refs

The individual and group-average characteristics of annual biorhythms in the leukocyte blood counts of healthy subjects were studied in the period between Dec. 1984 and Dec. 1985, i.e., during a minimum phase of the solar activity cycle. The leukocyte biorhythms were correlated with the annual rhythms in heliogeophysical indices in order to establish seasonal norms in leukocyte numbers for army recruits. The results indicated a possible presence of an 11-y biorhythm in the leukocyte counts. There also was a tendency for leukocyte counts to increase at the beginning phases of the spring and the fall seasons and to decrease at the end phases of the winter and the summer seasons, which must be taken into consideration when diagnosing blood disorders. Sex differences were found in the number averages and in the amplitude and phase characteristics of annual biorhythms, while the duration of biorhythms was similar in both sexes. I.S.

A87-43687
THE RELATIONSHIP BETWEEN CELLULAR REACTIONS IN THE BLOOD OF FLIGHT PERSONNEL AND SOME FUNCTIONAL STATES OF THE ORGANISM [ZAVISIMOST' KLETOCHNYKH REAKTSII KROVI LETCHIKOV OT NEKOTORYKH ISKHODYKH FUNKTSIONAL'NYKH SOSTOIANII ORGANIZMA]
P. S. PASHCHENKO Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), March 1987, p. 45-47. In Russian.

Cytochemical reactions in white blood cells on a work load of three flights per shift were evaluated in pilots grouped into three categories according to their psychophysiological state. The division, based on the type of the white-blood-cell morphological reactions to psychological stimuli, was as follows: (1) the subjects with the white-cell blood picture specific for a reaction to a weak stimulus, (2) subjects reacting by low activation to a moderate stimulus, and (3) subjects with an elevated-type of leukocyte reaction to a moderate stimulus. Compared to nonstressed subjects of the first and the second groups, the subjects of the third group displayed higher levels of cell deformation, lymphocyte and granulocyte vacuolization, lowered contents of glycogen and elevated levels of phosphorylase in neutrophils, as well as high levels of lymphocytic LDH and alpha-glycerophosphate activities. At the same time, the levels of cytochrome oxidase, succinate dehydrogenase, and G-6-P-dehydrogenase activities in lymphocytes of these subjects were decreased. I.S.

A87-43775
THE THRESHOLD FOR HYPOXIA EFFECTS ON PERCEPTUAL-MOTOR PERFORMANCE
BARRY FOWLER, BARRY KELSO (York University, Downsview, Canada), DAVID D. ELCOMBE (Civil Aviation Medical Unit, Downsview, Canada), and GERALD PORLIER (Defence and Civil Institute of Environmental Medicine, Downsview, Canada) Human Factors (ISSN 0018-7208), vol. 29, Feb. 1987, p. 61-66. Sponsorship: Department of National Health and Welfare of Canada. refs
(Contract DNHW-HQ-84/85-059050)

The hypoxia threshold for a decrement in perceptual-motor performance was determined with six subjects using a serial choice reponse time task at two levels of stimulus brightness. Low-oxygen mixtures were used to reduce SaO2 (arterial oxyhemoglobin saturation) to hypoxic levels ranging from 86 percent to 76 percent in steps of 2 percent. These values correspond to altitudes ranging from 8900 ft to 11,400 ft. Response time was slowed in a dose-dependent manner with a significant effect becoming apparent at an SaO2 of 82 percent (10,000 ft). The slope of the dose-response function was steeper for the low than for the high brightness condition. These results provide a threshold estimate of 9750 feet for performance decrements due to hypoxia and point to the disruption of vision as a factor influencing this decrement. Author

A87-44090
HUMAN THERMOREGULATION AFTER ATROPINE AND/OR PRALIDOXIME ADMINISTRATION
MARGARET A. KOLKA, LOU A. STEPHENSON, STEPHEN P. BRUTTIG, BRUCE S. CADARETTE, and RICHARD R. GONZALEZ (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 545-549. refs

The effects of intramuscular atropine (2 mg), pralidoxime (600 mg), and the combination of the two drugs on heat exchange were evaluated in four healthy males during seated cycle exercise at 30.3 C. Esophageal (Tes), rectal (Tre), and mean skin (Tsk)

temperatures and chest and forearm sweating (ms) were measured continuously; additional measurements included skin blood flow from the forearm (FBF) and heart rate (HR). Atropine injections produced expected results: decreased ms (by 60 percent) and elevated Tes, Tsk, HR, and FBF, relative to exercising saline-injected controls. Pralidoxime did not affect the core and skin temperature responses to the exercise differently from control; however, a slightly elevated FBF compensated for the reduction in ms (by -45 percent) that was observed. The combination of the two drugs resulted in significantly higher Tes and Tsk than with atropine alone. The thermoregulatory disadvantage of inhibited sweating by atropine was partially compensated for by enhanced skin blood flow. I.S.

A87-44092* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
POTENTIAL BENEFITS OF MAXIMAL EXERCISE JUST PRIOR TO RETURN FROM WEIGHTLESSNESS
VICTOR A. CONVERTINO (NASA, Kennedy Space Center; Bionetics Corp., Cocoa Beach, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 568-572. refs

The purpose of this study was to determine whether performance of a single maximal bout of exercise during weightlessness within hours of return to earth would enhance recovery of aerobic fitness and physical work capacities under a 1G environment. Ten healthy men were subjected to a 10-d bedrest period in the 6-deg headdown position. A graded maximal supine cycle ergometer test was performed before and at the end of bedrest to simulate exercise during weightlessness. Following 3 h of resumption of the upright posture, a second maximal exercise test was performed on a treadmill to measure work capacity under conditions of 1G. Compared to before bedrest, peak oxygen consumption, V(O2), decreased by 8.7 percent and peak heart rate (HR) increased by 5.6 percent in the supine cycle test at the end of bedrest. However, there were no significant changes in peak V(O2) and peak HR in the upright treadmill test following bedrest. These data suggest that one bout of maximal leg exercise prior to return from 10 d of weightlessness may be adequate to restore preflight aerobic fitness and physical work capacity. Author

A87-44093
SALIVA CORTISOL - A GOOD INDICATOR FOR ACCELERATION STRESS
HIDEO TARUI and AKIO NAKAMURA (Japan Air Self Defense Force, Aeromedical Laboratory, Tokyo, Japan) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 573-575. refs

The effects of +Gz stress on the salivary cortisol were studied using four healthy male volunteers (nonaircrew). They were subjected to acceleration up to +5Gz for 1 min without G-suit. At +4Gz and +5Gz stress, the level of saliva cortisol increased significantly (p less than 0.001) 20 min following centrifugation. At higher +Gz levels, the response of the salivary cortisol was noted to increase. The advantages of monitoring cortisol level in saliva as an indictor for +Gz stress are discussed. Author

A87-44094
SKIN POTENTIAL REFLEX CORRESPONDING TO TRANSIENT MOTION DISCOMFORT
NAOKI ISU, NOBUYUKI TAKAHASHI, and JIRO KOO (National Aerospace Laboratory, Chofu, Japan) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 576-580. refs

The qualitative and quantitative correspondence between the degree of motion discomfort and the skin potential reflex (SPR) was examined in four subjects. Head movement was provided three times during body rotation at three different angular velocities (Coriolis stimulus) to induce motion discomfort, and at rest as a control. SPRs were caused in the arousal sweat area by head movement. The wave form, latency, time-to-peak, and amplitude of SPR were analyzed. The amplitude of the depolarizing response (P response) of SPR increased proportionally to the angular velocity of body rotation and decreased in the course of repetitive Coriolis stimulation. It was revealed that the amplitude of P response of SPR in the arousal sweat area corresponds to the degree of transient motion discomfort. Author

A87-44095
EFFECT OF POSITIVE ACCELERATION (+GZ) ON SOFT CONTACT LENS WEAR
WILLIAM J. FLYNN, MICHAEL G. BLOCK, THOMAS J. TREDICI, and WAYNE F. PROVINES (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 581-587. refs

A87-44096
SPONDYLOLITHESIS IN PILOTS - A FOLLOW-UP STUDY
P. FROOM, J. RIBAK, Y. TENDLER, A. CYJON, M. KRIWISKY (Israel Air Force, Aeromedical Center, Ramat Gan, Israel) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 588, 589. refs

There were 21 pilots followed for 12-131 months in order to determine the natural history of spondylolithesis (SLL). Of these 21, 16 had follow-up X-ray examinations, and only one was found with significant progression of the posterior vertebral displacement. Of the 12 pilots with SLL and low back pain (LBP), four had recurrent single episodes of acute LBP, but all remained active and continued to fly over the follow-up period. None of the nine pilots who had SLL discovered on routine X-ray examination developed LBP over the follow-up period. It is concluded that pilots with SLL can continue to fly with minimal risk of morbidity and loss of flight time. Author

A87-44097
+GZ-INDUCED LOSS OF CONSCIOUSNESS AND AIRCRAFT RECOVERY
JAMES E. WHINNERY, DAVID H. GLAISTER, and RUSSELL R. BURTON (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 600-603. refs

Potential biomedical indices for monitoring the +Gz-induced loss of consciousness (G-LOC) and intervention stimuli for preventing G-LOC and enhancing recovery are discussed. The monitoring techniques can be either indirectly related to cerebral oxygen sufficiency, such as Doppler measurement of blood flow, or those that respond to changes due to LOC, such as the lack of responsiveness or a change in muscle tone. The optimum physiologic monitoring technique would be the direct determination of failure of brain cell function. The physiological intervention avenues include warning or stimulating signals, such as auditory, visual, and tactile (electrical, mechanical, or thermal) stimuli. The automatic recovery of the aircraft using aircraft flight dynamics computation must place the pilot in an optimum environment for his recovery, i.e., not only to the appropriate spatial attitude, but also to the safest +Gz level. I.S.

A87-44098
REFLECTANCE PHOTOPLETHYSMOGRAPHY AS AN ADJUNCT TO ASSESSMENT OF GRAVITATIONAL ACCELERATION TOLERANCE - PRELIMINARY FINDINGS
DOV JARON, THOMAS MOORE, B. R. SHANKARA REDDY, FRANK KEPICS (Drexel University, Philadelphia, PA), and LEON HREBIEN (U.S. Navy, Naval Air Development Center, Warminster, PA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, June 1987, p. 604-612. refs
(Contract N0014-85-K-0566)

The feasibility of using reflectance photoplethysmography (which monitors volumetric changes due to the flow of blood) to predict the onset of peripheral light loss (PLL) due to Gz acceleration was examined in seven healthy male subjects who had extensive centrifuge experience and training in the use of peripheral vision tracking device. The photoplethysmogram signals were compared with the mean value and the pulsatile component of the Doppler velocity (recorded from the opposite temporal artery)

used for predicting the onset of PLL. Plethysmography correctly predicted 80.5 percent of the PLL runs and 98.3 percent of non-PLL runs, while mean Doppler velocity predicted a higher (88.1) percentage of PLL runs, but only 77.2 percent of non-PLL runs. The pulsative Doppler velocity yielded only 50.7 percent of correct PLL predictions. I.S.

A87-44227#
THE HUMAN CENTRIFUGE OF THE FLUGMEDIZINISCHES INSTITUT DER LUFTWAFFE [DIE HUMANZENTRIFUGE AM FLUGMEDIZINISCHEN INSTITUT DER LUFTWAFFE]
E. BURCHARD, J. LANGHOFF, and M. THEWISSEN (Luftwaffe, Flugmedizinisches Institut, Fuerstenfeldbruck, West Germany) Luft- und Raumfahrt (ISSN 0173-6264), vol. 8, 1st Quarter 1987, p. 3-8. In German.

The benefits provided to aerospace medicine by the human centrifuge and the design and capabilities of the centrifuge of the West German Air Force Aerospace Medicine Institute are described. Initial studies in the area of aerospace medicine in Germany are reviewed. The effects of various flight maneuvers on human physiology and the tolerance of humans to different flight conditions (varying G levels) are investigated using centrifuge simulations. Particular attention is given to the monitoring of blood, heart, and eye changes. The components and operation of the centrifuge, which a has an arm length of 10 m, a pilot gondola velocity of 113 km/hr, and an acceleration of 10 G, are examined. The application of the centrifuge to aerospace medicine research, clinical studies, and pilot training is discussed. I.F.

A87-44721
A SURVEY OF SIMULATION SICKNESS AMONGST ROYAL AIR FORCE PILOTS - REPORT ON INTERIM RESULTS
A. G. PARFITT (Ministry of Defence, London, England) and J. CHAPPELOW (RAF, Institute of Aviation Medicine, Farnborough, England) IN: Advances in flight simulation - visual and motion systems; Proceedings of the International Conference, London, England, Apr. 29-May 1, 1986 . London, Royal Aeronautical Society, 1986, p. 212-226.

Incidences of adverse symptoms while flying in a simulator and post-simulator effects are accessed using as questionnaire survey, and potential factors causing these effects are investigated. Two versions of the questionnaire were employed: form A for pilots currently involved in sessions on the Warton or Farnborough simulators, and form B for pilots who have flown either or both of the simulators during the previous two years. A sample of the questionnaire is provided. Interim results based on 58 returned questionnaires are presented. The data reveal that physical and mental fatigue were the most frequent symptoms observed; many pilots experienced delayed effects; and the symptoms and delayed effects correlated with the intensity and duration of simulator activity. I.F.

A87-44722
ISSUES IN SIMULATOR SICKNESS
R. S. KENNEDY, K. S. BERBAUM (Essex Corp., Orlando, FL), M. G. LILIENTAL (U.S. Navy, Naval Training Systems Center, Orlando, FL), and W. P. DUNLAP (Tulane University, New Orleans, LA) IN: Advances in flight simulation - visual and motion systems; Proceedings of the International Conference, London, England, Apr. 29-May 1, 1986 . London, Royal Aeronautical Society, 1986, p. 227-237. refs

Recommendations for reducing simulator sickness are discussed. It is proposed that simulator sickness is due to cue conflicts and the assembly of the different technological capabilities of the simulator. Guidelines for the use of the simulator in a manner which limits simulator sickness, and for remedying simulator sickness are described. I.F.

A87-45649#
+GZ TOLERANCE AND THE PHYSICAL CHARACTERISTICS OF JASDF FIGHTER PILOTS
CHIEKO MIZUMOTO, TADAO YANAKA, MASAAKI IWANE, AKIO NAKAMURA, TSUTOMU ARIMORI et al. Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 27, Dec. 1986, p. 123-138. In Japanese, with abstract in English. refs

The relationhip between the +Gz tolerance and the physical parameters of fighter pilots was studied. A total of 123 JASDF F-15 trainees were evaluated for +Gz tolerance while performing spontaneous anti-G straining maneuvers without anti-G suits. Gradual onset run (GOR) and rapid onset run (ROR) G-patterns were used to assess the tolerance. The mean value of G-tolerance for GOR and the mean endurace time for ROR were 5.7 + or - 0.7 Gz and 53 + or - 19 sec, respectively, and the correlation between them was statistically significant. The G-tolerance for GOR correlated with Rohler's index; that for ROR had the highest correlation with the increment of heart rate. Multiple regression analysis showed that the G-tolerance for GOR appeared to depend on the physical constitution and the responsiveness of the cardiovascular system, while that for ROR depended on these factors and on the degree of endurance of the abdominal musculature. C.D.

A87-46571
EFFECT OF HYPOXIA-INDUCED PERIODIC BREATHING ON UPPER AIRWAY OBSTRUCTION DURING SLEEP
GREGORY WARNER, JAMES B. SKATRUD, and JEROME A. DEMPSEY (Wisconsin, University; William S. Middleton Memorial Veterans Hospital, Madison) Journal of Applied Physiology (ISSN 0161-7567), vol. 62, June 1987, p. 2201-2211. Research supported by the U.S. Veterans Administration, American Lung Association of Wisconsin, and National Heart, Lung, and Blood Institute. refs

The effect of the hypoxia-induced unstable periodic breathing on the incidence of obstructed breaths was studied in nine subjects who varied widely in their increase in total pulmonary resistance during NREM sleep. The data show that the hypoxia-induced instability in the breathing pattern can cause obstructed breaths during sleep coincident with the reduced motor output to inspiratory muscles. However, this obstruction is only manifested in subjects susceptible to upper-airway atonicity and narrowing and can be prevented in most cases if the respiratory drive is permitted to reach sufficiently high levels (as during central apnea). I.S.

A87-46572
LOCAL SWEATING AND CUTANEOUS BLOOD FLOW DURING EXERCISE IN HYPOBARIC ENVIRONMENTS
MARGARET A. KOLKA, LOU A. STEPHENSON, PAUL B. ROCK, and RICHARD R. GONZALEZ (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Journal of Applied Physiology (ISSN 0161-7567), vol. 62, June 1987, p. 2224-2229. refs

The effect of acute hypobaric hypoxia on local sweating and cutaneous blood flow was studied in four men and four women exercising (at 30 C) at 60 percent of their altitude-specific peak aerobic power for 35 min at sea level and at simulated altitudes of 2596 and 4575 m. There was no gender difference in the sensitivity of the threshold of either local sweating/esophageal temperature (ms/Tes) or the skin blood flow/Tes (SkBF/Tes) ratios at any altitude. With increasing altitude, the mean slopes of the ms/Tes relationships for the three regional sites decreased. The slope of the SkBF/Tes ratio was reduced in five of the eight subjects at 4575 m (428 Torr). Enhanced body cooling as a response to the higher evaporative capacity of the environment is suggested as a component of these peripheral changes occurring in hypobaric hypoxia. I.S.

A87-46990
CHARACTERIZATION OF THE RESULTING INCAPACITATION FOLLOWING UNEXPECTED +GZ-INDUCED LOSS OF CONSCIOUSNESS
JAMES E. WHINNERY, RUSSELL R. BURTON, PATRICIA A. BOLL, and DOUGLAS R. EDDY (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, July 1987, p. 631-636. refs

The paper describes unexpected +G-induced loss of consciousness (G-LOC) suffered by 55 male subjects during exercises on a human centrifuge. The period of the absolute incapacitation (16.6 s), characterized by a total loss of consciousness, was found to be followed by a period of relative incapacitation (14.5 s), characterized by confusion/disorientation. The G-LOC incapacitation (i.e., the absolute plus relative incapacitation) was dependent on the rate of the +Gz-stress onset and the +Gz level. G-LOC episodes could be classified into two types: (1) shorter episodes without convulsive movements and (2) longer episodes with deeper levels of unconsciousness, longer absolute incapacitation, and (frequently) dream states and convulsive movements. I.S.

A87-46991
THE EFFECTS OF HEAD-DOWN TILT ON CAROTID BLOOD FLOW AND PULMONARY GAS EXCHANGE
J. A. LOEPPKY, D. W. HIRSHFIELD, and M. W. ELDRIDGE (Lovelace Medical Foundation, Research Div., Albuquerque, NM) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, July 1987, p. 637-644. refs

The effect of a 20-min exposure to a -30-deg head-down tilt (HDT) on the pulmonary ventilation and gas exchange and on the common carotid artery blood flow (CCF) were studied in subjects who were originally in supine posture (control, SUP I), then were exposed to HDT, and finally returned to the supine posture (SUP II). The transition from SUP I to HDT caused a 6-percent decrease in the CCF (with a transient increase during the second minute), and increases in O2 uptake, CO2 output, respiratory exchange ratio, and tidal volume in the first munute. The transition from HDT to the SUP II caused an increase of CCF, which was 7 percent higher than during the SUP I position, and increases in CO2 output, respiratory exchange ratio, and tidal volume in the first minute. Oxygen uptake changed little. Correction of the O2 uptake for changes in the estimated lung O2 stores indicated that about 200 ml of blood were shifted within the circulation by the tilt transitions which provided a ventilatory stimulus. I.S.

A87-46992* Brandeis Univ., Waltham, Mass.
ASYMMETRIC OTOLITH FUNCTION AND INCREASED SUSCEPTIBILITY TO MOTION SICKNESS DURING EXPOSURE TO VARIATIONS IN GRAVITOINERTIAL ACCELERATION LEVEL
JAMES R. LACKNER, ASHTON GRAYBIEL, WALTER H. JOHNSON, and KENNETH E. MONEY (Brandeis University, Waltham, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, July 1987, p. 652-657. refs
(Contract NAS9-15147)

Von Baumgarten and coworkers (1979, 1981) have suggested that asymmetries in otolith function between the left and right labyrinths may result from differences in otoconial mass and could play a role in space motion sickness. Such asymmetries would be centrally compensated for under terrestrial conditions, but on exposure to weightlessness the persisting central compensation would produce a central imbalance that could lead to motion sickness. In this work ocular counterrolling was used as a way of measuring the relative 'efficiency' of the left and right otoliths; the ocular counterrolling scores of individuals were compared with their susceptibility to motion sickness during passive exposure to variations in Gz in parabolic flight maneuvers. The experimental findings indicate that large asymmetries in counterrolling for leftward and rightward body tilts are associated with greater susceptibility to motion sickness in parabolic flight. Author

A87-46993
EFFECT OF DEXAMETHASONE ON SYMPTOMS OF ACUTE MOUNTAIN SICKNESS AT PIKES PEAK, COLORADO (4,300 M)
PAUL B. ROCK, T. SCOTT JOHNSON, ALLEN CYMERMAN, RICHARD L. BURSE, LEO J. FALK (U.S. Army, Research Institute of Environmental Medicine, Natick; Beth Israel Hospital; Harvard Univ et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, July 1987, p. 668-672. refs

A87-46994
OPERATION EVEREST II - ALTITUDE DECOMPRESSION SICKNESS DURING REPEATED ALTITUDE EXPOSURE
MARK K. MALCONIAN, PAUL ROCK, JAMES DEVINE, ALLEN CYMERMAN, JOHN R. SUTTON (U.S.Army, Research Institute of Environmental Medicine, Natick, MA; Arctic Institute of North Ameri et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, July 1987, p. 679-682. refs
(Contract DAMD17-85-C-5206)

The incidence of altitude decompression sickness (ADS) was studied in 23 altitude scientists during repeated altitude exposure to 4572-8839 m in a decompression chamber. Prior to each altitude exposure, a 30-60 min prebreathing period with 100-percent oxygen took place. Ascent was made to an altitude at a rate of 2000 ft/min. Symptoms reported appear consistent with previous reports. Incidence of ADS at 7925-8839 m was 29.7 percent during 274 chamber flights and 1264.6 h of altitude time. Incidence appeared related to frequency of exposure, severity of altitude, and physical activity. Incidence was not related to age, duration of exposure, or body index (weight/height-squared). The high incidence of ADS reported in this study is similar to that reported by NASA. Author

A87-46995
INTRAVENTRICULAR CONDUCTION DISTURBANCES IN FLYING PERSONNEL - DEVELOPMENT AND PROGNOSIS OF BIFASCICULAR BLOCKS
GERARDO CANAVERIS and GERARDO J. NAU (Instituto Nacional de Medicina Aeronautica y Espacial, Buenos Aires, Argentina) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, July 1987, p. 683-689. refs

The evolutive characteristics as well as the qualification criteria applied to 21 cases of bifascicular blocks detected in a presumably healthy population of 6915 male individuals engaged in civilian flying activities were studied. The sequence of conduction disturbances, ages, and electrical axis rotation velocity are assessed. Bifascicular blocks may be complete or incomplete. The progression toward advanced conduction disturbances may affect the involved fascicles independently. Cases with incomplete bifascicular block have better prognosis, followed by those with primary conduction system disease. The mean time between the development of the first and the second conduction disturbance was 3.5 years. On an individual basis, once those etiologies which by themselves imply a future risk are ruled out, and provided they do not show evolutive features in frequent repeat evaluations, they may be waivered for flying activities, with a proposed maximum age of 60 years. Author

A87-46996
INTRAOCULAR LENSES IN AVIATORS - A REVIEW OF THE U.S. ARMY EXPERIENCE
THOMAS H. MADER, WILLIAM G. CAREY, KARL E. FRIEDL, and WILLIAM R. WILSON (U.S. Army, Madigan Army Medical Center, Tacoma, WA; U.S. Army, Lyster Army Hospital, Fort Rucker, A Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, July 1987, p. 690-694. refs

Intraocular lenses are known to be efficacious in the correction of aphakia, but their suitability and durability in Army aviators has not been previously evaluated. Eight experienced pilots (preoperative flight time average: 7660 hours), who had intraocular lens implants following removal of cataractus lenses, were studied. All had returned to flight duty, seven as pilots, with a total of 2700 hours postoperative flight time accumulated. All were very

pleased with the surgery and with the effectiveness of their lenses. Minor problems included: halos around lights in low illumination (5/8 pilots), erythropsia (2/8), and difficulties with a fixed focal length (2/8). Two aviators reported significant visual problems: complications associated with a platinum loop iris supported intraocular lens, and discomfort and glare stemming from traumatic corneal scarring. A detailed ophthalmological examination revealed abnormalities (5/8 pilots), but none which would be directly attributed to flying. Modern intraocular lenses appear to be an acceptable means of correcting aphakia in Army aviators.
Author

A87-46997
THE PREDICTIVE VALUE OF THE BODY MASS INDEX FOR SYSTOLIC BLOOD PRESSURE 12-15 YEARS LATER IN YOUNG AIR FORCE PERSONNEL
PAUL FROOM, MOSHE GROSS, JOSEPH RIBAK, JOSHUA BARZILAY, and JOCHANAN BENBASSAT (Israel Air Force Aeromedical Center, Tel Hashomer; Hadassah University Hospital, Jerusalem) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, July 1987, p. 695-698. refs

The relationship between the original body mass index (BMI = weight/height-squared) and the change of systolic blood pressure (SBP) after 12-15 years in service was studied in 719 male air force personnel, aged 18-30 at entry. The follow-up testing revealed an elevated blood pressure, defined as an SPB not lower than 140 mm Hg, in 6.7 percent of those with an elevated SPB and a normal BMI at entry, in 10.2 percent of those with a normal SPB and an elevated BMI at entry, and in 20.0 percent of those with both elevated BMI and SPB at entry. Of those with normal values of both the SPB and BMI at entry, only 2.2 percent had an elevated SPB upon follow-up testing. I.S.

A87-46999
PILOT AND ASTRONAUT OFFSPRING - POSSIBLE G-FORCE EFFECTS ON HUMAN SEX RATIO
BERTIS B. LITTLE, CECIL H. RIGSBY, and LORI R. LITTLE (Texas, University; Dallas Independent School District, TX; Northrop Corp., Hawthorne, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, July 1987, p. 707-709. refs

Ratio of male to female offspring in tactical pilots and astronauts who experienced G forces was compared to that of pilots and nonrated officers who were not exposed to such conditions. It is found that 62 pilots and astronauts exposed to higher G forces had a significantly lower ratio of males to females in their offspring (.40) than did 220 pilots and nonpilots who were not exposed to high G forces. Other studies have also reported a decreased sex ratio in offspring of men exposed to high G forces. Reduction in number of males produced by fathers routinely exposed to comparatively high-G stresses may be related to G-force effects on sperm. This study suggests high-G exposure may affect the reproduction process. Author

N87-25709# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.
BIOCHEMICAL ENHANCEMENT OF PERFORMANCE
Mar. 1987 132 p In ENGLISH and FRENCH Symposium held in Lisbon, Portugal, 30 Sep. - 2 Oct. 1986
(AGARD-CP-415; ISBN-92-835-0414-3) Avail: NTIS HC A07/MF A01

In modern weapons systems, the operator is in an environment of high information flux. His ability to receive, process, and act on the information is finite and therefore full system effectiveness may never be achieved because of operator limitations. Major advances are being made in areas dealing with regulation of neuronal responsiveness. This offers a number of opportunities for exploring ways in which the biochemistry of neurons may be altered, reversibly, to increase responsiveness to neurotransmitters and/or other agents. Human performance may be enhanced through these alterations. The agents which initiate the change in neuron responsiveness may be supplied through nutrition, pharmaceuticals, or biochemicals. The use of pharmaceutical to promote sleep, increase vigilance, and to alter regulatory centers is considered. Neurotransmitter precursors were supplied via nutritional supplements.

N87-25710# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
ENHANCEMENT OF PERFORMANCE: OPERATIONAL CONSIDERATIONS
A. N. NICHOLSON *In* AGARD Biochemical Enhancement of Performance 6 p Mar. 1987
Avail: NTIS HC A07/MF A01

Maintaining the effectiveness of aircrew during intensive and sustained operations requires knowledge from many disciplines. The first is that of understanding how the performance of individuals is modified by unusual patterns of work and rest, and how deterioration in performance can be limited by the use of short periods of sleep. The second is a detailed understanding of drugs and how they can be used either to preserve sleep or to maintain viligance. The initial approach, if this is possible, must be to optimize the work pattern, but the pattern of rest can always be optimized. The most effective approach at present is likely to be the use of short periods of sleep, probably before rather than during duty periods, and to ensure restful sleep between operations by the use of hypnotics. At present the role of hypnotics is much less certain. Caffeine is used widely and is clearly effective. Drugs which modify monoaminergic transmission require a much greater understanding, both their pharmacological effects on the central nervous system and the effects on performance, both advantageous and adverse, before they can be considered for use in operations. Author

N87-25711# Massachusetts Inst. of Tech., Cambridge. Dept. of Brain and Cognitive Sciences.
USE OF TYROSINE AND OTHER NUTRIENTS TO ENHANCE AND SUSTAIN PERFORMANCE
RICHARD J. WURTMAN *In* AGARD Biochemical Enhancement of Performance 4 p Mar. 1987
Avail: NTIS HC A07/MF A01

Administration of supplemental tyrosine can increase the release of the catecholamines dopamine, norepinephrine, and epinephrine from physiologically-active neurons, and can thereby modify behaviors and other neuronal functions that are mediated by these neurotransmitters. The tyrosine acts by increasing the substrate saturation of the enzyme tyrosine hydroxylase; when a given neuron is firing frequently this enzyme becomes phosphorylated and, consequently, tyrosine-dependent. The amount of tyrosine that enters the brain varies with the plasma tyrosine ratio, i.e., the ratio of the plasma tyrosine concentration to the summed concentrations of other large neutral amino acids that compete with tyrosine for transport across the blood-brain barrier. Hence, the administration of pure tyrosine is much more effective than eating proteins, which contain tyrosine: the proteins contain and deliver to the blood stream considerably larger amounts of the other large neutral amino acids. Tyrosine administration protects rats from the neurochemical and behavioral effects of stress; its ability to enhance performance of stressed humans is under exploration. Author

N87-25712# Army Research Inst. of Environmental Medicine, Natick, Mass.
DEVELOPMENT OF A PARADIGM TO ASSESS NUTRITIVE AND BIOCHEMICAL SUBSTANCES IN HUMANS: A PRELIMINARY REPORT ON THE EFFECTS OF TYROSINE UPON ALTITUDE- AND COLD-INDUCED STRESS RESPONSES
L. E. BANDERET, H. R. LIEBERMAN (Massachusetts Inst. of Tech., Cambridge.), R. P. FRANCESCONI, B. L. SHUKITT, R. F. GOLDMAN, D. D. SCHNAKENBERG, T. M. RAUCH, P. B. ROCK, and G. F. MEADORS, III *In* AGARD Biochemical Enhancement of Performance 12 p Mar. 1987
Avail: NTIS HC A07/MF A01

Tyrosine is the precursor for the catecholamine neurotransmitters dopamine and norepinephrine. Recent experiments have shown the behavior of animals given tyrosine is

less impaired after stressful treatments than that of animals given placebo. Whether tyrosine administration would reduce adverse behavioral and physiological effects in humans was investigated by two combined environmental stressors, hypoxia and cold. Twenty-seven young male military volunteers were tested in a double-blind crossover design. The subjects were tested once with a placebo and once with tyrosine at a control condition and at two levels of multiple environmental stressors. Performance tests evaluated simple and choice reaction time to visual stimuli, viligance, and processing of symbolic, numerical, verbal, and spatial materials. Blood samples were analyzed for plasma tyrosine and cortisol concentrations. Performance, symptoms, and mood were adversely affected by both levels of high altitude and cold. Tyrosine administration appeared to minimize the adverse consequences of these stressors. Tyrosine enhanced performance and reduced subjective symptoms. Mood states were also improved. Tyrosine had more beneficial effects at progressively more stressful altitude and cold conditions. Author

N87-25713# Basel Univ. (Switzerland). Dept. of Surgery Research Div.

MULTIVARIATE AND PSYCHO-PHYSIOLOGICAL FUNCTIONS OF DSIP

GUIDO A. SCHOENENBERGER, A. ERNST, and D. SCHNEIDER-HELMERT *In* AGARD Biochemical Enhancement of Performance 11 p Mar. 1987

Avail: NTIS HC A07/MF A01

From 1969 to 1977 the Delta-Sleep-Inducing-Peptide (DSIP) was isolated, characterized, and synthesized. Beside humoral sleep induction, DSIP acts upon the circadian rhythmicity of the locomotor activity and transmitter concentrations in the brain as well as on that of plasma proteins and cortisol levels in rats. The DSIP influences the prolactine levels and the circadian activity of N-Acetyl Transferase. The DSIP-like immunoreactive material showed a circadian rhythmicity in breast milk during normal lactation. The DSIP plasma concentrations also exhibit a rhythmic 24 h pattern, the amplitude of which apparently depends on the magnitude of body-exercise. The DSIP in humans was found also to exert a bell shaped dose response curve exhibiting an activating effect during awake states in situations conductive to sleep. Clinically and statistically significant effects upon sleep architecture were seen from 1 h through 20 h after injection; adverse effects were never observed. Single dose treatments of insomnia showed significant normalization effects of DSIP in all sleep parameters as did repeated administrations in chronic insomniacs. Daytime performance was found to improve after DSIP injections which at a higher dose exerted a beneficiary effect in organic insomniacs. In summary DSIP is suggested not only to be a sleep promoting and maintaining peptide but a supramodulatory active psychophysiological programming substance. Author

N87-25714# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France). Div. de Neurophysiologie Appliquee.

INTRODUCTION OF A NEW STIMULANT: CRL 40476 [PRESENTATION D'UN NOUVEAU STIMULANT: LE CRL 40476]

C. L. MILHAUD and D. P. LAGARDE *In* AGARD Biochemical Enhancement of Performance 7 p Mar. 1987 In FRENCH

Avail: NTIS HC A07/MF A01

The use of simulants constitutes one of the possible approaches to maintaining vigilance during sustained, long-duration operations. The efficiency and safety of the stimulant CRL 40476 was evaluated using the macaque rhesus. Measurements of nocturnal activity, as well as the interpretation of electroencephalographic records provide evidence of a powerful anti-sleep effect without the disturbance of the sleep pattern. The safety studies showed an absence of side effects on vegetative and behavioral functions, particularly those typical of amphetamines, for the dosages utilized to maintain wakefulness. Operational experimentation will be able to provide a preliminary determination of effective doses and administration frequencies for healthy humans. M.G.

N87-25716# Centre d'Essais en Vol, Bretigny-sur-Orge (France). Lab. de medecine Aerospatiale.

THE EVALUATION OF VIGILANCE IN STUDIES OF AERONAUTIC PHARMACOLOGY [L'EVALUATION DE LA VIGILANCE DANS LES ETUDES DE PHARMACOLLGIE EN AERONAUTIQUE]

J. L. POIRIER and H. VIEILLEFOND *In* AGARD Biochemical Enhancement of Performance 8 p Mar. 1987 In FRENCH

Avail: NTIS HC A07/MF A01

The design and results of various tests addressing two aspects of vigilance, psychomotor response and memorization, are described. The tests included short-term memorization tasks, visual conpensatory pursuit/tracking along two axes coupled with a secondary task measuring the response time of the subject to a visual cue, and visual pursuit tasks in a dynamic simulated-flight environment. The effects of four drugs were assessed: the psychotrope Medifoxamine 50, the antihistamine Astemizole, the psychostimulant Debrumyl, and the vasodilator RU 24722. M.G.

N87-25717# Centre d'Essais en Vol, Bretigny-sur-Orge (France). Lab. de Medecine Aerospatiale.

THE EFFECT OF ACETYL-DL-LEUCINE ON THE VESTIBULO-OCCULAR REFLEX IN HUMANS [EFFET DE L'ACETYL-DL-LEUCINE SUR LA PERFORMANCE DU REFLEXE VESTIBULO-OCCULAIRE CHEZ L'HOMME]

A. LEGER, D. LEJEUNE, and H. VIEILLEFOND *In* AGARD Biochemical Enhancement of Performance 8 p Mar. 1987 In FRENCH

Avail: NTIS HC A07/MF A01

The effect of the antivertiginous agent acetyl-dl-leucine on the vestibulo-occular reflex was tested. Twelve volunteers were administered the drug or a placebo via intravenous injection and subjected to vestibular stimulation. Electro-occulography was used to record horizontal nystagmus during and after rotations. The results demonstrate that acetyl-dl-leucine, administered at therapeutic doses, did not alter the quantitative characteristics of the vestibulo-occular reflex. M.G.

N87-25718# Harvard Medical School, Boston, Mass. Dept. of Physiology and Biophysics.

HOMEOSTATIC, ENTRAINMENT AND PACEMAKER EFFECTS OF DRUGS THAT REGULATE THE TIMING OF SLEEP AND WAKEFULNESS

MARTIN C. MOORE-EDE and THOMAS A. HOUPT *In* AGARD Biochemical Enhancement of Performance 9 p Mar. 1987

Avail: NTIS HC A07/MF A01

The timing of wakefulness and sleep in humans and other diurnal primates is influenced not only by the duration of prior wakefulness or prior sleep, but also by the phase of the circadian timing system. In continuous, round-the-clock operations, or with transportation between time zones, conflicts frequently occur between these determinants of arousal state. The predictive circadian component favors wakefulness and sleep at phases consistent with the recent history of environmental and internal time cues. On the other hand, the reactive homeostatic component is principally determined by the length of prior wakefulness on the particular day in question. Investigations of pharmacological agents which influence the timing of sleep and wakefulness indicate they may exert their effects directly on the neuronal/humoral mechanisms responsible for the generation of sleep, or by altering the phase of the circadian system. The circadian effects may either be achieved by influencing the interaction between environmental light-dark cycles and circadian pacemakers. Examples of drugs which appear to have predominantly homeostatic effects, pacemaker effects, or entrainment effects are discussed. An appropriate strategy for the management of alert wakefulness at any hour of day and night must use the appropriate pharmacological tools to manage circadian and homeostatic components of wakefulness and sleep. Author

N87-25719# Secretariat General de la Defense Nationale, Paris (France).
SIDE EFFECTS OF HYPNOTIC BENZODIAZEPINES ON THE VIGILANCE AND EFFICIENCY OF PERSONNEL AFTER AWAKENING [EFFETS RESIDUELS DES BENZODIAZEPINES HYPNOTIQUES SUR LA VIGILANCE ET L'EFFICIENCE DES PERSONNELS AU REVEIL]
L. CROCQ and M. A. CROCQ *In* AGARD, Biochemical Enhancement of Performance 13 p Mar. 1987 In FRENCH
Avail: NTIS HC A07/MF A01

In order to detect and evaluate the side effects of hypnotic benzodiazepines on the vigilance and efficiency of personnel after awakening, a double blind study was performed with three hypnotic benzodiazephines which satisify military operational requirements. At four day intervals sixteen subjects were administered one of five substances in uncertain order (placebo, Loprazolam 1 mg, Triazolam 0.25 mg, Triazolam 0.50 mg, and Flunitrazepam 1 mg). On awakening, psychometric tests were performed which determined the subjective state, attention, psychomotor efficiency, short- and long-term memory, mathematical reasoning, performance with complex tasks, and performance with information overload. The results showed the existence of a psychometric deterioration, manifested in the final test scores, with higher intellectual functions (reasoning, complex tasks, and information overload) being more greatly affected than gross aptitudes (attention and memory). However, differences in noticable deterioration were evident between subject groups and individuals and between the various drugs. M.G.

N87-25720# Naval Health Research Center, San Diego, Calif. Behavioral Psychopharmacology Dept.
SEDATING AND NONSEDATING SLEEPING AIDS IN AIR OPERATION
CHERYL L. SPINWEBER *In* AGARD Biochemical Enhancement of Performance 12 p Mar. 1987 Sponsored by the Department of the Navy
Avail: NTIS HC A07/MF A01

Both sedating and nonsedating sleeping aids may be appropriate for use in specific operational environments to promote sleep and permit efficient utilization of rest periods. Sedating agents, such as the benzodiazeprine triazolam, produce an impairment window which is a period of time postadministration when performance and responsivity during sleep are impaired. Nonsedating agents, such as the amino acid l-tryptophan, enhance sleep but do not alter performance of responsivity at any time postadministration. In a field trial of the use of l-tryptophan in the U.S. Marines airlifted from California to Okinawa, l-tryptophan increased total sleep time the first night after arrival. This sleep enhancement was associated with signifiacntly faster reaction times the next day, sparing of short-term memory from jet-lag effects, and more rapid recovery of reaction time over the first three days after arrival. Which type of agent to use in support of an air operation will be determined by the nature of the environments in which rest periods will occur and the duration of scheduled sleep times. Author

N87-25721# School of Aerospace Medicine, Brooks AFB, Tex. Aerospace Medical Div.
FB-111A AIRCREW USE OF TEMAZEPAM DURING SURGE OPERATIONS
WILLIAM F. STORM and ROBERT C. PARKE *In* AGARD Biochemical Enhancement of Performance 12 p Mar. 1987
Avail: NTIS HC A07/MF A01

The objectives of this field study were to evaluate the performance capabilities and sleep patterns of USAF FB-111A aircrews using temazepam as a sleep aid during premission crew rest. Seven 2-man aircrews participated in two data collection periods. During each period, a crew flew a pair of extended duration nighttime missions, one each on consecutive nights. The mission on the first night was an actual FB-11A training mission. The mission the subsequent night was flown in a high-fidelity simulator. Crews were administered 30 mg temazepam for the daytime crew rest interval between one pair of actual and simulated missions and a placebo for the crew rest between the other pair of missions. Sleep during daytime crew rest was of longer duration and better quality with temazepam than with the placebo. Twelve hours after drug ingestion, aircrew performance of the simulator missions and selected laboratory tests was similar to that with the placebo. Author

N87-25722# Service de Sante pour l'Armee de l'Air, Paris (France). Dept. de Psychiatrie et Hygiene Mentale Aerospatiales.
PHOBIC MANIFESTATIONS AMONG EXPERIENCED PILOTS [LES MANIFESTATIONS PHOBIQUES CHEZ LES PILOTES CONFIRMES]
J. R. GALLE-TESSONNEAU *In* AGARD Biochemical Enhancement of Performance 5 p Mar. 1987 In FRENCH
Avail: NTIS HC A07/MF A01

Fear-of-flight phobic responses are not uncommon among experienced pilots. The associated clinical expressions are numerous and varied: psychological, somatic, or behavioral. Early therapeutic intervention of acute reaction states is often favorable. The prognosis is most uncertain in organized pathological conditions and evolving chronic modes. M.G.

N87-25723 Defence Research Information Centre, Orpington (England).
SHIFT WORK AND BIOLOGICAL RHYTHMS
J. RUTENFRANZ Nov. 1986 19 p Transl. into ENGLISH from Arzneimittel-Forschung/Drug Research no. 28 (2), (West Germany), v. 10a, 1978 p 1867-1872
(DRIC-T-7825; BR101102; ETN-87-99827) Avail: NTIS Issuing Activity

Technological, economic, and social reasons for the introduction of shift work are reviewed. The extent of its use and its effect on the health of workers are discussed. Some 10% to 20% of shift workers suffer illness, mainly of the gastrointestinal tract, and a larger number experience feelings of ill health, principally sleep disorders and food intake disorders. These effects are attributed to individual predisposition, the disturbance of sleep by noise on the day after night work, and difficulties in adapting biological functions to changes in the times of work and sleep. ESA

N87-25724# Colorado Univ., Denver. Health Sciences Center.
OPERATION EVEREST 2: HIGH ALTITUDE PULMONARY HYPERTENSION UNRESPONSIVE TO OXYGEN
BERTRON M. GROVES, JOHN T. REEVES, JOHN R. SUTTON, PETER D. WAGNER, and ALLEN CYMERMAN Jan. 1987 50 p (Contract DAMD17-85-C-5206)
(AD-A179882) Avail: NTIS HC A03/MF A01 CSCL 06J

High altitude increases pulmonary arterial pressure (PAP) presumably via alvelor hypoxia. No measurements of PAP have been made in man above 15000 feet (4572m). Eight male athletic volunteers simulated an ascent of Mt. Everest by living in a hypobaric chamber 40 days while being slowly decompressed to a barometric pressure (PB) of 240 mmHg. We expected to find the development of severe pulmonary hypertension which would be partially reversible with acute oxygen breathing. Hemodynamic measurements including right arterial, pulmonary arterial, wedge and systemic arterial pressures and cardiac output were made at rest and during upright cycle exercise breathing ambient air and 100% oxygen. Acute oxygen breathing lowered the cardiac output and PAP but did not lower PVR. Systemic pressure and resistance did not rise with progressive altitude but were increased during oxygen breathing, thus demonstrating a behavior of the systemic circulation which is different from the pulmonary vasculature. We concluded that the severe chronic hypoxia caused modest pulmonary hypertension not accompanied by right heart failure not immediately reversed by oxygen breathing. GRA

N87-25725# Army Research Inst. of Environmental Medicine, Natick, Mass.

MAXIMAL AEROBIC CAPACITY FOR REPETITIVE LIFTING: COMPARISON WITH THREE STANDARD EXERCISE TESTING MODES

M. A. SHARP, E. HARMAN, J. A. VOGEL, J. J. KNAPIK, and S. J. LEGG 12 Feb. 1987 32 p

(AD-A179985) Avail: NTIS HC A03/MF A01 CSCL 06J

The purpose of this study was to develop a reliable multi-stage repetitive lifting VO2max test to be used as a laboratory tool, which paralleled standard ergometer VO2max testing procedures. A secondary purpose was to compare the repetitive lifting VO2max test responses to those obtained during treadmill, cycle ergometer and arm crank ergometer tests utilizing similar testing procedures. The economy of maximal and submaximal repetitive lifting exercise was examined and compared to that of leg cycling and arm cranking. GRA

N87-25726# Army Research Inst. of Environmental Medicine, Natick, Mass.

ENDOCRINOLOGICAL RESPONSES TO EXERCISE IN STRESSFUL ENVIRONMENTS

RALPH P. FRANCESCONI 16 Mar. 1987 60 p

(AD-A180011) Avail: NTIS HC A04/MF A01 CSCL 06I

The metabolic, thermoregulatory, and fluid-regulatory adjustments which occur during exercise, even under relatively moderate environmental conditions, may be concomitant with endocrine and neuroendocrine responses involving the hypothalamus, pituitary, adrenal, thyroid, sex glands, and pancreas. Reviews of studies investigating these relationships have been published previously; the imposition of an environmental stress in the form of heat, cold, or high terrestrial altitude in many cases exacerbates the intensity of these endocrinological response in man and higher animals. The responsibility and lability of these hormonal adjustments, the availability and accessibility of the biological medium in man (plasma, serum, urine), and the recent development of specific quantitative techniques for micro-assay (high-pressure liquid chromatography, radioimmunoassay) have combined to produce numerous reports on the human endocrine/neuroendocrine response to exercise during heat, cold, or hypoxic stress. GRA

N87-25727# Army Research Inst. of Environmental Medicine, Natick, Mass.

INTRA-ABDOMINAL AND INTRA-THORACIC PRESSURES DURING LIFTING AND JUMPING

EVERETT A. HARMAN, PETER N. FRYKMAN, ELIZABETH R. CLAGETT, and WILLIAM J. KRAEMER Mar. 1987 37 p

(AD-A180030) Avail: NTIS HC A03/MF A01 CSCL 06J

To investigate intra-thoracic pressure (ITP) and intra-abdominal pressure (IAP) during lifting and jumping, 11 males were monitored as they performed the dead lift (DL), slide row (SR), leg press (LP), bench press (BP), and box lift (BL), at 50, 75 and 100% of each subject's 4-repetition maximum, the vertical jump (VJ), drop-jump (DJ) form 0.5 and 1.0 meter heights, and Valsalva maneuver (VM). Measurements were made of peak pressure, time from pressure rise to switch-marked initiation of body movement (TRISE), and time from the movement to peak pressure (TPEAK). The highest ITP and IAP occurred during VM (22.2 + or - 6.0 and 26.6 + or - 6.7 kPa respectively) with one individual reaching 36.9 kPa (227 mmHg) IAP. In ascending order of peak ITP during the highest resistance sets, the activities were SR, BP, VJ, DJ, DL, LP AND VM, while the order for IAP was BP, VJ, DJ, BL, DL, LP, SR and VM. Pressures significantly ($P<.05$) increased with amount of weight lifted and rose before but peaked after the weight moved. IAP rose earlier and was of greater magnitude than ITP. For the jumps, pressure rose and diminished before the feet lost contact with the ground. Drop-jump height did not affect pressure. Correlation of pressure with weight lifted was fair to good for most activities. GRA

N87-25728# Army Research Inst. of Environmental Medicine, Natick, Mass.

INFLUENCE OF FASTING ON CARBOHYDRATE AND FAT METABOLISM DURING REST AND EXERCISE IN MEN

JOSEPH J. KNAPIK, CAROL N. MEREDITH, BRUCE JONES, LINDA SUEK, VERNON R. YOUNG, and WILLIAM J. EVANS 2 Mar. 1987 34 p Prepared in cooperation with Massachusetts Univ., Amherst and Tufts Univ., Boston, Mass.

(AD-A180036) Avail: NTIS HC A03/MF A01 CSCL 06D

Metabolic effects of an overnight fast or a 3.5-day fast were compared in 8 healthy young men at rest and during exercise to exhaustion at 45% VO2 max, glucose rate of appearance (Ra) and disappearance (Rd) were calculated from plasma glucose enrichment during a primed, continuous infusion of glucose. Serum substrates and insulin levels were also measured. Glycogen content of the m. vastus lateralis was determined in biopsies taken before and after exercise. At rest, glucose flux and whole body carbohydrate oxidation determined from the respiratory exchange ration were lower in F than PA but muscle glycogen levels were similar. During exercise, glucose flux, whole body carbohydrate oxidation and the rate muscle of glycogen utilization were significantly lower during the fast. In the PA state, glucose Ra and Rd increased together throughout exercise. However, in the F state Ra exceeded Rd during the first hour of exercise, causing an increase in plasma glucose to levels similar to those of the PA state. The increase in glucose flux was markedly less throughout F exercise. Lower carbohydrate utilization in the F state at rest and during exercise was consistent with higher circulating fatty acids and ketone bodies, lower levels of plasma insulin and the maintenance of physical performance as reflected by similar time to exhaustion. GRA

N87-25729# Duke Univ., Durham, N. C.

ABSTRACTS OF PAPERS PRESENTED AT THE ANNUAL MEETING OF THE SOCIETY OF GENERAL PHYSIOLOGISTS (40TH) HELD IN WOODS HOLE, MASSACHUSETTS ON 4-7 SEPTEMBER 1986

1986 72 p Meeting held in Woods Hole, Mass., 4-7 Sep. 1986

(AD-A180080) Avail: NTIS HC A04/MF A01 CSCL 06D

This is a collection of abstracts concerning these topics: Plasma membranes; Calcium regulation; Neurotransmitters; Erythrocytes; Synapse; Sodium-potassium pump; and Calcium. GRA

N87-25730# Army Research Inst. of Environmental Medicine, Natick, Mass.

HEAT INTOLERANCE, HEAT EXHAUSTION MONITORED: A CASE REPORT Final Report

LAWRENCE E. ARMSTRONG, ROGER W. HUBBARD, PATRICIA C. SZLYK, INGRID V. SILS, and WILLIAM J. KRAEMER 23 Mar. 1987 19 p

(AD-A180090) Avail: NTIS HC A02/MF A01 CSCL 06J

A 32 year-old male (S.H.) monitored during an 8-day heat acclimation (HA) investigation, unexpectedly exhibited heat intolerance and heat exhaustion. Thirteen other males completed HA without indications of either heat intolerance or heat exhaustion. Because S.H. responded normally to HA on days 1 to 4, the intervention of an unknown host factor on days 5 to 8 was suggested. S.H.'s heat exhaustion episode (day 8) was apparently forewarned by loss of body weight and increased heart rate, skin temperature (days 5 to 8) and rectal temperature (days 7 to 8) during daily 90 min trials. His symptoms indicated classical salt depletion heat exhaustion, but the calculated salt deficit was mild. Post-heat exhaustion serum enzyme levels were either normal or acutely elevated. Blood beta-endorphin and cortisol levels were 6 times and 2 times greater than control values, respectively. This case report is unique because physiological measurements and blood analyses were performed before, during, and after heat intolerance and heat exhaustion. GRA

N87-25731# Essex Corp., Orlando, Fla.
THE EFFECTS OF ASYNCHRONOUS VISUAL DELAYS ON SIMULATOR FLIGHT PERFORMANCE AND THE DEVELOPMENT OF SIMULATOR SICKNESS SYMPTOMATOLOGY Final Report, 25 Apr. - 26 Dec. 1986
K. C. ULIANO, E. Y. LAMBERT, R. S. KENNEDY, and D. J. SHEPPARD 26 Dec. 1986 71 p
(Contract N61339-85-D-0026)
(AD-A180196; NAVTRASYSCEN-86-D-0026-1) Avail: NTIS HC A04/MF A01 CSCL 06J

This research effort involved an experiment investigating the effect of asynchronous visual delays on simulator flight performance and the development of simulator sickness symptomatology. 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-five experienced pilots flew three 40- or 60-minute sessions with two simulator tasks (air taxi and slalom) under each of the lag conditions. Pilots flew one session per day for three days with the lag condition changing each day. Objective and self-report indices were collected and, while results showed no difference between lag conditions, paper-and pencil illness ratings reflected a high initial incidence of illness (46% on Day 1) followed by rapid adaptation upon subsequent exposure. Simulator performance, however, was differentially affected by lag with the longest lag producing the worst performance. Finally, relationships between sickness indices, flight performance data, and other variables are presented and discussed GRA

N87-25732# Army Research Inst. of Environmental Medicine, Natick, Mass.
MOOD STATES AT 1600 AND 4300 METERS HIGH TERRESTRIAL ALTITUDE
BARBARA L. SHUKITT and LOUIS E. BANDERET 9 Dec. 1986 6 p
(AD-A180535; USARIEM-M-14-87) Avail: NTIS HC A02/MF A01 CSCL 06E

Personal anecdotes imply that ascent to high altitude causes mood changes such as depression, apathy, and drowsiness. Also, behaviors at high altitude suggests that people are more argumentative, irritable, or euphoric. Since there are few systematic and quantitative studies assessing the effects of altitude on mood; this study assessed mood at two different altitudes and times of day using a standardized scale. Self-rated moods were twice daily using the Clyde Mood Scale with 19 males and 16 females. Baseline (control) mood states were determined at 200 m. Moods were then assessed at 4300 m with one group and at 1600 m with the second group. Friendliness, clear thinking, dizziness, sleepiness, and unhappiness were affected at 4300 m. Only sleepiness changed at 1600 m. At altitude mood changes were different from baseline the day of arrival (1 to 4 hours), most severe after on day (18 to 28 hours), and back to baseline levels by day 2 (42 to 52 hours). Few time of day (morning to evening) differences were found. Therefore, this mood scale appears useful for assessing the effects of different altitudes on mood states. GRA

N87-25733* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 300)
Aug. 1987 77 p
(NASA-SP-7011(300); NAS 1.21:7011(300)) Avail: NTIS HC A05 CSCL 06E

This bibliography lists 232 reports, articles and other documents introduced into the NASA scientific and technical information system in July 1987. Author

N87-25734# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 21, NO. 1, JANUARY - FEBRUARY 1987
O. G. GAZENKO, ed. 29 Apr. 1987 153 p Transl. into ENGLISH of Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 96 p
(JPRS-USB-87-003) Avail: NTIS HC A08/MF A01

Various topics in the fields of space biology and aerospace medicine are discussed. Aviation physiology, work capacity, pilot performance, blood chemistry, weightlessness effects, altitude and motion sickness, radiation damage, and the spectral rendition of vestibular nystagmus are among the topics covered.

N87-25735# Joint Publications Research Service, Arlington, Va.
CURRENT PROBLEMS OF AVIATION PHYSIOLOGY
N. M. RUDNYY and V. A. BODROV *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 1-11 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 4-11
Avail: NTIS HC A08/MF A01

A survey of current research concerns in the area of aviation physiology is given. Medical support of flight personnel, altitude sickness, personnel selection, hypoxia, motion sickness, visual displays, electroencephalographic investigations of the cerebral cortex, pilot training, and flight personnel fatigue are among the topics discussed. R.J.F.

N87-25736# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF ASSESSING HUMAN FUNCTIONAL CAPACITIES AND PREDICTING HEALTH STATUS
S. G. SALIVON *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 12-18 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 12-17
Avail: NTIS HC A08/MF A01

Reports dealing with assessments of human functional capabilities and health prediction are reviewed. Emphasis is placed on a systemic approach to the study of the functional abilities of the healthy man and prediction of his health status. Interactions in the man-environment system and hierarchical patterns of the regulation of various functional systems are considered. Author

N87-25738# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF HORMONES, SUGAR AND ELECTROLYTES UNDER HYPODYNAMIC CONDITIONS ACCORDING TO BLOOD BIOCHEMICAL PARAMETERS
V. V. MAKAROVSKIY, YU. P. REZNIKOV, A. F. KHALANGOT, and S. A. ZINKOVSKAYA *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 25-32 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 21-27
Avail: NTIS HC A08/MF A01

Time-course variations in hormones, carbohydrates and electrolytes (specifically, cortisol, aldosterone, testosterone, T3, T4, sugar, potassium, sodium and chlorides) in the blood of essentially healthy men, aged 19 to 59 years, kept for 30 days in a closed life support system were measured. Subjects aged 48 to 59 years who performed regular exercises showed a higher stability of potassium, sodium and chlorides and a normalization of hormones by test day 30 in contrast to other groups of subjects. Author

N87-25739# Joint Publications Research Service, Arlington, Va.
EFFECT OF WEIGHTLESSNESS AND HYPOKINESIA ON VELOCITY AND STRENGTH PROPERTIES OF HUMAN MUSCLES
L. S. GRIGORYEVA and I. B. KOZLOVSKAYA *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 33-37 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 27-30
Avail: NTIS HC A08/MF A01

The effects of short- and long-term microgravity and prolonged bed rest on velocity and strength parameters of leg muscles were measured by isokinetic dynamometry. It was found that long-term exposure to microgravity produced a more distinct decline of muscle strength than short-term exposure. Prolonged bed-rest led to greater strength losses than microgravity of comparable duration.
Author

N87-25740# Joint Publications Research Service, Arlington, Va.
PROBABILITY OF ALTITUDE DECOMPRESSION DISORDERS AS A FUNCTION OF DURATION OF PRE-EXPOSURE TO HYPOBARIC ATMOSPHERE
V. I. CHADOV, A. S. TSIVILASHVILI, and L. R. ISEYEV *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 38-42 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 30-33
Avail: NTIS HC A08/MF A01

Healthy volunteers, aged 21 to 47, were kept in an altitude chamber. Before decompression to a residual pressure of 293.3 GPa, the test subjects were consecutively exposed to 1120 GPa for two hours and then to 733.3 GPa for 24, 18 or 12 hours. At 293.3 GPa the test subjects performed a moderate workload for 6 hours. It was concluded that prior to the use of a space suit with a working pressure of 0.3 kgf/square cm (293.3 GPa), the time of exposure to a hypobaric normoxic (29 to 30 percent O2) atmosphere with the total barometric pressure 733.3 GPa should not be less than 18 hours and it should preferably be 24 hours. In this situation decompression safety of 6 hours of extravehicular activity can be predicted with high probability.
Author

N87-25741# Joint Publications Research Service, Arlington, Va.
SOME INDIVIDUAL DISTINCTIONS OF HUMAN ADAPTATION TO ALTITUDE
T. V. BEREZOVSKIY, T. V. SEREBROVSKAYA, and A. A. IVASHKEVICH *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 43-48 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 34-37
Avail: NTIS HC A08/MF A01

Two groups of healthy men, natives of lowlands who for one year lived and worked in chronic hypoxia (Group 1 at an altitude of 1680 m with P sub O sub 2 equals 120 mm Hg and Group 2 at an altitude of 3650 with P sub O sub 2 equals 90 mm Hg), were examined. The subjects showed a higher sensitivity of the respiratory system to hypoxia, an enhanced lung ventilation and circulation, a lower gas exchange and work capacity. Blood and metabolic test results are given.
Author

N87-25742# Joint Publications Research Service, Arlington, Va.
ATROPINE TEST DISTINCTIONS IN INDIVIDUALS OF DIFFERENT AGE GROUPS
KH. KH. YARULLIN and N. P. ARTAMONOVA *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 49-55 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 37-42
Avail: NTIS HC A08/MF A01

The diagnostic value of the atropine test was investigated in 47 essentially healthy men of different age groups (25 to 39, 40 to 49 and 50 to 59 years). The cardiovascular responses were evaluated from ECG recorded continuously for an hour after subcutaneous injection of 1.0 to 0.1 percent atropine sulphate. Atropine caused a two-stage effect of the cardiac chronotropic function. The first, bradycarditic, stage was induced by vagal stimulation while the second, tachycarditic, stage was, by contrast, produced by atropine blockade of the acetylcholine effect on m-cholino-receptors of myocardial cells. The atropine effect was identical in sign in all age groups. However, in the young group the bradycarditic effect was more distinct and atropine induced arrhythmias were more frequent. In the 50 to 59 years subjects the tachycarditic effect grew at a slower rate and the electric systole response to a higher heart rate was less pronounced.
Author

N87-25748# Joint Publications Research Service, Arlington, Va.
PRESSURE AND VOLUME PULSATION WITH CHANGE IN SPARE ROOM IN INTRACRANIAL CAVITY
L. G. SIMONOV and A. S. SARIBEKYAN *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 85-92 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 61-66
Avail: NTIS HC A08/MF A01

Changes in the amplitude and phase characteristics of pulse variations of volumes and pressures in response to an increase in the intracranial pressure are discussed. The study of 60 neurosurgical patients shows that as the intracranial pressure grows the amplitude of pulse variations of subdural pressure increases to 30 mm Hg and then decreases, the phase characteristics of the pulse waves changing accordingly.
Author

N87-25749# Joint Publications Research Service, Arlington, Va.
COMPARATIVE STUDY OF CENTRAL HEMODYNAMICS, MYOCARDIAL CONTRACTILITY AND LEFT VENTRICULAR WALL TENSION IN ATHLETES AND PATIENTS
B. A. KHODOS and V. L. GABINSKIY *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 93-99 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 66-71
Avail: NTIS HC A08/MF A01

The purpose of this study was to extend our knowledge about the athletic heart and improve diagnosis of latent manifestations of cardiac insufficiency. Echocardiography was used to examine central hemodynamics, myocardial contractility and left ventricle wall tension in athletes and patients with ischemic heart disease (IHD) and arterial hypertension at rest and after exercise. The study of time course variations of these parameters revealed different patterns of initial dilation and development of further dilation and hypertrophy. The most sensitive index of contractility was meridional and circular tension of the left ventrical wall which was the lowest in athletes and the highest in IHD patients.
Author

N87-25750# Joint Publications Research Service, Arlington, Va.
SPECTRAL RENDITION OF VESTIBULAR NYSTAGMUS
A. V. TELEZHNIKOV, V. G. BAZAROV, V. L. TSYGANKOV, M. V. KULIKOVA, and N. S. MISHCHANCHUK *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 100-104 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 71-73
Avail: NTIS HC A08/MF A01

A spectral analysis of an electronystagmogram (ENG) obtained during the Barany rotation test at an angular velocity of 180 degrees/s for 20 s was performed. The spectrum of individual nystagmic movements of the clonic and tonic types were analyzed as a function of change in the relationship of fast and slow phases. Author

N87-25754# Joint Publications Research Service, Arlington, Va.
EFFECT OF ADEQUATE STIMULATION OF VESTIBULAR ANALYZER ON ACOUSTIC EVOKED POTENTIALS WITH AVERAGE LATENCY PERIOD
V. P. OVSYANIK, E. A. BAKAY, V. V. GURIK, R. SH. KARIMOV, S. L. UDOVIK, and L. S. KOVALENKO *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 118-121 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 80-82
Avail: NTIS HC A08/MF A01

The objective was to analyze changes in amplitude of mean latency period acoustic evoked potentials (MAEP) before and after stimulation of the vestibular analyzer (VA) in subjects differing in vestibular stability. The studies indicate that vestibular stimulation of the chosen intensity leads to a reliable change in amplitude of components of acoustic evoked potentials of average latency period. Reliable differences are particularly significant in individuals with low vestibular stability. At the same time, the level and dynamics of changes in amplitudes of MAEP components after one or several cycles of adequate VA stimulation differed reliably in subjects differing in vestibular stability. Author

N87-25755# Joint Publications Research Service, Arlington, Va.
EVOKED POTENTIALS WITH LONG LATENCY PERIOD IN MAN WITH EXPOSURE TO LINEAR ACCELERATIONS
V. P. OVSYANIK and S. L. UDOVIK *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 122-128 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 82-87
Avail: NTIS HC A08/MF A01

The objective was to single out complex evoked potentials (CEP) in the bioelectrical activity (BA) of the human cerebral cortex which were induced by linear accelerations. Results indicated that with exposure to linear accelerations of the chosen range it was possible to single out CEP on the encephalogram. There was good reproducibility of parameters under identical conditions for the same subjects. It was learned that a change in head position in relation to the vertical lines leads to change in form and parameters of CEP. Author

N87-25756# Joint Publications Research Service, Arlington, Va.
HUMAN BLOOD LACTATE DEHYDROGENASE ISOZYME COMPOSITION WITH SINGLE EXPOSURE TO ACUTE HYPOXIA, AND ITS LINK TO PHYSICAL WORK CAPACITY
T. V. SEREBROVSKAYA, A. N. KRASYUK, and V. N. FEDOROVICH *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 129-133 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 87-89
Avail: NTIS HC A08/MF A01

The objective was to investigate changes in lactate dehydrogenase (LDH) isozyme composition of human red blood cells during conditioning with acute hypoxia and to explore possible links between these changes and physical work capacity. Results revealed that hypoxia conditioning elicits changes in both overall LDH activity in a hemolysate of human blood and its isozyme spectrum. Author

N87-25891*# Texas A&M Univ., College Station. Dept. of Industrial Engineering.
GENERAL PURPOSE ALGORITHMS FOR CHARACTERIZATION OF SLOW AND FAST PHASE NYSTAGMUS
CHARLES S. LESSARD *In* NASA. Lyndon B. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1986, Volume 2 31 p Jun. 1987
Avail: NTIS HC A13/MF A01 CSCL 06P

In the overall aim for a better understanding of the vestibular and optokinetic systems and their roles in space motion sickness, the eye movement responses to various dynamic stimuli are measured. The vestibulo-ocular reflex (VOR) and the optokinetic response, as the eye movement responses are known, consist of slow phase and fast phase nystagmus. The specific objective is to develop software programs necessary to characterize the vestibulo-ocular and optokinetic responses by distinguishing between the two phases of nystagmus. The overall program is to handle large volumes of highly variable data with minimum operator interaction. The programs include digital filters, differentiation, identification of fast phases, and reconstruction of the slow phase with a least squares fit such that sinusoidal or psuedorandom data may be processed with accurate results. The resultant waveform, slow phase velocity eye movements, serves as input data to the spectral analysis programs previously developed for NASA to analyze nystagmus responses to pseudorandom angular velocity inputs. Author

N87-25900*# Houston Univ., Tex. Dept. of Human Development.
BONE DENSITY IN LIMB-IMMOBILIZED BEAGLES: AN ANIMAL MODEL FOR BONE LOSS IN WEIGHTLESSNESS
IRA WOLINSKY *In* NASA. Lyndon B. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1986, Volume 2 6 p Jun. 1987
Avail: NTIS HC A13/MF A01 CSCL 06B

Prolonged weightlessness is man in space flight results in a slow progressive demineralization of bone accompanied by an increased calcium output in the urine resulting in negative calcium balances. This possibly irreversible bone loss may constitute a serious limiting factor to long duration manned space flight. In order to seek and test preventative measures an appropriate ground based animal model simulating weightlessness is necessary. Use of the mature Beagle in limb immobilization has been documented as an excellent model for orthopedic research since this animal most closely simulates the phenomenom of bone loss with regards to growth, remodeling, structure, chemistry and mineralization. The purpose of this project is to develop a research protocol for the study of bone loss in Beagles during and after cast immobilization of a hindleg; research will then be initiated. Author

N87-26497# Wake Forest Univ., Winston-Salem, N.C. Medical Imaging Research and Magnetic Resonance Center.
INTRODUCTION TO DYNAMIC EFFECTS AND INTERCOMPARISON IN THE MR (MAGNETIC RESONANCE) IMAGING PROCESS: FOUR SHORT REPORTS ON MRI DYNAMICAL AND INTERCOMPARATIVE PHENOMENA
P. R. MORAN Aug. 1986 40 p Sponsored by National Cancer Inst., Bethesda, Md.
(PB87-175865; BGSM/RAD/NMR-860816) Avail: NTIS HC A03/MF A01 CSCL 06P

The report provides a brief history of early measurement methods for blood flow, using nuclear magnetic resonance, prior to successful implementation on magnetic resonance imaging (MRI) scanners in 1983; it gives also a description of principles and performance of a commercial blood flowmetry system using continuous-wave magnetic resonance and the flow-driven adiabatic

passage phenomenon. For performance assessment of all MRI systems, the principles underlying all dynamic data acquisition behaviors are presented for an understanding of the concepts involved, and a contrast/detail assessment method, using a new kind of digitally analyzed phantom, is described. GRA

N87-26498# Health Effects Research Lab., Research Triangle Park, N. C.
MODELING OZONE ABSORPTION IN THE LOWER RESPIRATORY TRACT
J. H. OVERTON and F. J. MILLER Apr. 1987 19 p
(PB87-182697; EPA-600/D-87-129) Avail: NTIS HC A02/MF A01 CSCL 06P

A dosimetry simulation model was developed for predicting the local absorption of ozone (O3) in the lower respiratory tract (LRT) of animals and man. The model takes into account species LRT anatomy and ventilatory characteristics, transport in the lumen and air spaces, loss of O3 to the liquid lining, and transport and chemical reactions in the liquid lining, and underlying tissues and capillaries. Basic biological concepts and the mathematical formulation of the model are briefly outlined and the results of several investigations presented. Predicted values of LRT uptake are compared to experimental O3 uptake data in humans, showing good agreement over the range of experimental tidal volumes and breathing frequencies. The effect of airway path distance on centriacinar O3 dose is explored; large variation in dose for the first alveolated ducts in a rat are predicted. Human and rat generational doses vs. generation are plotted together for comparison; the curves demonstrate a remarkable similarity with regards to shape and structure. Author

N87-26499# Texas Technological Univ., Lubbock.
DEVELOPMENT OF A SIMPLE PROCEDURE FOR PREDICTING THE EFFECTS OF HEAT ON UNDERGROUND MINERS Final Report
J. D. RAMSEY and C. L. BURFORD 1986 126 p
(Contract PHS-NIOSH-210-81-6104)
(PB87-164455) Avail: NTIS HC A07/MF A01 CSCL 06P

Heat stress indices were evaluated to determine the simplest and yet sufficiently accurate method for determining heat exposure in underground mining situations. There was no simple method found to obtain the desired information. Carrying, positioning, and reading instruments for climatic measurements in underground mines created difficult and hazardous situations for the observers and also interfered with the activities of the miners, thus leading to incorrect data being collected. A Heat Stress Dosimeter (HSD) was designed to be worn by the miners, thus eliminating the majority of the problems encountered with other systems. The device consists of a miniaturized, self-contained environmental and physiological monitoring and recording system, and was designed based upon the Vitalog PMS-8 eight channel data converter and memory. Author

N87-26500# Kayser Threde G.m.b.H., Munich (West Germany).
DEVELOPMENT AND CONSTRUCTION OF AN INTEGRATED EXPERIMENT SYSTEM FOR SLED EXPERIMENTS DURING THE FIRST SPACELAB MISSION Final Report, Oct. 1984
WOLFGANG BANGERT, WOLFGANG BRUZEK, and WERNER MOLDENHAUER Bonn, West Germany BMFT Dec. 1986 267 p In GERMAN; ENGLISH summary Sponsored by BMFT (BMFT-FB-W-86-013; ISSN-0170-1339; ETN-87-99904) Avail: NTIS HC A12/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 43

A Spacelab sled, for research concerning the function of the human vestibular apparatus and its interaction with other space orientation systems, and for studies on space sickness was developed. The concept, realization, and utilization of the stimulation and measurement devices prior to, during, and after the mission, and the execution of the experiments are described. ESA

N87-26501# Technische Hogeschool, Eindhoven (Netherlands). Dept. of Electrical Engineering.
RESEARCH ON MODELS FOR THE TRANSIENT SYSTEM OF THE VISUAL SYSTEM M.S. Thesis
K. H. WONG 1986 119 p
(ETN-87-90134) Avail: NTIS HC A06/MF A01

A spatiotemporal model for the transient channel of the human visual system, to predict the detection of relatively large, and fast changing stimuli was developed. The model consists of a spatiotemporal filter and (in cascade) a temporal filter. The spatiotemporal filter is called the lateral membrane, a two-dimensional spatial structure modeled as an electric transmission line of a very low temporal order. Quantitatively the membrane and the temporal filter are parameterized on basis of the impulse response of disks with relatively large diameter (1 deg field). Computer simulations of the transient system were compared with measured data. For not too large stimulus disk diameter model results are good. ESA

N87-26502# Naval Aerospace Medical Inst., Pensacola, Fla.
TRIAZOLAM - PERFORMANCE SIDE EFFECTS: VESTIBULAR, MUSCULOSKELETAL, AND COMPLEX PERFORMANCE TESTS Interim Report
D. M. MURDOCH, J. M. LENTZ, G. G. REAMS, and C. A. DEJOHN 4 Mar. 1987 29 p
(AD-A180934; NAMRL-1327) Avail: NTIS HC A03/MF A01 CSCL 06O

Transient insomnia preceding or during intense military aviation operations has, in some cases, been treated by short-acting benzodiazepines like temazepam or triazolam. This study evaluated selected physiological and performance side effects of triazolam (0.25 mg) administered to nine men and one woman. Each subject completed drug and placebo testing, which started at one and eight hours following drug administration. Testing included measures of balance, fine motor movement, two-dimensional tracking, tilt table, tri-service performance assessment battery, pulmonary function, bike ergometer, and strength/endurance. This dose of triazolam produced no significant change in any of the tests with the exception of the balance tests. This study did not identify any significant performance side effects that would disqualify this agent for acute short-term use against insomnia sometimes encountered in the military aviation environment. GRA

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BEHAVIORAL SCIENCES

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

A87-43219#
AN ANALYSIS OF THE FLYING TRAINING DEFICIENCY (FTD) ELIMINATION OF THE JASDF UNDERGRADUATE PILOT TRAINING
ZENJI TAKASHIMA and MIYAKO OKAUKE Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 27, June 1986, p. 27-35. In Japanese, with abstract in English.

Recent findings on FTD elimination in the JASDF undergraduate pilot training program are described. It was found that landing and airwork were the main reasons for elimination in the early phases, while IFR, navigation, and formation played important roles in the later phases. Among the personality traits, overtension was the most dominant factor for FTD elimination in most phases. K.K.

A87-43581
THE DYNAMICS OF PHYSIOLOGICAL INDICES DURING MINUTE-INTERVAL TIME JUDGMENTS [DINAMIKA FIZIOLOGICHESKIKH POKAZATELEI PRI VOSPROIZVEDENII MINUTNOGO INTERVALA VREMENI]
O. S. RAEVSKAIA and T. D. DZHEBRAILOVA (Nauchno-Issledovatel'skii Institut Normal'noi Fiziologii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 13, Mar.-Apr. 1987, p. 201-206. In Russian. refs

Normal male subjects were asked to mentally count minute-long intervals, and the parameters of ECG, EEG, and cutaneous galvanic reaction (CGR) were recorded during the periods of rest, the 'ready' period, and the counting period. With respect to the duration of the subjective 'minute' and the precision of the minute reproductions, all subjects could be grouped into three categories. Subjects producing relatively long (about 90 s) 'minutes' had relatively low levels of activation both at rest and during the counting: a well-expressed alpha EEG rhythm of occipital leads, low-energy beta rhythms of forehead leads, and high variation of the ECG R-R interval. The same subjects exhibited high values of vegetative indices (high CGR to the 'ready' signals and high variability in the R-R intervals during transition from rest to counting). On the other hand, subjects in the 'short-minute' (about 52 s) category exhibited relatively high levels of activation, but low values of vegetative indices. I.S.

A87-43686
LINEAR DISCRIMINANT ANALYSIS IN A SYSTEM OF OCCUPATIONAL PSYCHOPHYSIOLOGICAL SELECTION AND CLASSIFICATION OF OPERATORS [LINEINYI DISKRIMINANTNYI ANALIZ V SISTEME PROFESSIONAL'NOGO PSIKHOFIZIOLOGICHESKOGO OTBORA I RASPREDELENIIA OPERATOROV]
R. N. KOROBOV, A. M. PARACHEV, and I. B. SLIUSAR Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), March 1987, p. 42-44. In Russian.

The method of linear discriminant analysis was developed for occupational psychophysiological selection and classification of subjects undergoing tests for three operator classes: conventional-type operators, stereotype operators, and operators of nonstereotype specialities. The psychophysiological indices and the methodology used in the procedure for obtaining the efficiency parameters for the three operator categories are described. It is shown that the subjects found to be fit for the activity in the conventional-operator category are also fit for the other two categories, whereas those found fit for a nonsteretype speciality also have an aptitude for efficient performance of stereotype work. I.S.

A87-43774
CONTENT, VARIETY, AND AUGMENTATION OF SIMULATED VISUAL SCENES FOR TEACHING AIR-TO-GROUND ATTACK
GAVAN LINTERN (Illinois, University, Savoy), KAREN E. THOMLEY-YATES, BRIAN E. NELSON (Essex Corp., Orlando, FL), and STANLEY N. ROSCOE (ILLIANA Aviation Sciences, Las Cruces, NM) Human Factors (ISSN 0018-7208), vol. 29, Feb. 1987, p. 45-59. refs

The Visual Technology Research Simulator was used for a quasi-transfer-of-training study in which 32 military pilots were taught to deliver bombs from a 30-deg dive. Scene content had a strong and consistent effect on performance and on differential transfer. A landscape scene that contained buildings, roads, and rectangular fields was better than a schematic grid pattern for both training and transfer. Scene variety in training did not benefit transfer, and there is a distinct possibility that it can interfere with early learning. Augmented feedback proved to be a potent instructional variable, but one that showed complex effects. It helped inexperienced pilots with their dive pitch control, and it helped the more experienced pilots with their longitudinal bombing error. The data presented here have strong implications for design and use of flight training simulators in that they indicate the importance of scene content and augmented feedback as training variables. Author

A87-44708
ADVANCES IN FLIGHT SIMULATION - VISUAL AND MOTION SYSTEMS; PROCEEDINGS OF THE INTERNATIONAL CONFERENCE, LONDON, ENGLAND, APR. 29-MAY 1, 1986
Conference sponsored by the Royal Aeronautical Society. London, Royal Aeronautical Society, 1986, 346 p. For individual items see A87-44709 to A87-44728.

Papers are presented on air-to-air refueling simulation; the effectiveness of flight simulation in training KC-10 pilots in receiver refueling; applications of low cost visual simulation for basic pilot training; vestibular models for design and evaluation of flight simulator motion; the design of motion simulation software with digital filtering techniques; and motion software for a research flight simulator. Topics discussed include the fundamentals of simulator cockpit motion generation; requirements for effective flight simulator displays; visual cuing requirements in flight simulation; optical information for flight simulation; and the integration of a six-axis motion system and a wide angle visual system inside a dome. Consideration is given to simulator sickness; FLIR simulation in pilot training; visual systems development; area-of-interest displays using laser illumination; engineering and human visual issues in the development of a fiber-optic helmet mounted display; and training perceptual-motor skills. I.F.

A87-44709
EFFECTIVENESS OF FLIGHT SIMULATION IN TRAINING KC-10 PILOTS IN RECEIVER REFUELING
MICHAEL J. WILD (American Airlines Training Corp., Fort Worth, TX) IN: Advances in flight simulation - visual and motion systems; Proceedings of the International Conference, London, England, Apr. 29-May 1, 1986 . London, Royal Aeronautical Society, 1986, p. 8-24.

The transfer of receiver refueling performance from the simulator to the aircraft is investigated by testing KC-10 and KC-135 pilot trainees in the receiver refueling task under day and night conditions. The receiver refueling performance scores of each pilot were measured during simulator and aircraft refueling missions; the performance scores were determined from the elapsed time the receiver pilot is connected to the tanker in air refueling boom prior to disconnect. The visual capabilities of the simulator are evaluated using questionnaires. It is observed that there is no significant difference in performance scores between the last simulator mission and the first aircraft mission, and that the visual capabilities of the simulator are similar to those of the aircraft. It is noted that effectiveness of simulator training will reduce the need for aircraft training and thereby improve safety and reduce costs. I.F.

A87-44710
FUTURE APPLICATIONS OF LOW COST VISUAL SIMULATION FOR BASIC PILOT TRAINING
IAN A. WORMOLD (RAF, Central Flying School, England) IN: Advances in flight simulation - visual and motion systems; Proceedings of the International Conference, London, England, Apr. 29-May 1, 1986 . London, Royal Aeronautical Society, 1986, p. 25-35.

The use and benefits of visual simulation in RAF pilots training are discussed. The systems approach to training students on the tandem seat, high performance, turboprop aircraft is described. Consideration is given to low-level navigation training, the visual circuit, simulation qualifications, solo general handling, emergency training, night flying, and instrument flying. The role of instructors in training pilots, and their training are examined. I.F.

A87-44716
VISUAL CUEING REQUIREMENTS IN FLIGHT SIMULATION
A. R. BUFFETT (Royal Aircraft Establishment, Farnborough, England) IN: Advances in flight simulation - visual and motion systems; Proceedings of the International Conference, London, England, Apr. 29-May 1, 1986 . London, Royal Aeronautical Society, 1986, p. 127-157. refs

The requirements for visual cuing in flight simulators are described. Human visual perception is discussed in terms of the

detection of images and the perception of three-dimensional space. The reduction of visual and space perception cues in the flight simulator; technological limitations in the areas of optical quality image content, display and projection methods; and the cost-effectiveness of producing real visual images are examined. The visual cues applicable to civilian fixed-wing aircraft, civilian helicopter, military fixed-wing aircraft, and military helicopter flight simulations are defined. I.F.

A87-44718
OPTICAL INFORMATION FOR FLIGHT SIMULATION
D. H. OWEN (Ohio State University, Columbus) IN: Advances in flight simulation - visual and motion systems; Proceedings of the International Conference, London, England, Apr. 29-May 1, 1986 . London, Royal Aeronautical Society, 1986, p. 170-190.
(Contract AF-AFOSR-81-0078; F33615-83-K-0038)

The usefulness of optical information in detecting and guiding self-motion during flight is evaluated using empirical tests. Functional and contextual variables, which affect sensitivity to changes in self-motion, are defined; the operational differences between these two optical variables are described. Self-motion events which represent loss in altitude from flight at a constant altitude or loss in speed from flight at a constant speed are examined. Global optical texture density, and the relation between control of self-motion and optical flow-pattern variables are analyzed. It is observed that both self-scaled and environment-scaled information are useful, and their applicability varies with the task being performed. I.F.

A87-44719
OPTICAL FLOW - THE KEY TO INTEGRATION OF VISUAL AND VESTIBULAR MOTION CUEING
M. E. C. ROBERTS and P. M. MURRAY (Rediffusion Simulation, Ltd., Crawley, England) IN: Advances in flight simulation - visual and motion systems; Proceedings of the International Conference, London, England, Apr. 29-May 1, 1986 . London, Royal Aeronautical Society, 1986, p. 191-203. refs

Factors which affect the successful integration of vestibular and visual motin cuing are examined. The upper and lower frequency motion limits for a motion system are given. The interaction between motion and visual simulation systems is studied. The effects of brightness, contrast, and refresh rate on the simulation of smooth apparent motion, and human sensitivity to apparent motion are investigated. A zone in which visual and motion cues interact is defined, and it is noted that apparent motion is essential for integrating the motion and visual systems. I.F.

A87-44723
CREATING DE-BRIEFING TOOLS FROM SYSTEM PERFORMANCE DATA
J. C. SIMONS (Systems Research Laboratories, Inc., Dayton, OH), B. D. PURVIS, and J. J. SKELLY (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Advances in flight simulation - visual and motion systems; Proceedings of the International Conference, London, England, Apr. 29-May 1, 1986 . London, Royal Aeronautical Society, 1986, p. 238-251.

A debriefing system based on Baddeley's (1982) concept of interactive context, which emphasizes the active role of the subject in organizing and storing the experience of unfolding information, is described. Summary statistics and planned and profile views of simulated mission segments were used to create recall probes. The processes for selecting debriefing probes and recall probes are discussed. The frequency of use of the probes by the pilots, and the frequency of pilot response during debriefs on mission events are analyzed. It is observed that altitude, course, and surrounding terrain probes were used for low-level navigation responses; discrete altitude, surrounding terrain, and prohibited area probes aided in minimum altitude crossing responses; discrete altitude, prohibited area envelope, and maneuvering techniques were employed for prohibited area performance responses; and course, altitude, and discrete airspeed data generated precise flight path control responses. I.F.

A87-44724
CONSIDERATIONS FOR FLIR SIMULATION IN PILOT TRAINING
J. L. DAVIES (Rediffusion Simulation, Ltd., Crawley, England) IN: Advances in flight simulation - visual and motion systems; Proceedings of the International Conference, London, England, Apr. 29-May 1, 1986 . London, Royal Aeronautical Society, 1986, p. 252-263.

The training of pilots to use FLIR is examined. The basic principles upon which the FLIR system operates, and the advantages of IR image generation versus visual image generation are discussed. The procedures involved in the computer generation of IR images are described. The use of the low altitude navigation and targeting IR system (Lantirn) for low-altitude, night, and adverse flight operations is considered. A three-level scheme for teaching pilots how to use the Lantirn system, which involves training on a generic IR trainer, a Lantirn part-task trainer, and operational flight trainer, is proposed. I.F.

A87-44728
TRAINING PERCEPTUAL-MOTOR SKILLS
J. M. FLACH (Illinois, University, Urbana) IN: Advances in flight simulation - visual and motion systems; Proceedings of the International Conference, London, England, Apr. 29-May 1, 1986 . London, Royal Aeronautical Society, 1986, p. 314-321. refs

The theme of this paper is that current approaches to the development of training strategies have failed to sufficiently analyze the consistent mapping between visual feedback and action. The hypothesis is that an effective training program will be one that highlights consistent stimulus/control relationships. In order to develop these training programs research is needed to identify the relevant stimulus dimensions for flight control. Author

A87-46439
CRM - A DIFFERENT APPROACH TO HUMAN FACTORS TRAINING
WILLIAM R. TAGGART ICAO Bulletin, vol. 42, May 1987, p. 13-16.

The development of a cockpit resource management (CRM) program, which focuses on crew resources and crew coordination in flight deck operation, in order to improve safety margins on commercial flights is examined. The issues a CRM program should address are discussed. The key elements of a CRM program are: inquiry, advocacy, conflict resolution, decision making, and critique. The basic components of a CRM program include a self-study module, baseline CRM seminar experience, the extension of CRM to other forms of training, and a method to validate and measure the results of the training. Each of these components of a CRM program are described. An example displaying the usefulness of CRM programs is presented. I.F.

A87-46440
ATC SIMULATION ASSURES TRAINING FLEXIBILITY
TOBIAS FURNEAUX (Thorn EMI Electronics, Ltd., Computer Systems Div., Wells, England) ICAO Bulletin, vol. 42, May 1987, p. 21-23.

The use of simulation for ATC training is discussed. The main advantages of simulation training are its flexibility, which allows the intensity and workload to be varied, and low costs compared to training in a live environment. A new simulation system, which has three simulators each based on a computer with an 0.75 megabyte memory with an operating speed of up to 3 million instructions/sec, is described. Each simulator has two sets of consoles and each console has two plan position indicator displays for surveillance radar, and one precision approach radar display. The operation of this simulator is discussed. A block diagram of the ATC radar simulator is presented. I.F.

N87-25737# Joint Publications Research Service, Arlington, Va.
RELATIONSHIP BETWEEN INFORMATION AND ACTIVATION, AND MENTAL WORK CAPACITY OF OPERATORS
K. K. IOSELIANI and B. N. RYZHOV *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 19-24 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 17-21
Avail: NTIS HC A08/MF A01

The diagnostic potential of a method used to assess mental performance of operators based on a combined application of the information carrying and psychophysiological expenditures of man is discussed. Psychophysiological cost was measured with respect to automatic responses and psychic stress. It was found that the extremums of the relationship between information and activation parameters were invariant. The data obtained suggest that the information-activation relationship may be used to advantage in the clinical and physiological evaluation of operators. Author

N87-25752# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF PSYCHOLOGICAL STATE DURING PERFORMANCE OF PROFESSIONAL WORK CONSISTING OF AIR TRAFFIC CONTROL
A. F. DENISOV *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 109-113 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, Jan. - Feb. 1987 p 76-78
Avail: NTIS HC A08/MF A01

The dynamics of the mental states of air traffic controllers exposed to professional workloads were studied. Seventy air traffic controllers up to 35 years of age, with an average work tenure of seven years were studied. Author

N87-25753# Joint Publications Research Service, Arlington, Va.
CONCEPTIONS OF AUTOMATION OF STUDIES OF OPERATOR PERFORMANCE
V. M. DROZHZHIN *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 114-117 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 78-80
Avail: NTIS HC A08/MF A01

Some possibilities relative to organizing the study of pilot performance on a model of computer engineering are discussed. The organization of microprocessor systems, graphic display of data, and the preprocessing of physiological curves at the pace of the experiment are discussed. R.J.F.

N87-25757# Army Research Inst. of Environmental Medicine, Natick, Mass.
MOOD STATES AT 1600 AND 4300 METERS TERRESTRIAL ALTITUDE
BARBARA L. SHUKITT and LOUIS E. BANDERET Jan. 1987 19 p
(AD-A179901) Avail: NTIS HC A02/MF A01 CSCL 05I

Personal anecdotes suggest that ascent to high altitude can cause mood changes such as depression, apathy, and drowsiness. Behaviors at high altitude indicate that people can become more argumentative, irritable, or euphoric. Since there are few systematic and quantitative studies assessing the effects of altitude on mood, this study compared moods at two different altitudes and times of day (morning - evening) using a standardized scale. The Clyde Mood Scale was used twice daily to determine self-rated moods in 19 males and 16 females. Baseline values were determined at 200 m; moods were then assessed at 4300 m with one group and at 1600 m with a second group. Friendliness, clear thinking, dizziness, sleepiness, and unhappiness were affected at 4300 m. Only sleepiness changed at 1600 m. At 4300 m, moods differed from baseline on the day arrival (1-4 hours), differed even more after one day(18 - 28 hours), and returned to baseline levels by day 2(42 - 52 hours). Morning and evening values did not differ at 200, 1600, or 4300 m, except for sleepiness at 4300 m. Therefore, mood states have a characteristic time course at altitude which is similar to that for acute mountain sickness symptomatology. GRA

N87-25758# Materials Research Labs., Ascot Vale (Australia).
THE EFFECT OF INSTANTANEOUS FIELD OF VIEW ON SEARCH RATE FOR SINGLE TARGETS OVER A WIDE FIELD
C. J. WOODRUFF and M. FOLKARD Nov. 1986 24 p
(AD-A180199; MRL-R-1032) Avail: NTIS HC A02/MF A01 CSCL 17E

The effect of the instantaneous field-of-view in searching a complex, wide-angle field viewed at fixed resolution was examined by simulation. The results show a decelerated improvement with instantaneous field-of-view over the range 6.9 deg to 55 deg for a 55 deg search field. This improvement was attributable to increased slewing rate of the search window. GRA

N87-25759# Systems Control Technology, Inc., Arlington, Va.
AERONAUTICAL DECISION MAKING FOR HELICOPTER PILOTS
RICHARD ADAMS and JACK THOMPSON Feb. 1987 133 p
(Contract DTFA01-80-C-10080)
(AD-A180325; DOT/FAA/PM-86/45) Avail: NTIS HC A07/MF A01 CSCL 01C

Aviation accident data indicate that the majority of aircraft mishaps are due to judgment errors. This training manual is part of a project to develop materials and techniques to help improve pilot decision making. This manual is designed to explain the risks associated with helicopter flying activities, the underlying behavioral causes of typical accidents, and the effects of stress on pilot decision making. It provides a means for the individual pilot to develop an Attitude Profile through a self-assessment inventory and provides detailed explanations of pre-flight and in-flight stress management techniques. The assumption is that pilots receiving this training will develop a positive attitude toward safety and the ability to effectively manage stress while recognizing and avoiding unnecessary risk. The examples used are taken from real accident and incident reports. GRA

N87-25760*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WORKSHOP ON WORKLOAD AND TRAINING, AND EXAMINATION OF THEIR INTERACTIONS: EXECUTIVE SUMMARY
EMANUEL DONCHIN (Illinois Univ., Urbana-Champaign.), SANDRA G. HART, and EARL J. HARTZELL Jul. 1987 40 p Workshop held in Carmel, Calif., 5-10 Jan. 1986
(NASA-TM-89459; A-87212; NAS 1.15:89459) Avail: NTIS HC A03/MF A01 CSCL 05H

The goal of the workshop was to bring together experts in the fields of workload and training and representatives from the Dept. of Defense and industrial organizations who are reponsible for specifying, building, and managing advanced, complex systems. The challenging environments and requirements imposed by military helicopter missions and space station operations were presented as the focus for the panel discussions. The workshop permitted a detailed examination of the theoretical foundations of the fields of training and workload, as well as their practical applications. Furthermore, it created a forum where government, industry, and academic experts were able to examine each other's concepts, values, and goals. The discussions pointed out the necessity for a more efficient and effective flow of information among the groups respresented. The executive summary describes the rationale of the meeting, summarizes the primary points of discussion, and lists the participants and some of their summary comments. Author

N87-25761*# Georgia Inst. of Tech., Atlanta. Center for Man-Machine Systems Research.
OPERATOR FUNCTION MODELING: AN APPROACH TO COGNITIVE TASK ANALYSIS IN SUPERVISORY CONTROL SYSTEMS Annual Report
CHRISTINE M. MITCHELL Aug. 1987 12 p
(Contract NAG2-413)
(NASA-CR-181180; NAS 1.26:181180) Avail: NTIS HC A01/MF A01 CSCL 05I

In a study of models of operators in complex, automated space systems, an operator function model (OFM) methodology was extended to represent cognitive as well as manual operator activities. Development continued on a software tool called OFMdraw, which facilitates construction of an OFM by permitting construction of a heterarchic network of nodes and arcs. Emphasis was placed on development of OFMspert, an expert system designed both to model human operation and to assist real human operators. The system uses a blackboard method of problem solving to make an on-line representation of operator intentions, called ACTIN (actions interpreter). J.P.B.

N87-26503# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Abteilung Flaechenflugzeuge.
HANDLING QUALITIES AND PILOT BEHAVIOR DURING INVESTIGATIONS ON A GROUND SIMULATOR WITH A SIDESTICK CONTROLLER
DIETRICH ALTENKIRCH Sep. 1986 40 p In GERMAN; ENGLISH summary
(DFVLR-MITT-86-20; ISSN-0176-7739; ETN-87-99680) Avail: NTIS HC A03/MF A01; DFVLR, Cologne, West Germany DM 16

A pilot training procedure for rating the handling qualities of a transport aircraft was performed with three test pilots using a moving cockpit ground simulator. The emphasis was on the assessment of the flying qualities of future flight control systems in landing approach and landing tasks. The controller was a displacement sidestick with fixed force gradients. Cooper-Harper pilot ratings and special effort ratings, as well as statistical values computed from measured performance data of the pilot/aircraft system are presented for all pilots as a function of the aircraft configuration. ESA

N87-26504# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abteilung Luft- und Raumfahrtpsychologie.
TEMPERAMENT-STRUCTURE SCALES (TSS), TEST MANUAL
PETER MASCHKE Nov. 1986 73 p In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-1069)
(DFVLR-FB-86-58; ISSN-0171-1342; ETN-87-99898) Avail: NTIS HC A04/MF A01; DFVLR, Cologne, West Germany DM 23.50

A 10 dimensional personality questionnaire for the selection of aviation personnel is described. The dimensions are: motivation, emotional stability, rigidity, extroversion, aggressiveness, vitality, dominance, personal warmth, spoiledness, and mobility. ESA

N87-26505*# Texas Univ., Austin. Dept. of Psychology.
DETERMINANTS OF INDIVIDUAL AND GROUP PERFORMANCE Final Technical Report, 1 Dec. 1981 - 31 May 1985
ROBERT L. HELMREICH 1986 10 p
(Contract NAG2-137)
(NASA-CR-181178; NAS 1.26:181178) Avail: NTIS HC A02/MF A01 CSCL 05I

A broad exploration of individual and group/organizational factors that influence performance in demanding environments such as space and air transport was undertaken. Primary efforts were directed toward defining critical issues, developing new methodologies for the assessment of performance in such environments, and developing new measures of personality and attitudes as predictors of performance. Substantial clarification of relevant issues for research and validation was achieved. A reliable instrument to assess crewmembers' attitudes regarding crew coordination and flightdeck management was validated. Major efforts in data collection to validate concepts were initiated. The results suggest that substantial improvements can be made in the prediction of performance and in the selection of crewmembers for aviation and space. Author

N87-26506 Texas Univ., Austin.
QUANTITATIVE ANALYSIS OF HUMAN PERCEPTION AND JUDGMENT Ph.D. Thesis
JAMES AUSTIN WRIGHT 1986 128 p
Avail: Univ. Microfilms No. DA8706135

This research is concerned with identifying, evaluating and expanding a method for finding out what knowledge is used by people in making decisions and quantifying its significance to the decision making process. Print quality surveys are analyzed to determine what physical characteristics of printed matter people use to judge between samples and how the physical characteristics affect judgments of preference. Also, a new multidimensional scaling technique based on maximum entropy is compared to the previously preferred method for this type of survey analysis which was based on maximum likelihood. Dissert. Abstr.

N87-26701*# Pennsylvania State Univ., University Park. Dept. of Industrial and Management Systems Engineering.
TRAINING FOR LONG DURATION SPACE MISSIONS
JOSEPH H. GOLDBERG *In* NASA. Lyndon B. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1986, Volume 1 41 p Jun. 1987
Avail: NTIS HC A16/MF A01 CSCL 05A

The successful completion of an extended duration manned mission to Mars will require renewed research effort in the areas of crew training and skill retention techniques. The current estimate of inflight transit time is about nine months each way, with a six month surface visit, an order of magnitude beyond previous U.S. space missions. Concerns arise when considering the level of skill retention required for highly critical, one time operations such as an emergency procedure or a Mars orbit injection. The factors responsible for the level of complex skill retention are reviewed, optimal ways of refreshing degraded skills are suggested, and a conceptual crew training design for a Mars mission is outlined. Currently proposed crew activities during a Mars mission were reviewed to identify the spectrum of skills which must be retained over a long time period. Skill retention literature was reviewed to identify those factors which must be considered in deciding when and which tasks need retraining. Task, training, and retention interval factors were identified. These factors were then interpreted in light of the current state of spaceflight and adaptive training systems. Author

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

A87-43123#
SPACECRAFT CONTAMINATION FLIGHT MEASUREMENT PROGRAM
DAVID F. HALL (Aerospace Corp., El Segundo, CA) AIAA, Thermophysics Conference, 22nd, Honolulu, HI, June 8-10, 1987. 6 p. refs
(Contract F04701-85-C-0086)
(AIAA PAPER 87-1624)

An in-flight spacecraft-contamination measurements program is in the engineering phase. The motivation for and goals of this program are discussed. Temperature-controlled quartz-crystal

microbalances and fused-silica mirror calorimeters will be employed as the contamination sensors. The performance requirements and siting of the sensors are discussed. Author

A87-43773
COMPARISON OF SPEECH AND PICTORIAL DISPLAYS IN A COCKPIT ENVIRONMENT
CHRISTOPHER P. ROBINSON (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) and RAY E. EBERTS (Purdue University, West Lafayette, IN) Human Factors (ISSN 0018-7208), vol. 29, Feb. 1987, p. 31-44. refs

A current trend in cockpit design is to incorporate synthesized speech to present secondary information. Multiple-resource theories of information processing support this, but theories of stimulus/central-processing/response compatibility suggest that spatial information presented visually may have some advantages over speech if the response is manual. Two experiments compare response performance over single and dual tasks when information was presented pictorially and by speech. Pictorial subjects responded more quickly than did speech subjects. The addition of the visual tracking task in the dual-task condition had a differential effect on performance, depending on the modality of the primary task and the rate at which information was presented. The dual task impeded performance more in the fast and medium presentation rates for the speech condition but had little differential effect across rates for the pictorial condition. Analysis of the error data indicated that subjects in the pictorial condition were better able to maintain the context of the emergency than those in the speech condition. Results are discussed in terms of current theories of information processing. Author

A87-44240
THE STUDY OF CREW WORKLOADS IN THE COCKPIT [UEBER DIE UNTERSUCHUNG VON BELASTUNGEN DER BESATZUNG IM COCKPIT]
ULRICH UNGER (Interflug Gesellschaft fuer Internationalen Flugverkehr mbH, Berlin, East Germany) Technisch-oekonomische Information der zivilen Luftfahrt (ISSN 0232-5012), vol. 23, no. 2, 1987, p. 49-54, 84. In German. refs

Techniques developed at the Leningrad Academy of Civil Aviation to evaluate cockpit hardware and procedures on the basis of the workload imposed on the crew are described and demonstrated, summarizing in part the analysis presented by Unger (1985). The symbolic representation of crew operations and the construction of task algorithms for each crew member on the level of operational units are explained, and the procedures for computing the task intensity for a given algorithm are outlined. As an example, the workload of the copilot of a Tu-134A in lowering the landing gear and landing flaps is analyzed, and the results are presented in tables, graphs, and diagrams. It is suggested that the workloads determined by the present technique can be verified and refined using simulator or flight data. T.K.

A87-44711* Massachusetts Inst. of Tech., Cambridge.
VESTIBULAR MODELS FOR DESIGN AND EVALUATION OF FLIGHT SIMULATOR MOTION
S. R. BUSSOLARI, R. B. SULLIVAN, and L. R. YOUNG (MIT, Cambridge, MA) IN: Advances in flight simulation - visual and motion systems; Proceedings of the International Conference, London, England, Apr. 29-May 1, 1986 . London, Royal Aeronautical Society, 1986, p. 36-46. refs
(Contract NAG2-12)

The use of spatial orientation models in the design and evaluation of control systems for motion-base flight simulators is investigated experimentally. The development of a high-fidelity motion drive controller using an optimal control approach based on human vestibular models is described. The formulation and implementation of the optimal washout system are discussed. The effectiveness of the motion washout system was evaluated by studying the response of six motion washout systems to the NASA/AMES Vertical Motion Simulator for a single dash-quick-stop maneuver. The effects of the motion washout system on pilot performance and simulator acceptability are examined. The data reveal that human spatial orientation models are useful for the design and evaluation of flight simulator motion fidelity. I.F.

A87-44758
A REVIEW AND INVESTIGATION OF AIMING AND TRACKING PERFORMANCE WITH HEAD-MOUNTED SIGHTS
MAXWELL J. WELLS and MICHAEL J. GRIFFIN (Southampton, University, England) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. SMC-17, Mar.-Apr. 1987, p. 210-221. Sponsorship: Ministry of Defence (Procurement Executive). refs
(Contract MOD-ERI/9/4/2040/0363)

The ability to control head movements determines the performance of head-mounted sights. A literature review and the results of a number of laboratory experiments investigating head aiming and tracking performance are presented. The literature review (the results of which are included as a table) revealed that tracking performance may be degraded by in-flight conditions. The experiments measured the frequency response of the head tracking system and systematically investigated, under laboratory conditions, the effects on performance of some of the variables which may be present in an operational environment. These included off-boresight target angle, helmet weight, seating conditions, the amplitude and axis of target motion, and reticle size and shape. It was shown that these variables had a relatively minor effect on performance. It is recommended that the influence of other relevant in-flight variables, such as the restriction due to clothing and personal equipment and the effects of whole-body vibration, should be investigated. Author

A87-45259*# Booz-Allen and Hamilton, Inc., Washington, D. C.
THE IMPACT OF INTEGRATED WATER MANAGEMENT ON THE SPACE STATION PROPULSION SYSTEM
GEORGE R. SCHMIDT (Booz-Allen and Hamilton, Inc., Washington, DC) AIAA, SAE, ASME, and ASEE, Joint Propulsion Conference, 23rd, San Diego, CA, June 29-July 2, 1987. 9 p.
(Contract NAS8-36526)
(AIAA PAPER 87-1864)

The water usage of elements in the Space Station integrated water system (IWS) is discussed, and the parameters affecting the overall water balance and the water-electrolysis propulsion-system requirements are considered. With nominal IWS operating characteristics, extra logistic water resupply (LWR) is found to be unnecessary in the satisfaction of the nominal propulsion requirements. With the consideration of all possible operating characteristics, LWR will not be required in 65.5 percent of the cases, and for 17.9 percent of the cases LWR can be eliminated by controlling the stay time of theShuttle Orbiter orbiter. R.R.

A87-46704#
ROBOTIC TELEPRESENCE
GEORGE C. MOHR (USAF, Harry G. Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: 1987 Annual Reliability and Maintainability Symposium, Philadelphia, PA, Jan. 27-29, 1987, Proceedings . New York, Institute of Electrical and Electronics Engineers, Inc., 1987, p. 25-30. refs

The concept of robotic telepresence, the linking of human hands and eyes with a robot's hands and eyes to permit viewing and manipulating objects from a remote location, is discussed. A 'master-slave' relationship between the human controller and robot is based on closed loop visual, tactile, and force sensing and display, coupled with head, eye, arm, hand, and finger position control of the robotic system. Technological areas requiring increased emphasis include hand-finger position sensing, tactile-force displays, and time-delay control compensation. The concept has application to the performance of maintenance, repair, and construction tasks in a hostile environment to enhance military capability, and for manned operations in both orbital and deep space environments. R.R.

A87-46998
DEVELOPMENT OF ANTI-G SUITS AND THEIR LIMITATIONS
EARL H. WOOD Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, July 1987, p. 699-706. refs
Initial anti-G suits were based on the belief that decreased

A87-47000
AN EXPERIMENTAL MICROCOMPUTER CONTROLLED SYSTEM FOR SYNCHRONIZED PULSATING ANTI-GRAVITY SUIT
THOMAS W. MOORE, JOANNE FOLEY, B. R. SHANKARA REDDY, FRANK KEPICS, and DOV JARON (Drexel University, Philadelphia, PA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 58, July 1987, p. 710-714. refs
(Contract N00014-85-K-0556)

An experimental system to deliver synchronized external pressure pulsations to the lower body is decribed in this technical note. The system is designed using a microcomputer with a real time interface and an electro-pneumatic subsystem capable of delivering pressure pulses to a modified anti-G suit at a fast rate. It is versatile, containing many options for synchronizing, phasing and sequencing of the pressure pulsations and controlling the pressure level in the suit bladders. Details of its software and hardware are described along with the results of initial testing in a Dynamic Flight Simulator on human volunteers. Author

N87-25751# Joint Publications Research Service, Arlington, Va.
RECOVERY OF SMALL AMOUNTS OF WATER IN THE DESERT
G. N. SADIKOV *In its* USSR report: Space Biology and Aerospace Medicine, Volume 21, No. 1, January - February 1987 p 105-108 29 Apr. 1987 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 21, no. 1, Jan. - Feb. 1987 p 74-75
Avail: NTIS HC A08/MF A01

A method is proposed for the recovery of small amounts of water for the support of aircraft crews who have made a forced landing in the desert. The portable emergency kit contains 4 to 5 polyethylene bags, the weight of which would be 320 to 400 g. One can recover 50 to 55 ml of water from a bush of average size for a daily total of 2.2 to 2.4 l. The method involves placing the polyethylene bag over plants and then collecting the water that condenses inside the bag. Author

N87-25762# National Academy of Sciences - National Research Council, Washington, D. C.
AIRLINER CABIN ENVIRONMENT: AIR QUALITY AND SAFETY Final Report
Aug. 1986 320 p
(Contract DTFA01-85-C-00013)
(PB87-164422; ISBN-0-309-03690-9) Avail: NTIS HC A14/MF A01 CSCL 13B

The report discusses the adequacy of air quality and standards aboard commercial aircraft for the health and safety of all who fly. Addressed are aspects of cabin air such as the quality of outside air, the quality of onboard air, the extent of pressurization, the characteristics of humidification, the presence of cosmic radiation, contaminants (such as bacteria, fungi, and other microorganisms), and pollutants (such as environmental tobacco smoke, carbon monoxide, carbon dioxide, and ozone) that could be responsible for health problems in the long or short run. It recommends some remedies for problems discovered, and outlines the safety precautions necessary to protect passengers in the event of in-flight fires which produce smoke and fumes. GRA

N87-25763*# Stanford Univ., Calif. Dept. of Mechanical Engineering.
DESIGN, DEVELOPMENT AND EVALUATION OF STANFORD/AMES EXTRA-VEHICULAR ACTIVITY (EVA) PREHENSORS Progress Report, Apr. 1986 - Mar. 1987.
LARRY J. LEIFER, J. JAMESON, M. LEBLANC, D. WILSON, E. SABELMAN, and D. SCHWANDT Apr. 1987 46 p
(Contract NCC2-295)
(NASA-CR-181116; NAS 1.26:181116) Avail: NTIS HC A03/MF A01 CSCL 05H

A summary is given of progress to date on work proposed in 1983 and continued in 1985, including design iterations on three different types of manually powered prehensors, construction of functional mockups of each and culminating in detailed drawings and specifications for suit-compatible sealed units for testing under realistic conditions. Author

N87-25764# Coast Guard, Washington, D.C. Office of Research and Development.
AN EVALUATION OF HEAT STRAIN MONITORING METHODS FOR WORKERS IN ENCAPSULATING, IMPERMEABLE PROTECTIVE CLOTHING Final Report
W. D. ELEY May 1987 65 p
(AD-A180555; USCG-D-12-87) Avail: NTIS HC A04/MF A01 CSCL 06J

Heat strain for six young, healthy, acclimized men (mean age 26.2 yrs., weight 84.1 kg) was measured during moderate exercise at various ambient conditions (21.5 C, 28 C, 31.5 C with sunshine), while wearing fully encapsulating chemical protective suits with self-contained breathing apparatus. The total weight of the Coast Guard Chemical Response Suit was 26.3 kg. The subjects performed a total of 35 minutes (20 minutes exercise, as determined by V(O2) measurements was 383 Kcal/hr. Heart rate and mean skin temperature rose significantly as ambient temperature increased. Under the most adverse ambient condition (31.5 C with sunshine), the mean heart rate and skin temperature were elevated 39.6 bpm and 4.1 C, respectively, over those recorded for control conditions. Significant increases in rectal temperature were not noted. Weight loss was observed only in the most severe ambient environment. The five minute recovery heart rate, recorded at minute 25 after 20 minutes of exercise, increased significantly as ambient temperature conditions became more adverse. It is concluded that wearers of impermeable protective clothing show progressive increases in heat strain as ambient temperature increases. This study indicates that recovery heart rate is probably the best indicator of heat tolerance endpoints for work in encapsulating, impermeable protective clothing. GRA

N87-25765*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
MULTI-ADJUSTABLE HEADBAND Patent Application
PIERCE C. TOOLE, inventor (to NASA), HOWARD E. CHALSON, inventor (to NASA), and WALTER S. BUSSEY, inventor (to NASA) (Planning Research Corp., Kennedy Space Center, Fla.) 8 Aug. 1986 22 p
(NASA-CASE-KSC-11322-1; US-PATENT-APPL-SN-894541)
Avail: NTIS HC A02/MF A01 CSCL 05H

This invention relates to a headband for a headset having separate coarse and fine adjustment features. The adjustments may be to the axial distance between at least one earpiece element and a side support. Such adjustment to the axial distance varies the pressure exerted on the head of the user. The present fine adjustment feature may be used while the headset is being worn, thereby permitting a user to optimize the amount of pressure between the contending criteria of comfort and keeping the headset in place on the user's head. NASA

N87-25766*# Umpqua Research Co., Myrtle Creek, Ore.
PRE- AND POSTTREATMENT TECHNIQUES FOR SPACECRAFT WATER RECOVERY Final Report
DAVID F. PUTNAM, GERALD V. COLOMBO, and WILLIAM F. MICHALEK Mar. 1987 103 p
(Contract NAS9-17073)
(NASA-CR-171987; NAS 1.26:171987; URC-70320) Avail: NTIS HC A06/MF A01 CSCL 06K

The objective was to develop techniques for satisfactory pretreatment of waste water (urine and wash water) prior to recovery by distillation and satisfactory post-treatment of the recovered water and humidity condensate for purification to the high quality necessary for reuse. The effort included literature and laboratory investigations, feasibility evaluations of candidate approaches, and development of conceptual designs for a waste water pretreatment system and a recovered water post-treatment system. Author

N87-25767*# Colorado Univ., Boulder. Dept. of Aerospace Engineering Sciences.
A METHOD OF VARIABLE SPACING FOR CONTROLLED PLANT GROWTH SYSTEMS IN SPACEFLIGHT AND TERRESTRIAL AGRICULTURE APPLICATIONS
J. KNOX Oct. 1986 20 p
(Contract NCC2-210)
(NASA-CR-177447; NAS 1.26:177447) Avail: NTIS HC A02/MF A01 CSCL 06K

A higher plant growth system for Controlled Ecological Life Support System (CELSS) applications is described. The system permits independent movement of individual plants during growth. Enclosed within variable geometry growth chambers, the system allocates only the volume required by the growing plants. This variable spacing system maintains isolation between root and shoot environments, providing individual control for optimal growth. The advantages of the system for hydroponic and aeroponic growth chambers are discussed. Two applications are presented: (1) the growth of soybeans in a space station common module, and (2) in a terrestrial city greenhouse. Author

N87-25768# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Unternehmensbereich Apparate.
FIRE SAFETY REQUIREMENTS FOR CABIN EQUIPMENT COMPONENTS [BRANDSICHERHEITSFORDERUNGEN AN BAUTEILE DER KABINENAUSSTATTUNG]
JUERGEN GROTE 1986 57 p In GERMAN Presented at the Deutsche Gesellschaft fuer Metallkunde e.V. Seminar on Anwendung von Fasserverbundwerkstoffen, Lahnstein, West Germany, 6-9 Oct. 1986
(MBB-UT-020/86; ETN-87-99961) Avail: Issuing Activity

Fire safety requirements for the equipment of those parts of airliner compartments occupied by crew and passengers are reviewed. The legal prescriptions FAR 25.853, and the Airbus Industry prescription ATS 1000-001 concerning limiting values and test methods for smoke density and toxicity of the materials are investigated. Using the comparison between the FAA investigations on 1:1 and 1:4 test stands and the usual testing methods, the relation to extensions of the legal prescriptions, published in 1984, for new airliners from 1987 and 1988 on respectively, is explained. ESA

N87-25769# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
IMPACT OF FUTURE DEVELOPMENTS IN ELECTRONIC TECHNOLOGY ON COCKPIT ENGINEERING
R. EGGLESTON, ed. (Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.) Jun. 1987 29 p
(AGARD-R-757; ISBN-92-835-1551-X) Avail: NTIS HC A03/MF A01

Presented are the results of the Cockpit Engineering subpanel of an AGARD workshop on The Potential Impact of Future Developments in Electronic Technology on the Future Conduct of Air Warfare held at the SHAPE Technical Center in The Hague, Netherlands, from 21 to 25 October 1985. The report considers the issue of how advances in electronics technology are expected to impact cockpit engineering for future airborne weapon systems, surveys the cockpit engineering problem, and provides a limited treatment of the considerations and developments believed to be needed to ensure that the potential offered by new electronic technologies is realized in future weapon systems. Author

N87-25897*# University of Southeastern Louisiana, Hammond. Dept. of Biological Sciences.
GENETIC TOXICITY STUDIES OF ORGANIC CHEMICALS FOUND AS CONTAMINANTS IN SPACECRAFT CABIN ATMOSPHERES
JOSEPH TORRES, JR. *In* NASA. Lyndon B. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1986, Volume 2 14 p Jun. 1987
Avail: NTIS HC A13/MF A01 CSCL 06K

Astronauts can be exposed during spaceflight to organic chemical contaminants in the spacecraft cabin atmosphere. Toxic exposures may cause lesions in the cellular DNA which are subsequently expressed as sister-chromatid exchanges (SCE). Analysis of SCE is a sensitive short term assay techinque to detect and quantitate exposures to DNA damaging (mutagenic) substances. The increase in SCE incidence over baseline (control) levels is generally proportional to the concentration of the mutagen and to the duration of exposure. The BHK-21 baby hamster kidney cell line was the in vitro test system used. Test organics were added to the culture media for 18 hrs, in concentrations ranging from one to 20 ppm. Acetaldehyde and carbon disulfide were chosen for this study since they have occurred as atmospheric contaminants in many of the STS flights, and have been reported to have toxic and mutagenic effects in various test systems. Glutaraldehyde was chosen because few data are available on the mutagenicity of this common fixative, which is carried on STS flights for use in biological experiments. Acetaldehyde was a very strong inducer of SCE at concentrations of 2 ppm and above. Glutaraldehyde and carbon disulfide failed to induce SCE.
Author

N87-26507# Oak Ridge National Lab., Tenn.
EVALUATION OF PROTECTIVE GARMENT FABRICS CHALLENGED BY PETROLEUM AND SYNFUEL FLUIDS
R. B. GAMMAGE, W. G. DREIBELBIS, D. A. WHITE, T. VO-DINH, and J. D. HUGUENARD 1987 26 p Presented at the 2nd International Performance of Protective Clothing Symposium, Tampa, Fla., 18 Jan. 1987 Prepared in cooperation with Pennsylvania State Univ., University Park, Tennessee Univ., Knoxville, and Jefferson County High School, Talbott, Tenn.
(Contract DE-AC05-84OR-21400)
(DE87-005687; CONF-870135-2) Avail: NTIS HC A03/MF A01

The permeations of eight different types of glove by eleven petroleum coal and shale oil hydrocarbon liquids were measured over 24 hours. Two measurement techniques involving photoionization of vapors and room temperature phosphorescence from polynuclear aromatic compounds were used to measure breakthrough times by volatile and low-volatility constituents, respectively. There were serious drawbacks to the general use of these techniques for measuring steady-state rates of permeation. The lighter, smaller molecular-size constituents permeated faster than the larger, multiringed aromatic constituents. For the light hydrocarbon fuels, especially gasoline, there was preferential permeation by benzene and toluene. Nitrile was severely corroded after extended exposure to hydroxybenzene-containing coal-derived liquids. A general ranking, from worst to best, of the protection afforded by the different gloves was latex much less than neoprene less than butyl rubber, PVC less than nitrile less than Viton, Tyvek/Saranex 23, PVA. No breakthroughs within 24 hours were observed with the latter three glove materials. DOE

N87-26508*# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
CONTROLLING FLEXIBLE MANIPULATORS, AN EXPERIMENTAL INVESTIGATION Ph.D. Thesis
GORDON GREENE HASTINGS Aug. 1986 245 p
(Contract NAG1-623)
(NASA-CR-180647; NAS 1.26:180647) Avail: NTIS HC A11/MF A01 CSCL 05H

Lightweight, slender manipulators offer faster response and/or greater workspace range for the same size actuators than tradional manipulators. Lightweight construction of manipulator links results in increased structural flexibility. The increase flexibility must be considered in the design of control systems to properly account for the dynamic flexible vibrations and static deflections. Real time control of the flexible manipulator vibrations are experimentally investigated. Models intended for real-time control of distributed parameter system such as flexible manipulators rely on model approximation schemes. An linear model based on the application of Lagrangian dynamics to a rigid body mode and a series of separable flexible modes is examined with respect to model order requirements, and modal candidate selection. Balanced realizations are applied to the linear flexible model to obtain an estimate of appropriate order for a selected model. Describing the flexible deflections as a linear combination of modes results in measurements of beam state, which yield information about several modes. To realize the potential of linear systems theory, knowledge of each state must be available. State estimation is also accomplished by implementation of a Kalman Filter. State feedback control laws are implemented based upon linear quadratic regulator design. Author

N87-26509*# Martek Corp., Columbia, Md.
ALGAL CULTURE STUDIES FOR CELSS
R. RADMER, P. BEHRENS, K. ARNETT, R. GLADUE, J. COX, and D. LIEBERMAN Feb. 1987 42 p
(Contract NAS2-12115)
(NASA-CR-177448; NAS 1.26:177448) Avail: NTIS HC A03/MF A01 CSCL 06K

Microalgae are well-suited as a component of a Closed Environmental Life Support System (CELSS), since they can couple the closely related functions of food production and atmospheric regeneration. The objective was to provide a basis for predicting the response of CELSS algal cultures, and thus the food supply and air regeneration system, to changes in the culture parameters. Scenedesmus growth was measured as a function of light intensity, and the spectral dependence of light absorption by the algae as well as algal respiration in the light were determined as a function of cell concentration. These results were used to test and confirm a mathematical model that describes the productivity of an algal culture in terms of the competing processes of photosynthesis and respiration. The relationship of algal productivity to cell concentration was determined at different carbon dioxide concentrations, temperatures, and light intensities. The maximum productivity achieved by an air-grown culture was found to be within 10% of the computed maximum productivity, indicating that CO2 was very efficiently removed from the gas stream by the algal culture. Measurements of biomass productivity as a function of cell concentration at different light intensities indicated that both the productivity and efficiency of light utilization were greater at higher light intensities. Author

N87-26702*# Wisconsin Univ., Milwaukee. Dept. of Human Kinetics.
EFFECT OF STS SPACE SUIT ON ASTRONAUT DOMINANT UPPER LIMB EVA WORK PERFORMANCE
MICHAEL C. GREENISEN *In* NASA. Lyndon B. Johnson Space Center, National Aeronautics and Space Administration (NASA)/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1986, Volume 1 8 p Jun. 1987
Avail: NTIS HC A16/MF A01 CSCL 05A

The STS Space Suited and unsuited dominant upper limb performance was evaluated in order to quantify future EVA astronaut skeletal muscle upper limb performance expectations. Testing was performed with subjects standing in EVA STS foot restraints. Data was collected with a CYBEX Dynamometer enclosed in a waterproof container. Control data was taken in one g. During one g testing, weight of the Space Suit was relieved from the subject via an overhead crane with a special connection to the PLSS of the suit. Experimental data was acquired during simulated zero g, accomplished by neutral buoyancy in the Weightless Environment Training Facility. Unsuited subjects became neutrally buoyant via SCUBA BC vests. Actual zero g experimental data was collected during parabolic arc flights on board NASA's modified KC-135 aircraft. During all test conditions, subjects performed five EVA work tasks requiring dominant upper limb performance and ten individual joint articulation movements. Dynamometer velocities for each tested movement were 0 deg/sec, 30 or 60 deg/sec and 120 or 180 deg/sec, depending on the test, with three repetitions per test. Performance was measured in foot pounds of torque. Author

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A87-43394* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THEORETICAL CONSTRAINTS ON OXYGEN AND CARBON DIXOIDE CONCENTRATIONS IN THE PRECAMBRIAN ATMOSPHERE
JAMES F. KASTING (NASA, Ames Research Center, Moffett Field, CA) Precambrian Research (ISSN 0301-9268), vol. 34, 1987, p. 205-229. refs

Theoretical arguments which bear on the time histories of atmospheric oxygen and carbon dioxide during the Precambrian are reviewed and extended. It is shown that reasonably tight constraints can be placed on atmospheric pCO2 during the early and late Proterozoic, based on the observation that parts of the earth were glaciated at those times. It is demonstrated that an upper bound on early Proterozoic pO2 can be derived from a simple box model of the atmosphere-ocean system. C.D.

A87-43792
ORGANIC MODEL OF INTERSTELLAR GRAINS
S. YABUSHITA, K. WADA (Kyoto University, Japan), T. INAGAKI, and T. KAWABE (Osaka Kyoiku University, Japan) Astrophysics and Space Science (ISSN 0004-640X), vol. 132, no. 2, April 1987, p. 409-414. refs

Extinction efficiency of grains is calculated from the Mie formula on the premise that the grains are of organic composition. The optical constants adopted for the calculations are those of E. coli, polystyrene and bovine albumin. The grain radius a is assumed to obey a distribution of the form N(a) varies inversely as a exp -alpha and the value of alpha is chosen so as to make the calculated extinction curve match the observed interstellar extinction curve. Although the calculated curve gives a reasonably good fit to the observed extinction curve for wavelength less than 2100 A, at longer wavelength region, agreement is poor. It is concluded that another component is required for the organic model to be viable. Author

A87-44120
AUTOCATALYTIC SYNTHESIS OF A TETRANUCLEOTIDE ANALOGUE
WOJCIECH S. ZIELINSKI and LESLIE E. ORGEL (Salk Institute for Biological Studies, San Diego, CA) Nature (ISSN 0028-0836), vol. 327, May 28, 1987, p. 346, 347. NSF-supported research. refs

Many of the difficulties facing the development of a purely chemical system in which oligonucleotides self-replicate could be

overcome by using a pair of complementary substrate molecules that condense together more easily than ribonucleotides. It is reported here that the tetranucleoside triphosphoramidate G(NHp)C(NHp)G(NHp)C(N3) acts as a template to catalyze the condensation of G(NHp)C(NH2) and pG(NHp)C(N3), forming further molecules of the template. The system is therefore autocatalytic, and in accordance with elementary theory the amount of product made increases with the square root of the template concentration. C.D.

A87-46074

STRUCTURAL CONFORMITY BETWEEN A CODON AND THE CODED AMINO ACID [STRUKTURNOE SOOTVETSTVIE MEZHDU KODONOM I KODIRUEMOI AMINOKISLOTOI]

V. A. OTROSHCHENKO, T. A. SHVEDOVA, N. V. VASIL'EVA, and T. F. STRIGUNKOVA (AN SSSR, Institut Biokhimii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 294, no. 1, 1987, p. 241-244. In Russian. refs

A very precise stereochemical conformity between amino acids and the corresponding nucleic-acid codons has been demonstrated experimentally. The results tend to support the theoretical model of Hendry et al. (1979, 1981). It is noted that this particular conformity could play a decisive role in the formation of the genetic code. B.J.

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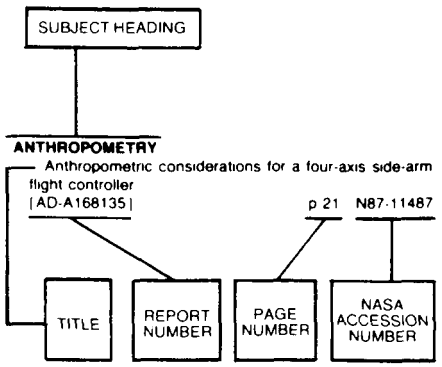

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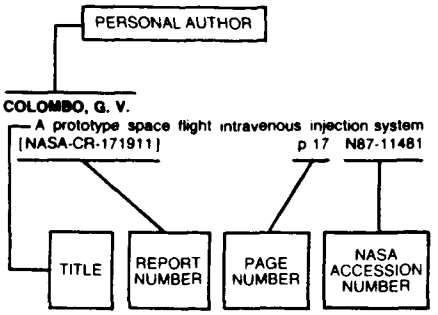

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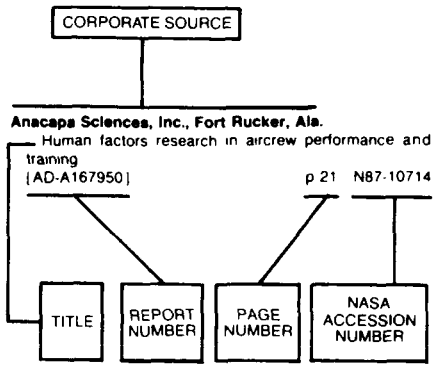

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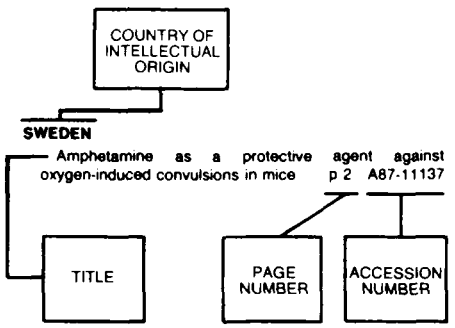

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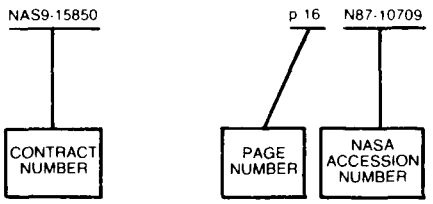

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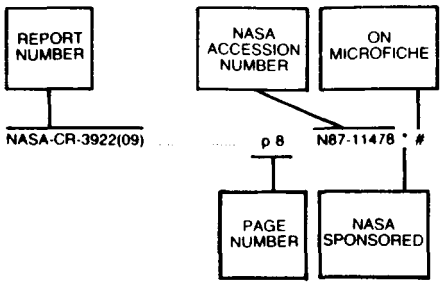

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REPORT

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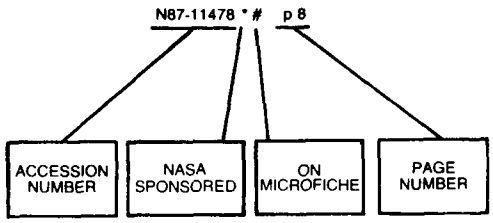

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