NASA SP-7011(295)

NASA

**Aerospace Medicine and Biology**
A Continuing Bibliography with Indexes

NASA SP-7011(295)
March 1987

Aerospace Medicine and Biology

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## ACCESSION NUMBER RANGES

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NASA SP-7011(295)

# AEROSPACE MEDICINE AND BIOLOGY

## A CONTINUING BIBLIOGRAPHY WITH INDEXES

## (Supplement 295)

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 February 1987 in

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

NASA Scientific and Technical Information Branch 1987
**National Aeronautics and Space Administration**
Washington, DC

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# INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 206 reports, articles and other documents announced during February 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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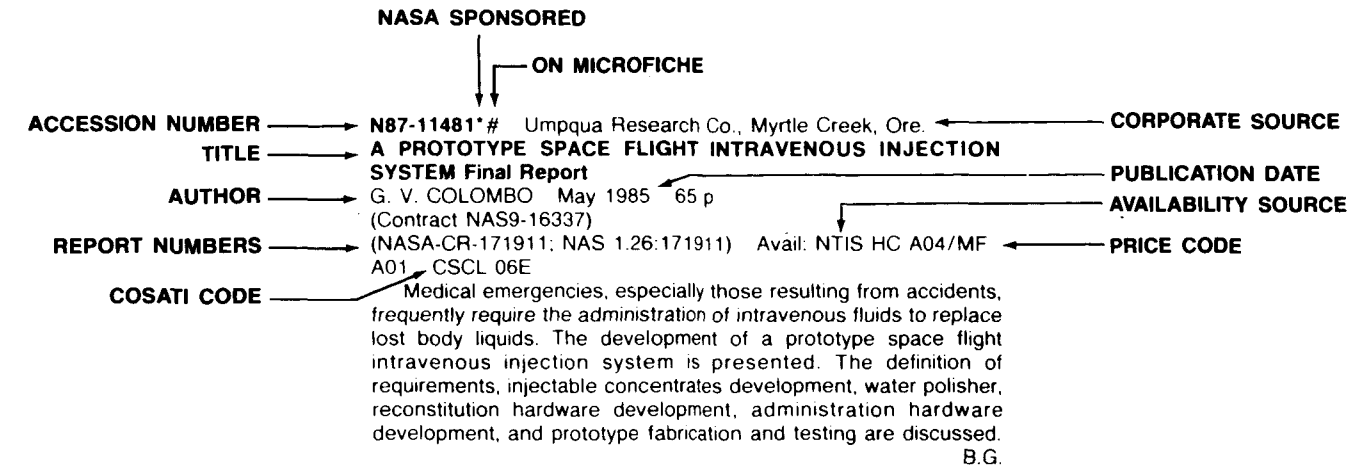
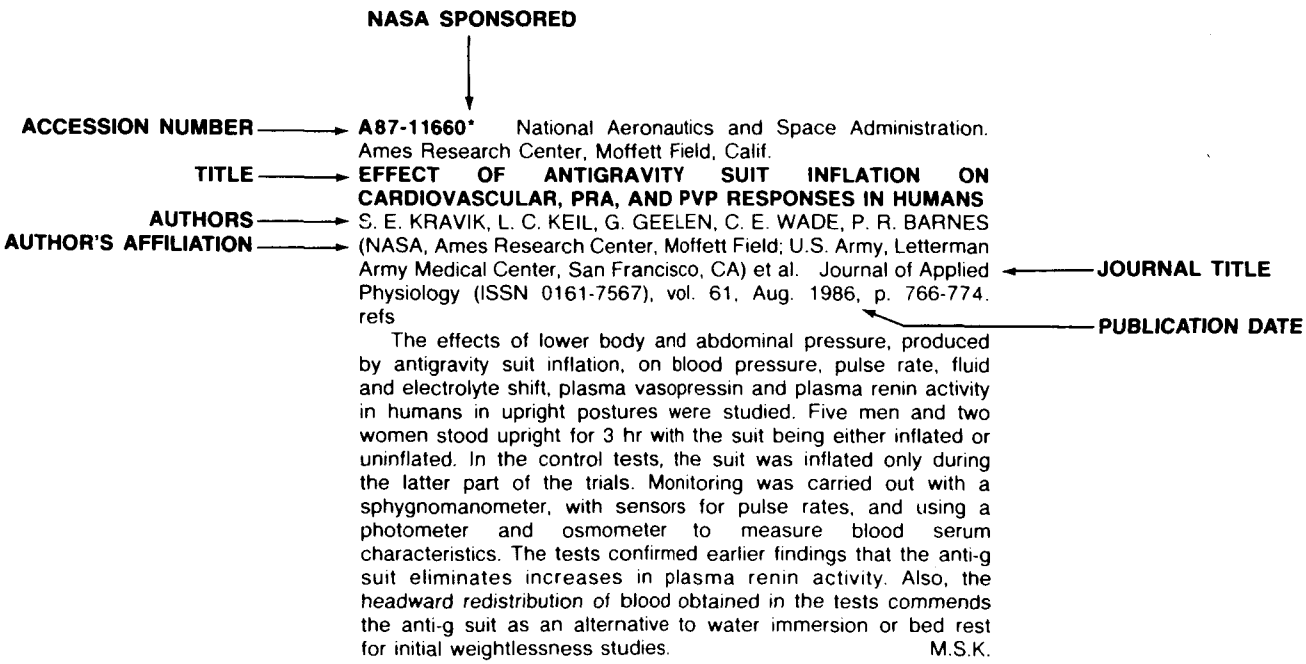
# TYPICAL REPORT CITATION AND ABSTRACT




# TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



# AEROSPACE MEDICINE AND BIOLOGY

*A Continuing Bibliography (Suppl. 295)*

MARCH 1987

## 51

## LIFE SCIENCES (GENERAL)

**A87-13189**
**EFFECTS OF COMBUSTION GASES ON ESCAPE PERFORMANCE OF THE BABOON AND THE RAT**
H. L. KAPLAN (Southwest Research Institute, San Antonio, TX) IN: Fire safety science; Proceedings of the First International Symposium, Gaithersburg, MD, October 7-11, 1985 . Washington, DC, Hemisphere Publishing Corp., 1986, p. 1133-1142. refs
(Contract DOT-FA03-81-00065)

In postcrash aircraft fires, only a few minutes are often available for egress. To assess the potential of combustion gases to impair human escape, a signalled avoidance task was developed for use with the juvenile baboon. The results indicate that the rat and the baboon have a comparable tolerance to Co and irritant gases and that laboratory test methods of incapacitation of rodents may be useful in evaluating the potential of combustion gas atmospheres containing CO and irritant gases to prevent human escape.
Author

**A87-13868*** Maryland Univ., Baltimore.
**BLOCKADE OF GLUCOCORTICOID RECEPTOR BINDING AND INHIBITION OF DEXAMETHASONE-INDUCED MUSCLE ATROPHY IN THE RAT BY RU38486, A POTENT GLUCOCORTICOID ANTAGONIST**
M. KONAGAYA, P. A. BERNARD, and S. R. MAX (Maryland, University; USVA, Medical Center, Baltimore, MD) Endocrinology (ISSN 0013-7227), vol. 119, no. 1, 1986, p. 375-380. USVA-supported research. refs
(Contract NIH-NS-15760; NAG2-100)

**A87-13873*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**THE OCCURRENCE OF DENITRIFICATION IN EXTREMELY HALOPHILIC BACTERIA**
R. L. MANCINELLI and L. I. HOCHSTEIN (NASA, Ames Research Center, Moffett Field, CA) FEMS Microbiology Letters (ISSN 0378-1097), vol. 35, 1986, p. 55-58. NASA-supported research. refs

The ability of Halobacterium vallismortis, Halobacterium mediterranei and Halobacterium marismortui (Ginzburg strain) to grow anaerobically and denitrify was determined. Each organism grew anaerobically only in the presence of nitrate. H. marismortui produced nitrite and dinitrogen from nitrate during exponential growth. However, as the culture entered stationary phase, dinitrogen production ceased and nitrous oxide was detected. H. vallismortis produced nitrous oxide and dinitrogen during exponential growth, with dinitrogen production ceasing at the onset of stationary phase. H. mediterranei produced dinitrogen during exponential growth and did not produce nitrous oxide. These results confirm the occurrence of denitrification in the halobacteria.
Author

**A87-14047*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**METHYL STEROL AND CYCLOPROPANE FATTY ACID COMPOSITION OF METHYLOCOCCUS CAPSULATUS GROWN AT LOW OXYGEN TENSIONS**
L. L. JAHNKE (NASA, Ames Research Center, Moffett Field, CA) and P. D. NICHOLS (Florida State University, Tallahassee) Journal of Bacteriology (ISSN 0021-9193), vol. 167, July 1986, p. 238-242. NASA-supported research. refs
(Contract N00014-82-C-0404; N00014-83-K-0056)

The sterol and fatty acid concentrations for M. capsulatus grown in fed-batch cultures over a wide range of oxygen tensions (0.1-10.6 percent) and at a constant methane level are evaluated. The analyses reveal that the biomass decreases as oxygen levels are lowered; the sterol concentration increases when the oxygen range is between 0.5-1.1 percent and decreases when the oxygen range is below 0.5 percent; and the amount of monounsaturated C16 decreases and the concentration of cyclopropane fatty acids increases after oxygen is reduced. It is noted that growth and membrane synthesis occur at low oxygen concentrations and that the synthesis of membrane lipids responds to growth conditions.
I.F.

**A87-14193**
**THE NEUROBIOLOGY OF LEARNING AND MEMORY**
R. F. THOMPSON (Stanford University, CA) Science (ISSN 0036-8075), vol. 233, Aug. 29, 1986, p. 941-947. Research supported by the McKnight Foundation and Sloan Foundation. refs
(Contract N00014-83-K-0238; NSF BNS-81-06648)

Recent progress and applications of research on the neurobiology of learning and memory are reviewed. Work on the identification of essential memory trace circuits in the mammalian brain is discussed, including studies of the essential circuitry for learning of discrete, adaptive behavioral responses, studies of classically conditioned cardiovascular responses, and research on the role in learning and memory of the cerebral cortex and hippocampus. Investigations of the neural mechanisms involved in learning are reviewed, including structural alterations in neurons, alterations in preexisting synapses, long-term potentiation, long-term depression, and neurochemical processes. C.D.

**A87-14655*** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**DIFFERENTIAL PARTITION OF VIRULENT AEROMONAS SALMONICIDA AND ATTENUATED DERIVATIVES POSSESSING SPECIFIC CELL SURFACE ALTERATIONS IN POLYMER AQUEOUS-PHASE SYSTEMS**
J. M. VAN ALSTINE (NASA, Marshall Space Flight Center, Huntsville, AL; British Columbia, University, Vancouver, Canada), T. J. TRUST (Victoria, University, Canada), and D. E. BROOKS (British Columbia, University, Vancouver, Canada) Applied and Environmental Microbiology (ISSN 0099-2240), vol. 51, June 1986, p. 1309-1313. Research supported by the Medical Research Council of Canada. refs

Two-polymer aqueous-phase systems in which partitioning of biological matter between the phases occurs according to surface properties such as hydrophobicity, charge, and lipid composition are used to compare the surface properties of strains of the fish pathogen Aeromonas salmonicida. The differential ability of strains

to produce a surface protein array crucial to their virulence, the A layer, and to produce smooth lipopolysaccharide is found to be important in the partitioning behavior of Aeromonas salmonicida. The presence of the A layer is shown to decrease the surface hydrophilicity of the pathogen, and to increase specifically its surface affinity for fatty acid esters of polyethylene glycol. The method has application to the analysis of surface properties crucial to bacterial virulence, and to the selection of strains and mutants with specific surface characteristics. R.R.

**A87-14689**
**AUTOMATED ELECTROPHYSIOLOGICAL EXPERIMENTS [AVTOMATIZIROVANNYI ELEKTROFIZIOLOGICHESKII EKSPERIMENT]**
B. IA. PIATIGORSKII, G. A. ZAITMAN, V. L. CHERKASSKII, and V. A. CHINAROV Kiev, Izdatel'stvo Naukova Dumka, 1985, 216 p. In Russian. refs

The use of computers in electrophysiological experiments is discussed. General principles of organizing a computer-controlled electrophysiological experiment are outlined, together with the structure of the systems software, data analysis, and the organization of a problem-oriented software package. Consideration is given to various programming languages. Traditional and novel methods of data treatment, including the Wiener approach, are described, as well as methods developing mathematical models and simulations of biological processes. The details are presented of the systematic organization of a computer-controlled experiment involving the study of the microstructure of action-potential sequences in information transfer by nerve cells. I.S.

**A87-14895**
**EXPERIMENTAL DIFFICULTIES IN OBSERVING THE EFFECTS OF MAGNETIC FIELDS ON BIOLOGICAL AND CHEMICAL PROCESSES**
S. UENO and K. HARADA (Kyushu University, Fukuoka, Japan) (IEEE, General Electric Co., IBM Corp., et al., International Magnetics Conference, Phoenix, AZ, Apr. 14-17, 1986) IEEE Transactions on Magnetics (ISSN 0018-9464), vol. MAG-22, Sept. 1986, p. 868-873. refs

Problems in observing the effects of magnetic fields on nerve excitation, combustion processes, biochemical reactions, and embryonic development are considered, and the role of oxygen as a paramagnetic molecule is studied. For time-varying magnetic fields, eddy currents are produced which stimulate excitable tissues at low frequencies and give rise to thermal effects at high frequencies, while the effects of static magnetic fields are poorly understood. Photochemical reactions and potential radiotherapy with magnetic fields are also discussed. R.R.

**A87-15300**
**FEATURES OF THE PHENOBARBITAL EFFECT ON THE RESPIRATORY ACTIVITY OF THE LIVER MITOCHONDRIA IN RATS WITH DIFFERENT RESISTANCES TO HYPOXIA [OSOBENNOSTI DEISTVIIA FENOBARBITALA NA DYKHATEL'NUIU AKTIVNOST' MITOKHONDRII PECHENI U KRYS S RAZLICHNOI USTOICHIVOST'IU K GIPOKSII]**
L. A. GORCHAKOVA (AN USSR, Institut Fiziologii, Kiev, Ukrainian SSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 32, July-Aug. 1986, p. 481-485. In Russian. refs

The effects of phenobarbital on the respiratory chain of the liver mitochondria in rats with high- and low-resistance to hypoxia are investigated. It is observed that the respiratory activity of the liver mitochondria, in particular the active enzyme system, varies with high and low hypoxia-resistance. The data reveal that the introduction of phenobarbital into rats with a high hypoxia-resistance results in a larger amount of respiratory reactivity in the liver mitochondria than in rats with a low resistance to hypoxia. I.F.

**A87-15392**
**THE FUTURE OF PROTEIN CRYSTAL GROWTH**
C. E. BUGG (Alabama, University, Birmingham) Journal of Crystal Growth (ISSN 0022-0248), vol. 76, Aug. 1986, p. 535-544. refs

Advances in protein crystallography are considered, and problems in obtaining large, high-quality crystals of biological macromolecules for analysis are discussed. Even when large enough crystals are obtained, the crystals of most biological macromolecules are found to diffract poorly due to internal disorder within the crystals. One development in protein crystal growth involves studies of crystal growth under the microgravity conditions in space to examine the effect that density-driven convective flow has on crystal growth. R.R.

**A87-15393**
**CRYSTAL GROWTH STUDIES OF LYSOZYME AS A MODEL FOR PROTEIN CRYSTALLIZATION**
S. D. DURBIN and G. FEHER (California, University, La Jolla) Journal of Crystal Growth (ISSN 0022-0248), vol. 76, Aug. 1986, p. 583-592. refs
(Contract NIH-GM-10319)

The protein concentration dependence of the growth rate of lysozyme crystals (tetragonal form) was investigated at two NaCl concentrations (3.5 percent 5 percent w/v). The rates for different crystallographic faces were found to have different concentration dependences, resulting in a changing crystal shape with concentration. The experimental results were compared with standard crystal growth theories. The strong concentration dependence could be fitted at high supersaturation by a two-dimensional nucleation model, whereas at low supersaturation a correlation of growth rate with etch-revealed imperfections on the crystal suggested a defect-mediated growth mechanism. Crystals grown for long times in unstirred solutions exhibited a nonuniform, 'patchy' growth when the supersaturation was raised, indicating an inactivation of parts of the crystal surface. This phenomenon may be related to the 'cessation of growth'. Author

**A87-15394*** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**GROWTH KINETICS OF TETRAGONAL LYSOZYME CRYSTALS**
M. PUSEY and R. NAUMANN (NASA, Marshall Space Flight Center, Huntsville, AL) Journal of Crystal Growth (ISSN 0022-0248), vol. 76, Aug. 1986, p. 593-599. refs

A method for immobilizing protein crystals in small volumes to determine growth rates on various faces is applied to study the growth kinetics of the (100) face of tetragonal hen-egg white lysozyme crystals at different degrees of bulk saturation. In normal gravity, transport is found to be dominated by convection for crystal sizes larger than a few microns, while in a microgravity environment, transport is diffusion-limited for sizes up to a few mm. It is found that convection can be significant even in microgravity for crystals approaching cm sizes, and that lysozyme growth is limited by surface kinetics in normal gravity. R.R.

**A87-15395*** Utah Univ., Salt Lake City.
**INORGANIC AND PROTEIN CRYSTAL GROWTH - SIMILARITIES AND DIFFERENCES**
F. ROSENBERGER (Utah, University, Salt Lake City) Journal of Crystal Growth (ISSN 0022-0248), vol. 76, Aug. 1986, p. 618-636. refs
(Contract NSG-1534)

Transport and interface kinetic concepts for the design and control of inorganic crystal growth experiments are reviewed, and their applications and limitations in protein crystal growth are considered. It is suggested that the interfacial concentration gradients are steeper for faster crystallization, and that the interfacial concentration distributions for the protein and the precipitant can differ significantly. Results show that uniformity in crystal composition and steady-state conditions in growth kinetics are favored by larger sample size, since surface-tension gradients

drive strong in microgravity experiments and in small samples on earth. Author

**A87-15580**
**A THREE-CHAMBER MODEL FOR THE INNER-EAR COCHLEA [TREKHKAMERNAIA MODEL' ULITKI VNUTRENNEGO UKHA]**
S. M. NOVOSELOVA IN: Mathematical problems in the theory of wave propagation. 15 . Leningrad, Izdatel'stvo Nauka, 1985, p. 133-143. In Russian. refs

A three-chamber model of the cochlea was developed on the basis of a two-chamber model, the former differing, from the latter by the simultaneous presence of both the basilar and the Reissner membranes. The values of the anisotropic stiffness of both membranes were determined using the data from Bekesy's hair tests (1960). The effects of the cochlear parameters, such as the values of the anisotropic stiffness of the membranes and the height of the canals, on the membrane responses in the two-dimensional and the three-dimensional models were estimated. I.S.

**A87-16056#**
**THE GRAVITATIONAL BIOLOGY LABORATORY (GBL)**
C. CHIPAUX (Matra, S.A., Velizy-Villacoublay, France), P. CLANCY (ESA, Paris, France), W. WODSAK (Dornier GmbH, Friedrichshafen, West Germany), and H. WOLFF (Brunel Institute for Bioengineering, Uxbridge, England) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 6 p.
(IAF PAPER 86-375)

The gravitational biology laboratory (GBL), an integral part of ESA's microgravity research effort, is described. Consideration is given to experimental procedures, engineering of the laboratory, plant cultivation, experiments not requiring illumination, and support laboratory equipment. As part of the Columbus equipment, the GBL will permit experimental undertakings that are forbidden by Eureca and Spacelab mission conditions. When incorporated into the Space Station, the GBL will allow for the growth of rather large plants (up to 1 m). K.K.

**A87-16057#**
**EXPERIMENTS AND APPROPRIATE FACILITIES FOR PLANT PHYSIOLOGY RESEARCH IN SPACE**
W. LORK (Dornier System GmbH, Friedrichshafen, West Germany) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 6 p. Sponsorship: European Space Research and Technology Centre.
(Contract ESTEC-6377/85-NL-PR)
(IAF PAPER 86-376)

Light is a very essential parameter in a plant's life. Changing the quality and/or quantity of illumination will not only determine the further development (photomorphogenesis), but effects also spontaneous responses like curvatures (phototropism). But there are several still unknown links in the signal transduction chain from the perception of the light signals to the terminal response. It is known from ground-based experiments, that parts of this signal transduction path is congruous with that of gravitational signals. BIOSAMPLE is a technology development program, which enables sophisticated experiments with whole plants in a microgravity environment. It allows complex sequences of gravitational- and light-stimuli with simultaneous recording of the plant's response (e.g. curvature of the stem) by video. This facility, in union with new genetic mutants (which are less- or insensitive to light), gravity, or both is a convenient tool for progress in plant physiology research. Author

**A87-16058#**
**THE RESPONSE OF STRUCTURE AND FUNCTION OF THE GRAVIRECEPTOR IN A VERTEBRATE TO NEAR WEIGHTLESSNESS**
J. NEUBERT, W. BRIEGLEB, A. SCHATZ (DFVLR, Institut fuer Flugmedizin, Cologne, West Germany), I. HERTWIG (Bonn, Universitaet, West Germany), and B. KRUSE IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 12 p. refs
(IAF PAPER 86-377)

The effects of weightlessness on the development of gravity receptors in Xenopus laevis embryos and larvae were investigated during a 7-day Shuttle experiment. The preflight, on-board, and post-flight treatments of the embryos and larvae are described. Light microscopy, TEM, and SEM data concerned with the shape, size, and position of the otolith membranes in larvae are analyzed. The data reveal that an otolithlike structure, which is rarely found in the 1-G larvae, develops frequently below the dorsal wall of the vesitbulum in the weightless larvae. It is also detected that cosmic radiation did not influence the embryonic development of the Xenopus eggs. I.F.

**A87-16059#**
**CHANGES OF INSULIN EFFECT ON LIPOGENESIS AND INSULIN BINDING TO RECEPTORS DURING HYPOKINESIA**
L. MACHO, M. FICKOVA, and S. ZORAD (Slovenska Akademia Vied, Ustav Experimentalnej Endokrinologie, Bratislava, Czechoslovakia) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 7 p. refs
(IAF PAPER 86-378)

The effect of hypokinesia on insulin action and insulin binding to specific receptors in fat cells was studied. Male Wistar rats were exposed to hypokinesia in special adjustable plastic cages for 1, 7, 21 and 60 days, and the stimulatory effect of insulin (10 and 100 mU) on the incorporation of radiocarbon labelled glucose into lipids of fat tissue and the binding of insulin to receptors of isolated adipocytes was estimated. Results showed that hypokinesia has an important influence on the stimulatory action of insulin and on insulin receptors in adipocytes. Author

**A87-16070*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
**ANIMALS IN BIOMEDICAL SPACE RESEARCH**
R. W. PHILLIPS (NASA, Johnson Space Center, Houston, TX; Colorado State University, Fort Collins) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 4 p.
(IAF PAPER 86-395)

Rat and squirrel monkeys experiments have been planned in concert with human experiments to help answer fundamental questions concerning the effect of weightlessness on mammalism function. For the most part, these experiments focus on identified changes noted in humans during space flight. Utilizing space laboratory facilities, manipulative experiments can be completed while animals are still in orbit. Other experiments are designed to study changes in gravity receptor structure and function and the effect of weightlessness on early vertibrate development. Following these preliminary animal experiments on Spacelab Shuttle flights, longer term programs of animal investigation will be conducted on Space Station. Author

**A87-16147**
**INVESTIGATION OF THE CHARACTERISTICS OF AUDITORY EFFECTS STIMULATED BY MICROWAVES USING A SPHERICAL MODEL [ISSLEDOVANIE OSOBENNOSTEI EFFEKTA RADIOZVUKA S POMOSHCH'IU SFERICHESKOI MODELI]**
V. V. SHOROKHOV, R. E. TIGRANIAN, and P. V. MASHKIN (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) Biofizika (ISSN 0006-3029), vol. 31, July-Aug. 1986, p. 695-700. In Russian. refs

The features of sound waves excited by microwave impulses (at 915 and 2375 MHz) were studied, using spherical flasks filled

with ethanol or 0.1 M NaCl in water as models of the human head. A piezoceramic transducer was used to register mechanical oscillations of the flask's surface. The results suggest that the auditory effects of microwaves are caused by stimulation of mechanical oscillations in the liquid (or the head tissues) by electromagnetic energy, followed by the bone-effected transfer of the absorbed energy to the auditory organs. I.S.

**A87-16149**
**SURFACE-ENHANCED RAMAN SPECTROSCOPY OF BIOPOLYMERS - MEMBRANE PROTEINS, BACTERIORHODOPSIN, AND RHODOPSIN ADSORBED ON SILVER ELECTRODES AND SILVER HYDROSOLS [SPEKTROSKOPIIA GIGANTSKOGO KOMBINATSIONNOGO RASSEIANIIA BIOPOLIMEROV - MEMBRANNYE BELKI, BARTERIORODOPSIN I RODOPSIN, ADSORBIROVANNYE NA SEREBRIANYKH ELEKTRODAKH I GIDROZOLIAKH SEREBRA]**
I. R. NABIEV, R. G. EFREMOV, and G. D. CHUMANOV (AN SSSR, Institut Bioorganicheskoi Khimii; Moskovskii Inzhenerno-Fizicheskii Institut, Moscow, USSR) Biofizika (ISSN 0006-3029), vol. 31, July-Aug. 1986, p. 724-734. In Russian. refs

**A87-16340*** North Carolina Univ., Chapel Hill.
**SEASONAL VARIATIONS IN THE STABLE CARBON ISOTOPIC SIGNATURE OF BIOGENIC METHANE IN A COASTAL SEDIMENT**
C. S. MARTENS, C. D. GREEN (North Carolina, University, Chapel Hill), N. E. BLAIR (North Carolina State University, Raleigh), and D. J. DES MARAIS (NASA, Ames Research Center, Moffett Field, CA) Science (ISSN 0036-8075), vol. 233, Sept. 19, 1986, p. 1300-1303. refs
(Contract NAGW-593; NSF OCE-82-08666; NSF OCE-84-16963)

Systematic seasonal variations in the stable carbon isotopic signature of methane gas occur in the anoxic sediments of Cape Lookout Bight, a lagoonal basin on North Carolina's Outer Banks. Values for the carbon isotope ratio of methane range from -57.3 per mil during summer to -68.5 per mil during winter in gas bubbles with an average methane content of 95 percent. The variations are hypothesized to result from changes in the pathways of microbial methane production and cycling of key substrates including acetate and hydrogen. The use of stable isotopic signatures to investigate the global methane cycle through mass balance calculations, involving various sediment and soil biogenic sources, appears to require seasonally averaged data from individual sites. Author

**N87-12103#** Research Inst. of National Defence, Umea (Sweden). Dept. 4.
**DETECTION, IDENTIFICATION, AND SETTLING OF BACTERIA FROM AN AEROSOL; TESTING OF A DETECTOR FOR AEROSOLS WITH BACTERIA AND PRELIMINARY INVESTIGATION OF SETTLING ON DIFFERENT SURFACE MATERIALS**
K. GUSTAFSSON, P. HALLIN, E. HENNINGSON, G. LINFORS, L. NORLANDER, and G. SANDSTROEM May 1986 31 p In SWEDISH; ENGLISH summary
(FOA-C-40229-B2; ISSN-0347-2124; ETN-86-98335) Avail: NTIS HC A03/MF A01; Research Inst. of National Defence, Stockholm, Sweden KR 50

A prototype detector for aerosols with bacteria was tested in different types of terrain where aerosols (with killed Escherichia coli) were generated. The investigation shows that the device detects increases in the total amount of bacteria in outdoor air (1 million bacteria/cc). The detection limit is high related to possible infection doses due to the high background level of outdoor air, but goes down in a cleaner environment. With an enzyme linked immunosorbal assay it is possible to identify the bacteria in the sampled aerosol and with filter hybridization an identification and an approximation of the number was made of bacteria on metal, cloth from uniforms, nitrocellulose filters, and water. ESA

**N87-12104#** Institut National Polytechnique, Grenoble (France).
**IMAGE ANALYSIS, PERCEPTION STRATEGY AND COGNITIVE STRATEGY Ph.D. Thesis [IMAGES, STRATEGIES PERCEPTIVES ET STRATEGIES COGNITIVES D'ANALYSE]**
C. GARBAY 1986 324 p In FRENCH
(ETN-86-98401) Avail: NTIS HC A14/MF A01

The functional analysis of the information perceived in cell microscopy is carried out as well as a study of the human mechanisms of image interpretation. A comparison is made with computerized procedures to represent and analyze images. The concepts are illustrated by the application to interpreting histological images (cancerous cells). ESA

**N87-12105#** Joint Publications Research Service, Arlington, Va.
**USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOL. 20, NO. 2, MARCH - APRIL 1986**
O. G. GAZENKO, ed. 23 Jul. 1986 144 p Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar.-Apr. 1986 96 p
(JPRS-USB-86-004) Avail: NTIS HC A07/MF A01

Twenty-one articles addressing various topics in exobiology and aerospace medicine are compiled. Specific subject areas include adaptation theory, radiation safety, physiological effects of weight-lessness, microbiology of closed environments, space flight food supplies, water reclamation methods, and others.

**N87-12116#** Joint Publications Research Service, Arlington, Va.
**TYPOLOGICAL CHARACTERISTICS OF CENTRAL HEMODYNAMICS OF MONKEYS IN CLINOSTATIC AND ORTHOSTATIC POSITIONS**
A. N. DEMIN, G. S. BELKANIYA, and V. A. DARTSMELIYA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 80 - 86 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 60 - 65
Avail: NTIS HC A07/MF A01

By tetrapolar rheography central hemodynamics was investigated in 74 rhesus monkeys in the clino- and orthostatic state. The basic hemodynamic parameters were examined in relation to the entire sample, to the group with a higher or lower blood pressure, BP(mean), and to four states of central circulation in orthostatic animals. The typological circulatory differences in the orthostatic state were shown to be determined by qualitatively different hemodynamic mechanisms responsible for BP(mean). The hemodynamic characteristics in the clino- and orthostatic state were found to be reciprocally related. It is recommended to take into consideration the typological differences of hemodynamics that can modify cardiovascular responses to various effects. Author

**N87-12117#** Joint Publications Research Service, Arlington, Va.
**DISTINCTIONS OF CAPILLARIZATION OF WHITE RAT SKELETAL MUSCLE DURING ADAPTATION TO HIGH ALTITUDE OF THE PAMIRS AND ANTARCTICA**
V. S. BELKIN and O. B. ASTAKHOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 87 - 92 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 65 - 69
Avail: NTIS HC A07/MF A01

The capillary-myofiber quantitative relations were examined morphometrically in 180 white male rats exposed for 1.5 months to altitudes of 3488 to 4000 m above sea level (Antarctic and Pamir highlands). During the first three weeks of adaptation drastic changes in the parameter were seen. It is suggested that one of the factors responsible for them is a shift in the functional status of muscle produced by the method of transportation of the animals to the highland environments. Author

**N87-12119#** Joint Publications Research Service, Arlington, Va.
**INVESTIGATION OF VIABILITY OF QUAIL EMBRYOS AND CHICKS WHEN EGGS ARE EXPOSED TO GAMMA RADIATION AND VIBRATION AS RELATED TO DIFFERENT TERMS OF EGG STORAGE**
V. F. MISCHENKO and A. V. SHAFIRKIN *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 98 - 105 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 72-77
Avail: NTIS HC A07/MF A01

The viability of quail embryos and nestlings from the incubation eggs exposed: (1) to gamma radiation at a dose of 300 cGy and stored for 15 days or (2) to gamma-radiation at a dose of 300 cGy and stored for 30 days or (3) to vibration with the acute egg end oriented contrary to the vibration front and stored for 30 days did not decrease as compared to that of the controls stored for the same time period. The viability diminished if the radiation dose was increased to 600 to 1200 cGy or if the egg orientation during vibration was changed. Author

**N87-12122#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF HYDROCORTISONE ON OSTEOGENIC FUNCTION OF MOUSE BONE MARROW**
T. Y. BURKOVSKAYA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 114 - 119 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 83-86
Avail: NTIS HC A07/MF A01

Bone marrow cells were implanted into the capsule of the kidney of mice which were then given intraperitoneal injections of hydrocortisone in the dose of 5 mg per animal. The drug influenced different stages of bone histogenesis in a different manner. The stage of onset of bone formation proved to be most sensitive, whereas the earlier and later stages were less sensitive to hydrocortisone. It is concluded that the target cells for hydrocortisone are osteoblasts at the stage of active synthesis of bone proteins rather than cell-precursors of osteogenesis.
Author

**N87-12124#** Joint Publications Research Service, Arlington, Va.
**USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOL. 20, NO. 4, JULY - AUGUST 1986**
8 Oct. 1986 154 p Transl. into ENGLISH of Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 96 p
(JPRS-USB-86-006) Avail: NTIS HC A08/MF A01

Presented are translations from a Russian usage language bimonthly journal on aerospace medicine and space biology. Indicative of the articles are these titles: Distinctions of Visual Monitoring of Evaluating Readings in Maneuvered Flight; Capabilities of Ultrasonic Methods of Evaluating Hemodynamics of Cardiovascular System; Psycho- physiological Aspects of Color Coding of Flight and Navigation Information on Onboard Electronic Displays; and Forecasting Operator Work Capacity During Long Term Continuous Work.

**N87-12138#** Joint Publications Research Service, Arlington, Va.
**BEHAVIORAL REACTIONS OF ANIMALS EXPOSED TO SPACEFLIGHT CONDITIONS IN THE PRENATAL PERIOD**
Z. I. APANASENKO, M. A. KUZNETSOVA, and V. Y. KOROTKOVA *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 55-60 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 55-60
Avail: NTIS HC A08/MF A01

The Wistar female rats were flown on the biosatellite Cosmos-1514 during their pregnancy days 13 to 18. Offspring (at the age 1 to 3 months) of four of these rats were used to investigate their behavioral reactions in the open field and mazes of different design, food attraction being applied. Control rats of matched pregnancy term were kept either in a vivarium or in a biosatellite mockup where all flight factors, except for weightlessness, were simulated. It was found that exposure to weightlessness in the above intrauterine developmental period caused no serious changes in the behavioral reactions of rats during their postnatal development. The number of refusals and errors and the latency period were similar in the rats from the flight and control groups. Changes were seen only in fine behavioral regulation. The flown animals displayed a lower research activity in the open field, a longer time of search in the maze, a far longer time for grooming and a greater number of inadequate movements, and a stronger response to external inhibiting stimuli. These changes seem to be caused by a slight attenuation of the basic nervous processes (primarily, inhibitory) and a decrease of their balance and lability. These effects may be associated with an inhibitory influence of space flight factors on the maturation of cortical structures.
Author

**N87-12139#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF WEIGHTLESSNESS ON RAT FETUS SKELETAL DEVELOPMENT**
L. A. DENISOVA *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 87-91 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 60-63
Avail: NTIS HC A08/MF A01

The size of the ossified areas of skeletal bones of fetuses of white rats flown onboard Cosmos-1514 during their pregnancy days 13 to 18 was compared to that of synchronous and vivarium controls. The effect of zero-g on the pregnant animals in the course of an active formation of fetal bones involved a distinct (13 to 17%) arrest of the development of nearly every area of the fetal skeleton. The signs of the arrest development were more manifest in less mature skeletal structures. Since the Ca-2 content was identical in the flight and control rats, it can be concluded that the inhibited ossification of the flight fetuses was produced by the impairment of mechanisms controlling Ca-2+ incorporation into the growing skeleton. The ossified areas in the skeleton of the flight newborns were significantly larger than those of the synchronous and vivarium controls. This means that during the re-adaptation period (pregnancy days 18 to 23) the inhibited ossification of the fetal skeleton was completely compensated and that the flight newborns (i.e., the rats whose prenatal development occurred in part in zero-g) were ahead of the controls with respect to the ossification rate. Author

**N87-12140#** Joint Publications Research Service, Arlington, Va.
**FUNCTIONAL STATE OF SOMATOTROPIC CELLS OF ADENOHYPOPHYSIS IN HYPOKINETIC RATS**
Y. I. ALEKSEYEV *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 92-97 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 63-67
Avail: NTIS HC A08/MF A01

Morphological and cytokaryometric examinations of the somatotropic cell population of the rat pituitary anterior lobe were performed on hypokinetic days 30, 90 and 165, and 60 days after 165-day hypokinesia (readaptation period). During prolonged hypokinesia the major changes occurred in the cytoplasm of somatotropic cells and were accompanied by an inhibition of the growth hormone synthesis. A higher activity of somatotropic cells during readaptation suggested that diminished motor activity may be responsible for a lower hormone production in the pituitary. The experimental findings and published data allow the conclusion that the inhibition of animal growth which takes place during hypokinesia is closely associated with an inhibited somatotropic function. Author

**N87-12141#** Joint Publications Research Service, Arlington, Va.
**NOREPINEPHRINE USED TO CONTROL ENERGY OF HEAT PRODUCTION AND UTILIZATION OF ATP IN SINGLE MUSCULAR CONTRACTION UNDER NORMAL AND HYPEROXIC CONDITIONS**
L. D. PCHELENKO *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 98-105 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 67-72
Avail: NTIS HC A08/MF A01

The effect of noradrenalin (NA, 0.008 microgram/ml) on the rate of heat release (V) during a single isometric contraction of an isolated diaphragm was investigated in rats kept in air and 99% oxygen for 3 hours. The effect was measured by the electrothermometric method in the presence and in the absence of ATP (0.01 mg/ml) in the incubation solution. Hyperoxia doubled V of muscle contraction. The calorigenic effect of NA was not detected in the norm and was very distinct during hyperoxia so that V sub NA = 0.14 x V sub init + 10.88. ATP increased V both in the normal and hyperoxic state. However, the increase of the initial V level was 5.3-fold in the hyperoxic state and 1.5-fold in the norm. It is concluded that hyperoxia disturbs energy metabolism of muscle contraction through NA-dependent acceleration of ATP-lytic processes and increase in energy expenditures of heat formation in the course of muscle contraction. Author

**N87-12147#** Joint Publications Research Service, Arlington, Va.
**ORTHOSTATIC CARDIAC RHYTHM RESPONSE IN WAKING MACACA MULATTA MONKEYS**
M. D. GOLDOVSKAYA, V. P. MELNICHENKO, and B. S. KULAYEV *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 129-131 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 86-88
Avail: NTIS HC A08/MF A01

There are only isolated publications in the literature that describe orthostatic reactions of heart rhythm in waking monkeys. The nature of the responses in those investigations could have been largely determined by an unstable heart rhythm associated with motor excitement of immobilized monkeys. The orthostatic cardiac rhythm response in waking monkeys was evaluated with consideration of this factor. Author

**N87-13122*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**CREW FACTORS IN FLIGHT OPERATIONS. PART 3: THE OPERATIONAL SIGNIFICANCE OF EXPOSURE TO SHORT-HAUL AIR TRANSPORT OPERATIONS**
H. C. FOUSHEE, J. K. LAUBER, M. M. BAETGE (Informatics General Corp., Palo Alto, Calif.), and D. B. ACOMB (San Jose State Univ., Calif.) Aug. 1986 67 p
(NASA-TM-88322; A-86338; NAS 1.15:88322) Avail: NTIS HC A04/MF A01 CSCL 06S

Excessive flightcrew fatigue has potentially serious safety consequences. Laboratory studies have implicated fatigue as a causal factor associated with varying levels of performance deterioration depending on the amount of fatigue and the type of measure utilized in assessing performance. These studies have been of limited utility because of the difficulty of relating laboratory task performance to the demands associated with the operation of a complex aircraft. The performance of 20 volunteer twin-jet transport crews is examined in a full-mission simulator scenario that included most aspects of an actual line operation. The scenario included both routine flight operations and an unexpected mechanical abnormality which resulted in a high level of crew workload. Half of the crews flew the simulation within two to three hours after completing a three-day, high-density, short-haul duty cycle (Post-Duty condition). The other half flew the scenario after a minimum of three days off duty (Pre-Duty) condition). The results revealed that, not surprisingly, Post-Duty crews were significantly more fatigued than Pre-Duty crews. However, a somewhat counter-intuitive pattern of results emerged on the crew performancemeasures. In general, the performance of Post-Duty crews was significantly better than that of Pre-Duty crews, as rated by an expert observer on a number of dimensions relevant to flight safety. Analyses of the flightcrew communication patterns revealed that Post-Duty crews communicated significantly more overall, suggesting, as has previous research, that communication is a good predictor of overall crew performance. Author

**N87-13123#** State Univ. of New York, Buffalo. Dept. of Biophisical Sciences.
**MECHANICAL TRANSDUCTION: UNIFICATION**
F. SACHS Jun. 1986 4 p Repr. from NIPS, v. 1, Jun. 1986 p 98-100
(Contract DAAG29-85-K-0135)
(AD-A171191; ARO-22560.1-LS) Avail: NTIS HC A02/MF A01 CSCL 06C

The transduction mechanical stimuli into electrical responses is essential for audition, kinesthesis, proprioception, and autonomic sensation of pressure and volume. The primary event in transduction is the opening of an ion channel whose linkage to the cytoskeleton provides high sensitivity. When linked to adapting mechanical structures, this scheme can account for the presently known properties of various mechanical transducers.
Author (GRA)

**N87-13124#** Brookhaven National Lab., Upton, N. Y.
**X-RAY FLUORESCENCE WITH SYNCHROTRON RADIATION**
K. W. JONES, B. M. GORDON, A. L. HANSON, J. G. POUNDS, and G. SCHIDLOVSKY Mar. 1986 10 p Presented at the Annual Joint Meeting of the Electron Microscopy of America and the Microbeam Analysis Society, Albuquerque, N. Mex., 10 Aug. 1986
(Contract DE-AC02-76CH-00016)
(DE86-010543; BNL-38006; CONF-860829-26) Avail: NTIS HC A02/MF A01

X-ray fluorescence (XRF) has long been used to make measurements of trace element concentrations in biological materials with very high sensitivity. It has not been previously possible to work with micrometer spatial resolutions because of the relatively low brightness of X-ray tubes. This situation is much improved by using synchrotron storage ring X-ray sources since the brightness of the synchrotron source is many orders of magnitude higher than is obtained with the most intense tube sources. These intense sources open the possibility of using the XRF technique for measurements with resolutions of approximately cellular dimensions. A description of a current research project at Brookhaven which uses synchrotron radiation induced X-ray emission (SRIXE) is presented to illustrate a specific application of the method in biology. DOE

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## AEROSPACE MEDICINE

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

**A87-13551**
**FUNDAMENTALS OF AEROSPACE MEDICINE**
R. L. DEHART, ED. (Industrial Medicine Employer's Service of Oklahoma, Inc.; Hillcrest Occupational Medicine Services, Tulsa; Oklahoma, University, Norman) Philadelphia, PA, Lea and Febiger, 1985, 1001 p. For individual items see A87-13552 to A87-13584.

A textbook is presented for the various facets of aviation, aerospace, and occupational health medicine. Consideration is given to the interaction of human physiology with aerospace environments and to research programs initiated to enhance the understanding and safety of this interaction. The procedures, health

problems and maintenance, and training for practitioners of aviation medicine are explored in depth. M.S.K.

**A87-13552**
**THE HISTORICAL PERSPECTIVE**
R. L. DEHART (Industrial Medicine Employer's Service of Oklahoma, Inc.; Hillcrest Occupational Medicine Services, Tulsa; Oklahoma, University, Norman) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 5-25. refs

The development of human flight capabilities is traced, along with progress in aviation medicine, up to the advent of aerospace medicine in WW II. The altitudes and distances flown and the instrumentation carried increased steadily, as did the database on crash injuries. When flights to altitudes around 6000 m became possible in the 1860s, the hazards associated with a lowered partial pressure of O2 were recognized and experimentation was initiated in altitude chambers. Physicians who were also trained pilots defined physical criteria and testing for US military pilots after 1910. Physical standards for civil pilots were codified in 1927, and the position of flight surgeon and schools for aviation medicine were established soon after. M.S.K.

**A87-13553**
**THE MODERN PERSPECTIVE**
R. L. DEHART (Industrial Medicine Employer's Service of Oklahoma, Inc.; Hillcrest Occupational Medicine Services, Tulsa; Oklahoma, University, Norman) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 26-40. refs

The progress in flight technologies and the increasing numbers of humans involved have spurred a rapid growth in the numbers of flight surgeons in the past 50 yr. Flight surgeons were given the final word on the flight fitness of pilots in the US in 1926; empirical interest in space medicine started in 1952. Flight surgeons were instrumental in the development of oxygen apparatus and pressure suits for high-altitude flight and anti-g suits for retaining consciousness during high-speed maneuvers. Doctors also participated in high-altitude balloon flights and rocket-sled trails. The educational routes and career opportunities for U.S. flight surgeons are discussed. M.S.K.

**A87-13554**
**THE FUTURE PERSPECTIVE**
G. C. MOHR (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 41-59. refs

The areas of aerospace medicine requiring further investigation to respond to near-term increased capabilities of scientific, civil, and military aircraft and aerospacecraft are summarized. Hypersonic flight will expose crew and passengers to new atmospheric species, more intense radiation, and depressurization hazards. Aerospaceplanes will need self-contained air supplies, structural cooling methods, lightweight structures with enhanced strength, and advanced navigation systems. M.S.K.

**A87-13556**
**RESPIRATORY PHYSIOLOGY**
P. J. SHEFFIELD (USAF, School of Aerospace Medicine, Brooks AFB, TX) and R. D. HEIMBACH (Texas A & M University, College Station; Southwest Texas Methodist Hospital, San Antonio, TX) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 72-109. refs

The physiology of human respiration is explored with emphasis on the effects of altitude, pressure, and atmospheric composition. Account is taken of changes in oxygen requirements with strenuous exercise, and of the total volume of gas which can be held by the lung and utilized from it. The chemical exchanges which occur between the lung alveoli and the veins and in the body tissues are summarized. Changes which occur in hypoxic and hypemic hypoxia are described as a function of altitude. Attention is also given to the effects of hyperventilation, oxygen toxicity and hypercapnia. M.S.K.

**A87-13558**
**DECOMPRESSION SICKNESS AND PULMONARY OVERPRESSURE ACCIDENTS**
R. D. HEIMBACH (Texas A & M University, College Station; Southwest Texas Methodist Hospital, San Antonio, TX) and P. J. SHEFFIELD (USAF, School of Aerospace Medicine, Brooks AFB, TX) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 132-161. refs

The causes, symptoms, and amelioration techniques of decompression sickness are discussed. Humans are most susceptible to the condition at altitudes above 720 m or after having dived to significant depths underwater and flying shortly thereafter. Factors which influence the formation of nitrogen bubbles in the muscles are reviewed, along with the physiological effects of the bubbles. The effects of breathing pure oxygen to purge the body of nitrogen, the temporal duration of the exposure to low-pressure conditions, and a recent exposure to low pressure are discussed. Techniques for treating someone experiencing decompression sickness are delineated. M.S.K.

**A87-13562**
**SPATIAL ORIENTATION IN FLIGHT**
K. K. GILLINGHAM and J. W. WOLFE (USAF, School of Aerospace Medicine, Brooks AFB, TX) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 299-381. refs

Human perceptions of motions and spatial orientation are described, along with their significance for pilots. Motion is perceived as either translational or rotational in terms of movements about the center of the human head. The neurophysiological processes which occur in response to accelerations are described in detail, together with the various mistakes which can enter human consciousness when flying aircraft, causing erronoeus and potentially fatal corrective maneuvers by pilots. M.S.K.

**A87-13564**
**AIRCREW HEALTH CARE MAINTENANCE**
R. B. RAYMAN (USAF, Regional Hospital, Langley AFB, VA) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 403-420. refs

Medical criteria for the selection, health maintenance, and grounding of pilots are summarized. Methods applied by the U.S. and RAF in selecting the positions of flight crew candidates are described, as are periodic medical checkups to evaluate the flight fitness of aircrew members. The peculiar circumstances arising in determinations of the flight status of women are discussed, especially the man-machine interface and the effects of menses and pregnancy. M.S.K.

**A87-13565**
**CLINICAL AEROSPACE CARDIOLOGY**
J. R. HICKMAN, JR. and G. M. MCGRANAHAN, JR. (USAF, School of Aerospace Medicine, Brooks AFB, TX) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 421-464. refs

A lack of precision in cardiological examinations results in failure to achieve exact identifictions of cardiovascular dysfunctions and to develop a suitable database. The situation is acute in aerospace medicine because of the danger of allowing a pilot who has a serious condition to continue flying. Only a long-term record from a battery of cardiovascular tests can provide sufficient data. Such a data base would also, eventually aid in screening out candidates for pilot training. A review is provided of asymptomatic cardiovascular findings which can impact the certification of a pilot. M.S.K.

**A87-13566**
**OPHTHALMOLOGY IN AEROSPACE MEDICINE**
T. J. TREDICI (USAF, School of Aerospace Medicine; Texas, University, Brooks AFB, TX; Uniformed Services University of the Health Sciences, Bethesda, MD) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 465-510. refs

The physical, physiologic, medical, and bioengineering aspects of vision which are significant for pilots are examined in detail. Medical tests that have been devised for selecting personnel with exceptional visual capabilities are described, along with cockpit equipment for extending the effectiveness of that vision. Ophthalmological, vision engineering and human-factors techniques for ensuring the health and optimal functioning of the pilot visual system are discussed. M.S.K.

**A87-13567**
**OTOLARYNGOLOGY IN AEROSPACE MEDICINE**
C. T. YARINGTON, JR. (Washington, University; Mason Clinic, Seattle) and H. H. HANNA IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 511-537. refs

The human otolaryngologic system (OS) is described, and attention is given to disorders that can have a negativce impact on flight fitness. Clinical conditions which are caused by exposure to the flight environment are characterized: otitis externa, perforated tympanic membrane, vertigo, anosmia, allergic and vasomotor rhinitis, nasal polyposis, acute sinusitis, laryngitis, and maxillofacial trauma. M.S.K.

**A87-13569**
**FURTHER SIGNIFICANT MEDICAL AND SURGICAL CONDITIONS OF AEROMEDICAL CONCERN**
R. MOSER, JR. (USAF, School of Aerospace Medicine, Brooks AFB; Texas, University, Austin; Uniformed Services University of the Health Sciences, Bethesda, MD) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 571-594. refs

Medical conditions which aerospace medicine practitioners confront are described in terms of patient management, treatments, and flight safety. Attention is given to hematologic considerations (oxygen transport, anemia, and sickle-cell disease), gastrointestinal disorders (gastroenteritis, peptic ulcers, and hemorrhoids), and genitourinary disorders (kidney stones and proteinuria). Also discussed are: diabetes mellitus and gout, malignant tumors, and orthopedic disorders. Treatments, where effective, are summarized for all disorders mentioned. M.S.K.

**A87-13571**
**AEROSPACE MEDICINE IN THE UNITED STATES AIR FORCE**
J. W. ORD (USAF, Aerospace Medical Div., Brooks AFB, TX) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 615-631.

The involvement of flight surgeons in the selection, health maintenance and monitoring, and judgement of the flight fitness of pilots and other aircrew members for the Air Force is described. Flight surgeons perform the physical and psychological examinations of aircrew candidates. Aptitude tests are administered, along with interviews, to evaluate the suitability of candidates for airlift, tactical, strategic, and space missions. M.S.K.

**A87-13572**
**ARMY AVIATION MEDICINE**
N. B. CHASE (PHS, Office of the Surgeon General, Washington, DC) and R. J. KREUTZMANN (U.S. Army, Aeromedical Center, Fort Rucker, AL) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 632-650.

The training and missions of U.S. Army flight surgeons are described, with emphasis on the peculiarities of rotary-wing medicine. Important aspects of the Army aviation medicine training program are summarized, as are the peculiar disorientation, night-vision, environmental, noise, and vibration hazards faced by helicopter flight crews. Attention is given to attempts to make helicopters crashworthy and to identify effective training methods which will lower the chances of collisions. M.S.K.

**A87-13573**
**NAVAL AVIATION MEDICINE**
R. P. CAUDILL, JR. (U.S. Navy, Naval Aerospace Medical Institute, Pensacola Naval Air Station, FL) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 651-675.

The tasks and the training of U.S. navy aviation medicine practitioners are described. Medical research on naval aviators is dedicated to improving flight safety, human efficiency and the selection and training of flight personnel. A program is being carried out which involves long-term monitoring of the health profiles of 1000 naval airmen. M.S.K.

**A87-13574**
**CIVIL AVIATION MEDICINE**
S. R. MOHLER (Wright State University, Dayton, OH) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 676-697. refs

The medical systems which exist in support of civil air traffic are described. Medical restrictions and hazards associated with each type of aircraft are summarized, noting special dangers posed by agricultural spray operations, fatigue, and aerobatic maneuvers. M.S.K.

**A87-13575**
**AVIATION MEDICAL SUPPORT TO AIRLINES**
R. L. DEHART (Industrial Medicine Employer's Service of Oklahoma, Inc.; Hillcrest Occupational Medicine Services, Tulsa; Oklahoma, University, Norman) and C. C. GULLETT (Harvey W. Watt and Co., Atlanta, GA) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 698-717. refs

The responsibilities of aviation-medicine practitioners in support of the personnel and passengers of U.S. airlines are described. Current in-house, contract, and contingency medical services of large and small airlines are explored, including practices followed in the selection of flight crew and nonflying personnel and carrying out periodic medical checkups. M.S.K.

**A87-13576**
**AEROMEDICAL REHABILITATION AND HEALTH PROMOTION FOR CIVILIAN PROFESSIONAL AIRCREW**
R. L. MASTERS (Colorado, University, Denver) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 718-734. refs

Medical problems faced by civil air transport pilots are summarized, along with the services and resources available. The mandatory FAA physical is performed by designated physician, whose judgment may be, it is asserted, uneven and not thorough. When a disorder disqualifies a pilot from flight duty, the flight surgeon must map a course back to full health for the pilot to avoid wasting the substantial skills of the pilot. M.S.K.

**A87-13577**
**THE FEDERAL AVIATION ADMINISTRATION RESPONSIBILITIES IN AEROSPACE MEDICINE**
J. R. DILLE (FAA, Civil Aeromedical Institute, Oklahoma City, OK) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 735-761. refs

The regularity and administrative duties of the FAA in regard to civil aviation are delineated. The functions of the FAA Office of Aviation Medicine are described, including the evolution and current standards for certification of pilots. The procedures followed for granting, withdrawing, or appealing the loss of certification are summarized. M.S.K.

**A87-13580*** National Aeronautics and Space Administration, Washington, D.C.
**BIOMEDICAL CHALLENGES OF SPACEFLIGHT**
A. E. NICOGOSSIAN (NASA, Div. of Life Sciences; Uniformed Services University of Health Sciences, Washington, DC) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 839-861. refs

The biomedical effects of long- and short-term spaceflight are summarized, along with training programs to offset deleterious effects. It is noted that humans do adapt well to spaceflight, although some changes are not yet well understood. Descriptions are provided of the neurovestibular reactions; cardiovascular deconditioning; motor-system disturbances; bone and mineral alterations; and changes in the blood, bodily fluid, and electrolytes which are typical after some time in space. M.S.K.

**A87-13582**
**ROLE OF AIRCRAFT IN THE TRANSMISSION OF DISEASE**
G. D. LATHROP and W. H. WOLFE (USAF, School of Aerospace Medicine, Brooks AFB, TX) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 891-903. refs

The impact of air transport on the spread of various diseases is analyzed. Examples of diseases spread among humans are penicillinase-producing neisseria gonorrhoeae, influenza, rubella and rubeola, and lassa fever. An instance of contaminated foodstuffs is clostridium perfringens (food poisoning), which may incapacitate aircrew members during flight. Vector-borne pestilences are insects which stow away in grain bags or parasites such as malaria which are transmitted in blood transfusions or spread by insects. M.S.K.

**A87-13583**
**OCCUPATIONAL MEDICAL SUPPORT TO THE AVIATION INDUSTRY**
R. T. P. DETREVILLE (USAF, Occupational and Environmental Health Laboratory, Brooks AFB, TX) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 904-940. refs

Occupational health hazards, diagnostic techniques, treatment procedures and preventive measures of concern to aviation medicine specialists are reviewed. Professional organizations and publications established to enhance occupational health and safety are identified. Physical hazards germane to the aviation industry (noise; heat and cold; vibration; and electromagnetic, ionizing, and nonionizing radiation) are discussed, along with therapeutic, preventive and protective measures for injuries related to each type of hazard. M.S.K.

**A87-13723**
**BRIGHT LIGHT RESETS THE HUMAN CIRCADIAN PACEMAKER INDEPENDENT OF THE TIMING OF THE SLEEP-WAKE CYCLE**
C. A. CZEISLER, J. S. ALLAN, J. M. RONDA, R. SANCHEZ (Brigham and Women's Hospital, Boston, MA), S. H. STROGATZ (Harvard University, Cambridge, MA) et al. Science (ISSN 0036-8075), vol. 233, Aug. 8, 1986, p. 667-671. Research supported by the U.S. Olympic Committee and Center for Design of Industrial Schedules. refs
(Contract NIH-1-R01-AG-04912-02; NIH-1-R01-HD-20174-01; NIH-5-M01-RR-00888; NIH-5-R01-GM-30719-03; AF-AFOSR-83-0309)

In connection with the hypothesis that light is a possible synchronizer of the human circadian pacemaker, the output of an elderly woman's circadian pacemaker was monitored under the following conditions: (1) before and after exposure to 4 hrs of bright light for seven consecutive evenings, and (2) before and after a control study in ordinary room light while her sleep-wake schedule and social contacts remained unchanged. Body temperature and cortisol secretion recordings indicated that exposure to bright light in the evening induced a 6-hr delay shift of her circadian pacemaker. Owing to the magnitude, rapidity, and stability of this shift, existing concepts regarding circadian phase-resetting capacity in humans may be at stake; exposure to bright light can indeed reset the human circadian pacemaker which controls daily variations in physiologic, behavioral, and cognitive function. K.K.

**A87-14660*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**EFFECT OF POSTURE ON ARTERIAL BAROREFLEX CONTROL OF HEART RATE IN HUMANS**
M. H. HARRISON, D. RITTENHOUSE, and J. E. GREENLEAF (NASA Ames Research Center, Moffett Field, CA) European Journal of Applied Physiology (ISSN 0301-5548), vol. 55, 1986, p. 367-373. refs

The effects of blood-volume redistribution induced by postural changes on baroreflex activity are investigated. The central blood volume and baroreceptor functions of ten males between 23-51 years old were examined while they were in the head-up tilt (HUT), head-down tilt (HDT), and supine positions. It is observed that during HDT at 15 deg the pulse interval over the first five cardiac cycles following neck suction onset is 51 + or - 18 ms longer, at 30 deg it is 61 + or - 20 ms longer, and at 45 deg it is 74 + or - 35 ms longer than at supine; during HUT at 15 deg the pulse interval is 25 + or - 9 ms shorter than when supine, but for the 30 and 45 deg there is no significant difference in pulse interval detected. The data reveal that posture does modify arterial baroreflex control of heart rate. I.F.

**A87-14681**
**THE HUMAN ORGANISM AND ANTIOXIDANTS [CHELOVEK I PROTIVOOKISLITEL'NYE VESHCHESTVA]**
ZH. I. ABRAMOVA and G. I. OKSENGENDLER Leningrad, Izdatel'stvo Nauka, 1985, 232 p. In Russian. refs

The interrelationships between free-radical oxidation reactions and biological antioxidation systems are described, examining these processes in humans under conditions of health and disease. The antioxidative properties of vitamins, vitamin-like compounds, selenium, and phospholipids are discussed, together with the antioxidation enzyme systems. Consideration is given to the conditions of excessive oxidation of membrane lipids and antioxidation-enzymes insufficiency encountered in humans affected by atherosclerosis, myocardial ischemia, respiratory diseases, radiation sickness, cancer, and chemical poisoning, as well as in old organisms. Special attention is given to the harmful effects of specific food components, additives, and processes used in food preparation and storage, and to the beneficial effects of antioxidant additives, such as vitamins A, E, and C. I.S.

**A87-15243**
**ACCELERATED ADAPTATION OF THE BODY TO A HOT CLIMATE [OB USKORENNOI ADAPTATSII ORGANIZMA V USLOVIIAKH ZHARKOGO KLIMATA]**
I. S. KONYSHEV and S. S. MARKEEVA Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), May 1986, p. 37-39. In Russian.

The exercise program of Novozhilov et al. (1983), designed to accelerate adaptation to a hot climate, was tested on recruits transferred from regions of cold or moderate climate to Central Asia. Energy consumption, parameters of thermal and physiological states, as well as various indices of physical and mental conditions, were evaluated before the start of the training and during the two months following the program. Five days of adaptive training resulted in marked improvements in both the physiological and mental conditions as well as in physical and mental performance levels. I.S.

**A87-15244**
**PROBLEMS OF FATIGUE AMONG FLIGHT PERSONNEL [K PROBLEME UTOMLENIIA LETNOGO SOSTAVA]**
V. A. BODROV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), May 1986, p. 40-43. In Russian.

The aspects of diagnosis and prevention of fatigue and overfatigue in flight personnel are discussed. Various forms of fatigue are classified under compensatory, acute, chronic, and overfatigue states. The causes, symptoms, both professional and functional, and the corrective measures necessary to normalize

the disturbed behavior and performance levels in each state are described. I.S.

**A87-15246**
**THE EFFECT OF ELEVATED DOSES OF VITAMIN C ON THE ADAPTATION AND WORK CAPACITY OF SEAMEN IN THE TROPICS [VLIIANIE POVYSHENNYKH DOZ VITAMINA C NA ADAPTATSIIU I RABOTOSPOSOBNOST' MORIAKOV V TROPIKAKH]**
V. V. BERDYSHEV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), June 1986, p. 47, 48. In Russian.

**A87-16061#**
**REVIEW OF BASIC MEDICAL RESULTS OF THE SALYUT-7/SOYUZ-T 8-MONTH MANNED FLIGHT**
O. G. GAZENKO, E. B. SHULZHENKO, A. I. GRIGOREV, O. IU. ATKOV, and A. D. EGOROV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 9 p. refs
(IAF PAPER 86-381)

This paper presents the results of medical investigations performed in the Salyut-7 8-month mission in which a professional physician took part. The paper contains anthropometric measurements, the results of investigating the vestibular function, cardiovascular function at rest and in response to multistep tests (with emphasis on echocardiographic measurements), and metabolic parameters and indices of the hormonal status. It also discusses the medical aspects of the extravehicular activity. The medical investigations, (with some new methods applied) provide the continuity of the methodological approaches and of the data accumulated in previous missions. Author

**A87-16062#**
**PLASMA AND URINE CATECHOLAMINE LEVELS IN COSMONAUTS DURING LONG-TERM STAY ON SPACE STATION SALJUT-7**
R. KVETNANSKY, M. VIGAS (Slovenska Akademia Vied, Ustav Experimentalnej Endokrinologie, Bratislava, Czechoslovakia), N. A. DAVYDOVA, V. B. NOSKOV, I. A. POPOVA (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) et al. IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 7 p. refs
(IAF PAPER 86-383)

Results are reported of a study of changes in catecholamine levels in the blood of cosmonauts drawn aboard Space Station Salyut-7 during a long-term mission. The special appliance used to take the samples is described, and levels of epinephrine (EPI) and norepinephrine (NE) found in plasma and urine are reported along with the levels of their metabolites in urine. The levels of EPI and NE are found to have been almost unchanged during space flight. The results suggest a low SAS activity during the late stages of a long-term space flight. C.D.

**A87-16063#**
**NEUROHUMORAL MECHANISM OF SPACE MOTION SICKNESS**
A. I. GRIGOREV, A. D. EGOROV, and I. A. NICHIPORUK (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 9 p. refs
(IAF PAPER 86-384)

This paper reviews existing hypotheses concerning the mechanisms of adaptation of the vestibular apparatus and related somatosensory systems to microgravity, with reference to flight data. Based on the theoretical concepts and experimental data accumulated in space flights, a conceptual model of the development of a functional system responsible for the termination of vestibular dysfunction and space motion sickness manifestations is presented. It is also shown that changes in the hormonal status during motion sickness induced by vestibular stimulation provide evidence that endocrine regulation of certain functions can be involved in adaptive responses. Author

**A87-16064#**
**THE EYE-MOVEMENTS DURING SLEEP - MODELLING OF THE SPACELAB-1 RESULTS**
P. A. DEQUAE and O. J. QUADENS (Antwerpen, Rijksuniversitair Centrum, Antwerp, Belgium) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 9 p. refs
(IAF PAPER 86-386)

Analysis of the serial dependency of the time intervals between the rapid eye movements (REMs) during sleep has shown that consecutive intervals tend to be of similar duration (long after long, short after short), while there is a dynamical interaction between the long and the short intervals. The Spacelab-1 experiment has confirmed the hypothesis drawn from previous studies of Petre-Quadeus and De Lee (1970) that the REMs consist of two types of events, and that the consecutive time intervals are not a random phenomenon. The process can be described by means of a finite - semi-Markov chain model of the 1st order. Entropy ratios calculated from the simulated REM process evidenced an increase in serial dependency during the first night in space and after early return to normal gravity. Author

**A87-16065#**
**VESTIBULAR FACTORS INFLUENCING THE BIOMEDICAL SUPPORT OF HUMANS IN SPACE**
B. K. LICHTENBERG (Payload Systems, Inc., Wellesley, MA) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 6 p.
(IAF PAPER 86-389)

The medical support needed to counter the long-term and short-term effects of weightlessness on the vestibular system are described. The vestibular system consists of semicircular canals and otolith organs, and provides orientation ability, to stabilize the eyes during head and body motion, and to help control posture and locomotion. The role of head motions in inducing space motion sickness is discussed. The otolith tilt-translation reinterpretation hypothesis which occurs upon reentry to the earth's atmosphere is examined. The use of artificial gravity to offset long-term effects on the vestibular system is considered. I.F.

**A87-16066#**
**CENTRAL AND REGIONAL HEMODYNAMICS IN PROLONGED SPACE FLIGHTS**
O. G. GAZENKO, E. B. SHULZHENKO, V. F. TURCHANINOVA, and A. D. EGOROV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 11 p. refs
(IAF PAPER 86-390)

Central and regional circulations at rest and during provocative tests on short-term (7 days) and long-term (65-237 days) space flights are examined. Tetrapolar rheography was utilized to measure the circulations. The data reveal that rest stroke volume, cardiac output, and heart rate decrease during short-term flights, remain unchanged during long-term flights, and increase during long-term flights following exercise. It is noted that regional circulation variations are induced by a rearrangement of the total hemodynamics of the body in microgravity. I.F.

**A87-16067#**
**CORRELATION OF MACRO AND MICRO CARDIOVASCULAR FUNCTION DURING WEIGHTLESSNESS AND SIMULATED WEIGHTLESSNESS**
P. M. HUTCHINS, T. H. MARSHBURN, T. L. SMITH, S. W. OSBORNE, C. D. LYNCH (Wake Forest University, Medical Center, Winston-Salem, NC) et al. IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 6 p. refs
(IAF PAPER 86-391)

An animal model is developed in which one can correlate microvascular and systemic cardiovascular function. The microcirculatory preparation consists of a lightweight, thermoneutral chamber implanted around intact skeletal muscle on the back of a rat. Using this technique, the preformed microvasculature of the cutaneous maximus muscle may be observed in the conscious, unanesthetized animal. Microcirculatory variables which may be

obtained include venular and arteriolar numbers, lengths and diameters, ssingle vessel flow velocities, vasomotion, capillary hematocrit anastomoses and orders of branching. Systemic hemodynamic monitoring of cardiac output by electromagnetic flowmetry, and arterial and venous pressures allows correlation of macro- and microcirculatory changes at the same time, inthe same animal. Author

**A87-16068*#** State Univ. of New York, Buffalo.
**BIOMEDICAL SUPPORT OF MAN IN SPACE**
D. R. PENDERGAST, A. J. OLSZOWKA, M. A. ROKITKA, and L. E. FARHI (New York, State University, Buffalo) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 9 p. refs
(Contract NASG-16042)
(IAF PAPER 86-393)

The effects of G and/or exercise on cardiopulmonary adjustments to stresses are studied. The control of the cardiopulmonary system is examined using simulated microgravity (recumbency, immersion, lower body positive pressure, and 6-deg head-down tilt) and increased acceleration. It is observed that at rest and during exercise in simulated zero-6 environments, the stroke volume and cardiac output are initially increased and then (after prolonged exposure) return to prezero-G levels. Cardiovascular responses to increased gravity (1, 2, and 3 G) at rest and during exercise are analyzed; a decrease in plasma volume resulting in decreases in stroke volume and cardiac output, and an increase in heart rate are detected. I.F.

**A87-16069*#** National Aeronautics and Space Administration, Washington, D.C.
**ASSESSMENT OF THE EFFICACY OF MEDICAL COUNTERMEASURES IN SPACE FLIGHT**
A. NICOGOSSIAN, F. SULZMAN (NASA, Life Sciences Div., Washington, DC), M. RADTKE (Management and Technical Services Co., Washington, DC), and M. BUNGO (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 5 p.
(IAF PAPER 86-394)

Changes in body fluids, electrolytes and muscle mass are manifestations of adaptation to space flight and readaptation to the 1-g environment. The purpose of this paper is to review the current knowledge of biomedical responses to short- and long-duration space missions and to assess the efficacy of countermeasures to 1-g deconditioning. Exercise protocols, fluid hydration, dietary and potential pharmacologic measures are evaluated, and directions for future research activities are recommended. Author

**A87-16142#**
**SPACELAB-D1 DATA TREATMENT - OTOLITHO-EYES INTERACTIONS**
Y. MATSAKIS (CNRS, Laboratoire de Neurophysiologie Sensorielle, Paris, France) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 14 p. refs
(IAF PAPER ST-86-12)

The effect of gravity on the optokinetic nystagmus (OKN) is investigated. Monocular optokinetic simulation was produced by a stimulator, otolithic stimulation was achieved by lying the subject on a cart, and eye-movement measurements were obtained by electrooculography. The slow phase velocity which is utilized to study nystagmus is evaluated. The asymmetry in the vertical plane of OKN gain and the amplitudes of saccades and slow phases are examined. I.F.

**A87-16146**
**TRACKING EYE MOVEMENTS IN THE CASE OF CERTAIN TYPES OF STROBOSCOPIC STIMULATION [PROSLEZHIVAIUSHCHIE DVIZHENIIA GLAZ PRI NEKOTORYKH VIDAKH STROBOSKOPICHESKOI STIMULIATSII]**
**STIMULIATSII]**
D. G. LEBEDEV and N. S. SUROVICHEVA (AN SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR) Biofizika (ISSN 0006-3029), vol. 31, July-Aug. 1986, p. 672-675. In Russian.

The characteristics of a subject's eye movements during the tracking of a moving sequence of stationary images were used to assess the subject's reaction to stroboscopic stimulation. The response of two types of stimulation was studied. In the first case, the extreme stationary positions obtained from real forward-backward horizontal motion of a small lighted circle were used, while, in the second case, intermediate stationary positions obtained from the forward motion of the image in plane perpendicular to the line of vision were presented. The eye movements indicated perception of the sequence as a smooth motion only when the LEDs representing the image were successively lighted in the upward direction. I.S.

**A87-16395**
**G-LOC IS DIFFERENT**
M. GAINES Flight International (ISSN 0015-3710), vol. 130, Aug. 30, 1986, p. 98-101.

The problem of G-loc, or G-induced loss of pilot consciousness, highly agile fighter aircraft is discussed. G-loc is related to blood flow and hypoxia; if, during high-G maneuvers, the pilot's blood flow diminishes to the point where oxygen delivery to the brain ceases, it takes only an additional 5-6 sec (during which the brain exhausts its oxygen reserve) for unconsciousness to result. Attention is given to a novel 'articulated' ejection seat which increases reclination angle with G-loading without affecting the pilot's field-of-view. O.C.

**N87-11814** Joint Publications Research Service, Arlington, Va.
**INTERVIEW ON MEDICAL PROGRAM OF 237-DAY FLIGHT**
O. Y. ATKOV, O. G. GAZENKO, and Y. I. CHAZOV *In its* USSR Report: Space (JPRS-USP-86-005) p 142 152 12 Sep. 1986 Transl. into ENGLISH from Zemlya i Veselennaya (Moscow, USSR), no. 5, Sep. - Oct. 1985 p 49-56
Avail: NTIS HC A11/MF A01

The crew of Mayaki (beacons), L. D. Kizim, V. A. Solovyev, and O. Yu. Atkov spent 237 days working on board the Salyut-7/Soyuz orbital scientific research complex conducting an intensive program of medical and biological research. The execution of the program, some of the results of the research, and experiments conducted were discussed. B.G.

**N87-12107#** Joint Publications Research Service, Arlington, Va.
**RADIO-FREQUENCY ELECTROMAGNETIC RADIATION: RADIATION SAFETY**
B. I. DAVYDOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS -USB-86-004) p 15 - 27 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, No. 2, Mar. - Apr. 1986 p 15-24
Avail: NTIS HC A07/MF A01

Existing safety standards for electromagnetic radiation in the radio frequency range, including microwave radiation, adopted in the USSR, Great Britain, Poland, Czechoslovakia, USA, Canada, FRG and recommended by IRPA/INIRC are described. It is proposed to use the value 0.4 W/kg as the basic value of an absorbed dose rate which corresponds to the energy flux density 100 W/m(2) for frequencies over 2 GHz. The concepts of an effective dose rate and effective dose are discussed. Various questions of how to provide safety of those working with electromagnetic radiations are considered. Author

**N87-12108#** Joint Publications Research Service, Arlington, Va.
**MATHEMATICAL MODELS OF FLUID-ELECTROLYTE METABOLISM**
A. I. GRIGORYEV and V. V. VERIGO *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS -USB-86-004) p 28 - 32 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), Vol. 20, No. 2, Mar. - Apr. 1986 p 24-27
Avail: NTIS HC A07/MF A01

Mathematical modeling of fluid-electrolyte metabolism and fluid homeostasis in real and simulated microgravity is discussed. At the first stage physiological reactions to provocative tests were simulated. The assumptions made yielded satisfactory results, particularly with respect to the excretion of the most important electrolytes in different time intervals of bed rest and recovery. The development of models of fluid homeostasis, taking into consideration tissue elasticity and plasticity and fluid buffering capacity, is discussed. Author

**N87-12109#** Joint Publications Research Service, Arlington, Va.
**PRELIMINARY RESULTS OF MEDICAL INVESTIGATIONS DURING 5-MONTH SPACEFLIGHT ABOARD SALYUT-7-SOYUZ-T ORBITAL COMPLEX**
Y. I. VOROBYEV, O. G. GAZENKO, Y. B. SHULZHENKO, A. I. GRIGORYEV, A. S. BARER, A. D. YEGOROV, and I. A. SKIBA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 33 - 42 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), Vol. 20, No. 2, Mar. - Apr. 1986, p 27-34
Avail: NTIS HC A07/MF A01

The medical examinations carried out in the 150-day flight were a continuation of previous studies in terms of the approaches and methods used. The novel approach was a biochemical study of body fluids collected during flight. An important place was occupied by medical monitoring and support performed during extravehicular activity (EVA). The medical results of the 150-day flight were consistent with the data obtained during previous spaceflights of similar duration. The health condition and work capacity of the crewmembers throughout the flight (including two EVA events) were good. The changes seen during and after flight were adaptive and disappeared after a relatively short readaptation period.
Author

**N87-12111#** Joint Publications Research Service, Arlington, Va.
**VENOUS PRESSURE IN JUGULAR VEIN SYSTEM AND EFFECTIVENESS OF BLOOD RETURN TO RIGHT HEART DURING 120-DAY HEAD-DOWN TILT**
V. G. DOROSHEV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 49 - 53 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), Vol. 20, No. 2, Mar. - Apr. 1986 p 38-41
Avail: NTIS HC A07/MF A01

Study of time-course variations of venous pressure in the jugular veins can be used to identify individual adaptation to prolonged head-down tilt. The method of measuring blood return to the right heart presented in this article can be employed to evaluate the efficacy of countermeasures during head-down tilt and to predict orthostatic tolerance after it. Author

**N87-12112#** Joint Publications Research Service, Arlington, Va.
**HUMAN HEART FUNCTION IN EARLY HOURS AND DAYS OF HEAD-DOWN TILT (ECHOCARDIOGRAPHIC DATA)**
V. V. BYSTROV, A. F. ZHERNAVKOV, and A. A. SAVILOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 54 - 60 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 42-46
Avail: NTIS HC A07/MF A01

Six healthy volunteers (aged 19 to 24) were exposed to head-down tilt (at 10 deg) for 7 days. The study revealed phasic changes of intracardiac circulation and the pump function which were not accompanied by contractility disorders. On the whole, the changes represented a manifestation of cardiovascular adaptation to hemodynamic shifts that are typical of this type of simulated weightlessness. The echocardiographic parameters varied similarly during the head-down tilt test and the joint Soviet-French experiment onboard Salyut-7. Author

**N87-12113#** Joint Publications Research Service, Arlington, Va.
**HUMAN BLOOD FREE AMINO ACIDS AT EARLY STAGE OF HEAD-DOWN TILT**
I. G. POPOV and A. A. LATSKEVICH *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 61 - 70 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 46-54
Avail: NTIS HC A07/MF A01

The concentration of 17 free amino acids in plasma of 6 test subjects, aged 20, who were for 7 days exposed to head-down tilt and remained on a controlled diet, was measured. The study revealed an increase in the concentration of most amino acids by the end of day 3 and all amino acids by the end of day 7. This indicates that the diet used is a good source of the required amino acids and that there are processes which facilitate an increase of amino acids during the first days of exposure. The concentration of most amino acids returned to the baseline level on the 7th recovery day. Author

**N87-12114#** Joint Publications Research Service, Arlington, Va.
**BLOOD SERUM ENZYME ACTIVITY IN HEALTHY MAN WITH SIMULATION OF EFFECTS OF WEIGHTLESSNESS**
I. A. POPOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS -USB-86-004) p 71 - 75 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 54-58
Avail: NTIS HC A07/MF A01

The enzymic activity of blood of healthy male volunteers was examined during 8-day bed rest in the horizontal and head-down (-6 deg) position, water immersion up to the neck and 6-hour head-down tilt (-15 deg). Alkaline phosphatase, cholinesterase (CE), leucine arylamidase (LA), glutamate dehydrogenase (GDH) and gamma-glutamyl transpeptidase (GGTP) were measured. During horizontal bed rest the activities of all the enzymes, except for GDH, decreased in a moderate degree which was very distinct at an early stage of exposure. The activity of GDH and CE decreased significantly after the exposure. The enzymic activity tended to decline during head-down tilt at -6 deg. The LA and GGTP activity decreased to a greater extent, being statistically significant during head-down tilt at -6 deg and in the recovery period. The enzymic activity insignificantly increased during water immersion and 6-hour head-down tilt at -15 deg, remaining in some cases elevated during 5 days after exposure. The lower activity of enzymes (which was significant for some of them) during horizontal and antiorthostatic bed rest was primarily associated with diminished motor activity, whereas increased enzymic activity was related to the gravity-induced blood shift to the intrathoracic area. Author

**N87-12115#** Joint Publications Research Service, Arlington, Va.
**PARAMECIUM TEST FOR TOXIC SUBSTANCES IN HUMAN BLOOD DURING SIMULATED WEIGHTLESSNESS**
V. I. LAVROV, I. B. GONCHAROV, A. F. DAVYDKIN, A. P. IVANOV, A. N. ROMANOV, and V. F. IVCHENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 76 - 79 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 58-60
Avail: NTIS HC A07/MF A01

The paramecium test was used to measure the buildup of toxic substances in the healthy man exposed to simulated weightlessness. The most distinct changes were seen on bed rest days 3 and 7-8 in all test subjects (41 subjects). After bed rest day 8 the parameter reached a plateau, the toxicity level stopped increasing, but the paramecium test time remained shorter than normal. It can therefore be suggested that the prognosis of any disease that may develop in this situation will be worse. In view of this it is important to improve the prophylaxis and treatment of endogenous and exogenous intoxications during spaceflight and to provide active detoxication based on the purification of biological fluids by sorption. Author

**N87-12123#** Joint Publications Research Service, Arlington, Va.
**MATHEMATICAL MODEL OF CUPULOENDOLYMPHATIC SYSTEM WITH DIFFERENT CUPULA AND ENDOLYMPH DENSITIES**
A. V. KONDRACHUK and S. P. SIRENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 120 - 130 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 86-92
Avail: NTIS HC A07/MF A01

A mathematical model of time-course variations of the cupuloendolymphatic system (semicircular canals) is described which can be described by the Stein-hauzen phenomenological equation for the case of a unidimensional toroid, assuming that the densities of the cupula and endolymph are identical. If the densities are different, the time-course variations of the cupuloendolymphatic system may aggravate and manifest at the powered stages of space flight. Author

**N87-12126#** Joint Publications Research Service, Arlington, Va.
**CAPABILITIES OF ULTRASONIC METHODS OF EVALUATING HEMODYNAMICS OF CARDIOCEREBROVASCULAR SYSTEM**
L. G. SIMONOV and M. S. GELFENBEYN *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 7-19 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 8-16
Avail: NTIS HC A08/MF A01

Ultrasonic methods used at present to evaluate hemodynamic parameters of different organs and velocity characteristics of circulating blood are reviewed. The ultrasonic methods make it possible not only to diagnose different vascular lesions but also to investigate the effects of unusual environmental parameters on the human body. A classification is given of the existing and advanced procedures based on ultrasonic location when applied to determine hemodynamic characteristics of the cardiocerebrovascular system. A description is presented of ultrasonic methods used in studying the heart (velocity characteristics of the circulation of cardioelements), brain (pulse oscillations of vessel blood filling in the cranial cavity) and large arteries (blood filling and blood flow velocity). Author

**N87-12130#** Joint Publications Research Service, Arlington, Va.
**TOLERANCE TO +GZ ACCELERATIONS OF INDIVIDUALS OF DIFFERENT AGES OTHER THAN PILOTS**
A. R. KOTOVSKAYA, I. F. VIL-VILYAMS, and V. Y. LUKYANYUK *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 35-40 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 25-29
Avail: NTIS HC A08/MF A01

Ninety-six healthy nonpilots, ages 21 to 50 years, were esposed to 228 rotations on a 7.25 m arm human centrifuge. The study demonstrated aged related changes in +Gz tolerance of 3 to 5 G (for 30 s). The subjects at the age 31 to 40 years showed the highest tolerance while the subjects at the age 21 to 35 and 46 to 50 years the lowest tolerance. Young subjects (21 to 25 years old) often developed an asthenic type of the systolic pressure reaction in the ear lobe and visual disorders whereas older subjects (46 to 50 years old) displayed cardiac arrhythmias, lower heart rate and delayed recovery of blood pressure after exposure. It was also found that 60 to 80% subjects aged over 40 well tolerated acceleration of up to 5 G and therefore can be viewed as potential candidates for cosmonauts. Author

**N87-12132#** Joint Publications Research Service, Arlington, Va.
**USE OF GAS MIXTURES WITH HIGH OXYGEN AND CARBON DIOXIDE CONTENT TO NORMALIZE EXTERNAL RESPIRATION AND BLOOD ACID-BASE EQUILIBRIUM IN PRESENCE OF MUSCLE FATIGUE**
N. A. AGADZHANYAN, N. P. KRASNIKOV, and S. I. NAYDICH *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 45-51 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 32-37
Avail: NTIS HC A08/MF A01

Use of gas mixtures containing 1% CO2 + 35% O2 and 35% O2 in the air during a passive rest after a high workload led to the neutralization of acid metabolites and recovery of acid-base equilibrium. This was due to a greater oxygen consumption, retention of metabolic CO2 in plasma and accumulation of endogenous CO2 in body fluids. Author

**N87-12133#** Joint Publications Research Service, Arlington, Va.
**MATHEMATICAL MODEL OF HUMAN KINEMATIC REACTIONS TO IMPACTS**
I. F. OBRAZTSOV, Y. G. KONAKHEVICH, V. A. LYAPIN, and A. V. MARYIN *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 52-58 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 37-41
Avail: NTIS HC A08/MF A01

The problem of selecting the structure of a mathematical model that describes the kinematic reactions of the human body during traffic accidents is studied. A calculation procedure and a program that allow selection of a structure (up to 17 elements) without deriving repeatedly equations of motion as well as automatic recalculation of all inertia and size parameters is presented. Author

**N87-12134#** Joint Publications Research Service, Arlington, Va.
**USE OF CENTRAL ELECTROANALGESIA FOR FUNCTIONAL RECOVERY FROM MOTION SICKNESS**
A. S. NEKHAYEV, V. D. VLASOV, and V. V. IVANOV *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 59-63 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no, 4, Jul. - Aug. 1986 p 42-44
Avail: NTIS HC A08/MF A01

Central electroanalgesia (CEAN) is a technique that involves application of pulsating current to the central nervous system in order to enhance its tonicity recover autonomic equilibrium and to reduce parasympathetic cardiovascular reactions. In two experimental runs in which 9 volunteers participated the efficacy of CEAN is preventing motion sickness symptoms produced by

Markaryan's test was studied. After two rotations repeated with a one-hour interval vestibular reactions persisted for 7 to 10 hours. CEAN had a positive effect: after a one-hour CEAN session applied between two rotations the tolerance time of the second rotation increased on an average by 76%. An additional exposure to CEAN after rotation eliminated almost completely the adverse effects of rotation and made effective the postrotation work. Due to CEAN parasympathetic reactions of the cardiovascular system typical of the postrotation recovery period were indistinct. These data suggest that CEAN is an effective method to be used to help a rapid recovery of the functional state of the human body during motion sickness. Author

**N87-12136#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF COAMIDE AND FOLICOBALAMIN ON ERYTHROPOIESIS UNDER NORMAL LIVING CONDITIONS AND DURING ANTIORTHOSTATIC HYPOKINESIA**
R. K. KISELEV, A. M. CHAYKA, and V. I. LEGENKOV *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 70-75 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 48-53
Avail: NTIS HC A08/MF A01

The study was performed on 41 healthy men, aged 19 to 40, who led a normal life or were exposed to short-term or long-term head-down tilts. The effectiveness of hemostimulants was determined with respect to hemoglobin, red blood cells or reticulocyte counts. Folicobalamine and coamide administration in therapeutic doses increased hemoglobin and reticulocyte blood levels in the ambulant subjects or those exposed to a 7-day head-down tilt. The effect was stable and persisted for 2 to 3 weeks after which the blood parameters returned to the pretest level. Folicobalamine administered at the final stage of 50-day head-down tilt facilitated partial recovery of hemoglobin during the study (which is very important) and rapid recovery after it. The objective and subjective tolerance of the drugs was good. It is therefore concluded that folicobalamine should be taken at the final stage of head-down tilt or spaceflight to alleviate readaptation to the normal environment. Author

**N87-12137#** Joint Publications Research Service, Arlington, Va.
**HUMAN TOLERANCE TO HIGH-INTENSITY CONTACT HEAT ON INTEGUMENTAL SURFACE**
A. P. KOZLOVSKIY and Y. A. LUSHCHIKOV *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 76-79 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 53-55
Avail: NTIS HC A08/MF A01

Significant heating of the thermoprotective suit leads to a rapid growth of the temperature of its inner layer which is in contact with the human body. Prediction of the allowable time of high temperature exposure is important when evaluating safety parameters. The results of measuring the time during which the direct contact between cotton and wool clothes and the forearm skin can be tolerated is presented. The results describe the time and amplitude parameters of the maximally allowable heat exposure. They can be used in testing prototypes of the protective equipment and in selecting their thermophysical characteristics as applied to an extreme environment. Author

**N87-12142#** Joint Publications Research Service, Arlington, Va.
**CENTRAL HEMODYNAMIC PARAMETERS DURING DRY IMMERSION OF PATIENTS WITH BORDERLINE HYPERTENSION**
V. I. FOMICHEV and T. N. ZENG *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 106-108 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. Aug. 1986 p 73-74
Avail: NTIS HC A08/MF A01

Central hemodynamics parameters were measured in eight men, aged 45 to 55 years, with boundary arterial hypertension using a Soviet-made instrument and a dye (wofaverdin). Measurements were taken before dry immersion, 24 and 120 hours after the onset of dry immersion, and during recovery. Individual variations in the parameters of central hemodynamics to dry immersion were detected. Author

**N87-12143#** Joint Publications Research Service, Arlington, Va.
**RELATIONSHIP BETWEEN CONSTITUTIONAL DISTINCTIONS AND FUNCTIONAL CHARACTERISTICS OF THE CARDIOVASCULAR SYSTEM OF HEALTHY SUBJECTS AND PATIENTS WITH HYPERTENSION IN CLINOSTATIC AND ORTHOSTATIC POSITION**
G. S. BELKANIYA and V. A. DARTSMELIYA *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 109-115 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 75-78
Avail: NTIS HC A08/MF A01

The results are described of a correlation analysis of the relationship between the basic parameters of central hemodynamics (arterial pressure, cardiac output, stroke volume, peripheral vascular resistance) and primary somatometric characteristics carried out in 90 healthy subjects and 62 patients with arterial hypertension in the clinostatic and orthostatic position. In the orthostatic position the correlation between somatometric characteristics and hemodynamic parameters increased significantly in comparison to the clinostatic position. It is assumed that orthostatic characteristics of circulation are an adequate phenotypical manifestation of the human genotype as a biped living being. Author

**N87-12144#** Joint Publications Research Service, Arlington, Va.
**SPECIALIZED EQUIPMENT FOR MAGNETIC RECORDING OF PHYSIOLOGICAL DATA FOR EXPERIMENTS ABOARD BIOSATELLITES**
V. S. MAGEDOV and Y. S. KORYAKOV *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 116-119 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 79-80
Avail: NTIS HC A08/MF A01

Large volumes of scientific information have to be recorded when conducting automated phyiological studies in biosatellites. The specificity of conditions of such investigations imposes size and weight restrictions on onboard equipment and precludes the possibility of servicing it during flight. The existing onboard magnetic recorders do not have a long enough continuous running time to record physiological data, and for this reason, it has become necessary to develop specialized magnetic recording equipment (MRE) that would service the purposes and conditions of long term experiments aboard biosatellites. Such equipment must provide for many hours of continuous recording of physiological information within a specified band of recorded frequencies, and limited size and supply of magnetic tapes. The main theoretical premises that enabled the development of a specialized MRE for continuous, long term recording of phsiological signals on magnetic tape. The method of frequency-modulated recording (FMR) was used in this equipment, since it permits maximum density of signal recording on the tape. Author

**N87-12146#** Joint Publications Research Service, Arlington, Va.
**ENDOCRINE STATUS OF COSMONAUTS FOLLOWING LONG-TERM SPACE MISSIONS**
N. F. KALITA and R. A. TIGRANYAN *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 125-128 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 84-86
Avail: NTIS HC A08/MF A01

Spaceflights are associated with a set of stress factors that affect many systems of the body, in particular the endocrine system. The studies conducted to date yielded some information concerning the endocrine status of cosmonauts during and after spaceflights.

At the same time, in spite of good physical training and conditioning of cosmonauts, individual changes may occur in the reactions of each of them in response to spaceflight factors, which are related to different characteristics, including psychological and age-related ones. For this reason, it is rather important to study the endocrine status of cosmonauts, since this would deepen our understanding of changes that take place in the body. The levels of a number of hormonal and biologically active compounds were examined in cosmonauts who had participated in long term (73 to 185 days) spaceflights and to demonstrate stressor reactions in the acute period of readaptation to Earth's gravity. Author

**N87-12148#** Joint Publications Research Service, Arlington, Va.
**PROBLEMS OF AVIATION AND SPACE MEDICINE, BIOLOGY AND PSYCHOLOGY DISCUSSED AT FIFTEENTH GAGARIN SCIENTIFIC LECTURES**
G. S. RATNER *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 132-144 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 88-94 Avail: NTIS HC A08/MF A01

The 15th Gagarin Scientific Lecture Series took place from 1 to 10 April 1985. At the first session, one of the papers was delivered by Prof A. D. Yegorov under the title of Biomedical Problems of Long-Term Spaceflights. It dealt with analysis of biological mechanisms of effects of weightlessness and other spaceflight factors on man on the basis of summarization of the results of investigations and experience with spaceflights. The demonstrated patterns and recommendations developed on their basis made it possible to achieve records with regard to duration of human active performance in space. Two papers were delivered at the general meeting of this section, Problems of Aviation and Space Medicine and Psychology. USSR Cosmonaut-Pilot O. Yu. Atkov, candidate of medical sciences, told about the studies he conducted during the 237-day flight aboard the Salyut-7 orbital station. In all, more than 300 biomedical experiments referable to 34 projects were conducted. Author

**N87-12149#** Naval Aerospace Medical Research Lab., Pensacola, Fla.
**TEMPORAL TUNING EFFECTS IN THE VISUALLY EVOKED RESPONSE M. S. Thesis - Houston U., Tex. Final Report**
R. E. PARKANSKY (Houston Univ., Tex.) Aug. 1985 145 p
(AD-A168219; NAMRL-MONOGRAPH-32) Avail: NTIS HC A07/MF A01 CSCL 06P

Electrophysical and psychophysical evidence indicates that there are channels in the visual system that are more sensitive to either spatially-structured stimuli or luminance-modulated stimuli. This sensitivity or tuning was demonstrated by having the largest or optimum response produced by either spatially-structured or luminance-modulated stimuli. The purpose of this study is to determine if the steady-state visually evoked response to three stimuli is significantly and predictably altered by the choice of temporal frequency. It is expected that, for each observer, there will be an optimal temporal frequency or frequencies corresponding to a given pattern size, contrast and intensity. Also, this relationship will likely vary between individuals, but will remain relatively constant for a given observer over time. Three subjects were each presented with three stimuli. These stimuli were: (1) a square pattern of small checks where each check subtended 15 minutes of arc; (2) a square pattern of large checks where each check subtended 57 minutes of arc; and, (3) an unpatterned square stimul us. The check stimuli were presented in such a manner that alternate checks were 180 deg out of phase with each other and the unpatterned stimulus was presented as a luminance charge. GRA

**N87-12150#** Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
**RELATIONSHIP OF FIELD TESTS TO LABORATORY TESTS OF MUSCULAR STRENGTH AND ENDURANCE, AND MAXIMAL AEROBIC POWER**
D. G. BELL and I. JACOBS Apr. 1986 22 p
(AD-A168260; DCIEM-86-R-22) Avail: NTIS HC A02/MF A01 CSCL 06R

This study evaluates the relationship between established laboratory tests of selected physical fitness components and a field tests battery (EXPRES) presently used annually to evaluate the physical fitness of Canadian Force personnel. Muscular strength, muscular endurance and maximal aerobic power were evaluated in 33 male personnel. The EXPRES test battery included isometric handgrip dynamometry as an indicator of strength, pushups and situps as indicators of muscular endurance, and maximal aerobic power was predicted from the heart rate response to a submaximal step-test. The laboratory measures of strength consisted of maximal isokinetic and isometric contractions of the body's large muscle groups performed on a computerized strength evaluation system. Maximal power generated during a 30 s cycle ergometer sprint (Wingate Test) was used as the laboratory measure of muscular endurance. Maximal aerobic power was measured directly during exhaustive cycle exercise. When correlation coefficients were calculated for the various field and laboratory tests, the values range from 0.46 - 0.67 for muscular strength, 0.49 - o.58 for endurance, and 0.65 for maximal aerobic power. All correlation coefficients were statistically significant (pless than 0.01), but the standard errors about the regression lines were quite large. GRA

**N87-12151#** Letterman Army Inst. of Research, San Francisco, Calif.
**OCULAR HAZARDS ASSOCIATED WITH LASER EXPOSURE Interim Report, Jan. - Dec. 1985**
H. ZWICK and J. ALLEN Mar. 1986 18 p
(AD-A168506; LAIR-86-60) Avail: NTIS HC A02/MF A01 CSCL 06R

In our experiments we have investigated the effects of low-level laser exposure on spatial vision measured in animal subjects. In monkeys trained to report minimal visual resolution as well as constrast thresholds for varying size targets (constrast sensitivity) we found that small spot (50 micron) exposure can significantly alter these measures of spatial vision. Such effects have both medical and tactical implications. Because such levels of exposure may produce prolonged change in spatial visual function even at levels below the maximum permissible exposure (MPE) level, the military medical community is faced with a dilemma that repeated exposure could result in considerable tissue destruction in non-regenerating neural retinal tissue long before any significant change in visual function is measurable. Long-term measurements of animal spatial vision has revealed subtle but significant evidence of visual function loss that is associated with low-level laser exposure to the fovea. Such effects may cause sufficient alterations to spatial vision to produce momentary distractions in co mplex military performance, such as target tracking. These potential hazards to human vision and visual performance have motivated development of human visual protective materials to counter low-level, multi-spectral laser exposure, as well as the development of new troop training strategies that should provide countermeasures through improved training scenarios. GRA

**N87-12152#** Army Research Inst. of Environmental Medicine, Natick, Mass.
**SLOWLY-DEVELOPING MODIFICATIONS IN CUTANEOUS CIRCULATORY CONTROL**
C. B. WENGER May 1986 11 p
(AD-A168702; USARIEM-M31/86) Avail: NTIS HC A02/MF A01 CSCL 06P

The factors discussed below affect skin blood flow (SkBF) through nonthermal mechanisms. In considering them, however, it is necessary to account for thermoregulatory effects which may operate at the same time, because of the dominant role of the

latter in the control of the SkBF. Therefore, these non-thermal factors will be approaches in terms of how they modify the relation of forearm blood flow (ABF), probably the most widely used index of SkBF, to the thermoregulatory signal, as represented by esophageal temperature (T sub es) when skin temperature is not changing. Slowly developing modifications may have time courses ranging from minutes (e.g., transcapillary fluid shifts, peripheral pooling of blood) through hours (e.g., circadian rhythms, dehydration) to weeks ( e.g., exercise training, heat acclimation, menstrual cycle). Most of these factors change the threshold for vasodilation, but some also change the slope of the ABF:T sub es relation. Several of the factors that change the threshold for vasodilation likewise change thresholds for other thermoregulatory responses, such as sweating. If the operation of the thermoregulatory system as a whole is shifted to a different temperature level, such a shift represents a change in thermoregulatory set-point. Fever was probably the first condition to be recognized as resulting from a change in thermoregulatory set-point, and as expected, the threshold for forearm vascodilation is elevated in fever. GRA

**N87-12153#** Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

**BIOLOGICAL RHYTHMS AND ROTATING SHIFT WORK: SOME CONSIDERATIONS FOR AIR TRAFFIC CONTROLLERS AND MANAGERS Final Report**

C. E. MELTON and R. S. BARTANOWICZ Jan. 1986 12 p
(AD-A168742; DOT/FAA/AM-86/2) Avail: NTIS HC A02/MF A01 CSCL 06P

This report is a general review of some of the current themes and practices regarding rotating shift work intended to inform air traffic controllers, technicians, and managers of these issues, and to offer some ideas that may be helpful in dealing with difficulties in this area. There are no pat or easy single solutions to the problems of every employee. Managers are always faced with difficult decisions, and shift work is one of the most difficult because it can become an emotionally charged issue. GRA

**N87-12154#** Army Research Inst. of Environmental Medicine, Natick, Mass.

**HUMAN EXERCISE AND HEAT EXCHANGE IN THERMAL ENVIRONMENTS**

M. N. SAWKA, A. J. YOUNG, C. B. WENGER, and K. B. PANDOLF May 1986 12 p
(AD-A168746; USARIEM-M-35/86) Avail: NTIS HC A02/MF A01 CSCL 06S

The thermal-physiological strain imposed by an exercise-environmental condition depends upon the individual's metabolic rate and the capacity for heat exchange with the environment. In hot environments, applied physiology issues concerning the capacity of humans to thermoregulate include the influence of an individual's acclimation state, aerobic fitness, hydration level, and circadian rhythms as well as the type of physical exercise performed. In cold environments, issues include further investigation of human cold acclimation, as well as the influence of body fat and exercise type on the resistance to hypothermia during cold water exposure. Emerging instrument/engineering technologies for the measurement of core temperature, sweating rate, skin blood flow and shivering offer promise for studying physiological responses in different environments. GRA

**N87-12155#** Florida Univ., Gainesville.

**STRESS AND NEUROENDOCRINE REGULATION OF IMMUNE RESPONSES Annual Report, 30 Jun. 1985 - 31 Mar. 1986**

A. J. DUNN and N. R. HALL 20 Apr. 1986 15 p
(Contract N00014-85-K-0300; RR0-4108)
(AD-A168768) Avail: NTIS HC A02/MF A01 CSCL 06S

Work is currently in progress on establishing a consistently reproducible paradigm for stress-induced immunosuppression in the mouse. Preliminary data indicate decreases in spleen and thymus weights, and in T-cell responsivity to mitogens following brief periods of restraint or electric footshock, especially with repeated treatments. Other preliminary data indicate that brain dopaminergic and noradrenergic systems respond acutely to the injection of a viral antigen (NDV), in addition to the previously reported increases in plasma corticosterone. The cerebral responses are particularly evident in hypophysectomized mice, in which we do not observe substantial increases in plasma corticosterone. We have not observed consistent changes in cerebral amines following injection of activated spleen cell supernatants, or thymosin fraction V (Tf-5). In a collaborative study, we found that Tf-5 does not directly alter corticosterone binding to its brain receptors, thus ruling out one potential mechanism for the anti-stress properties of Tf-5. GRA

**N87-12156#** California Univ., Berkeley. Lawrence Berkeley Lab.

**CARBON DIOXIDE INCREASE AND HUMAN HEALTH: DATA AND RESEARCH REQUIREMENTS FOR DETERMINING CONSEQUENCES (INCLUDING A BIBLIOGRAPHY FOR ADDITIONAL READING)**

M. R. WHITE, I. HERTZ-PICCIOTTO, and M. E. JOHNSTON May 1986 139 p
(Contract DE-AC03-76SF-00098)
(DE86-012760; LBL-21625) Avail: NTIS HC A07/MF A01

The purpose of this study was to determine the data and information needed to eventually define the consequences on human health of elevated CO2. To attain this purpose, current knowledge of the effects of climate and weather on human health was reviewed. An increase in atmospheric CO2 is predicted to have several effects which may have an influence, directly and indirectly, on human health. These include climate change, changes in vegetation (due to changes in fertilization and water-use efficiency of plants), changes in ocean chemistry (due to increases in dissolved CO2), and possibly slight changes in human biochemistry and physiology (due to breathing air with elevated concentrations of CO2). This report describes some of the ways that climate and weather influence human health, some of the modifying factors, and the information and data needed to initiate studies of the possible consequences of elevated atmospheric CO2 on human health. DOE

**N87-12157#** Health Effects Research Lab., Research Triangle Park, N. C.

**RADIOFREQUENCY RADIATION: ACTIVITIES AND ISSUES**

J. A. ELDER Jul. 1986 12 p
(PB86-217155; EPA/600/D-85/135) Avail: NTIS HC A02/MF A01 CSCL 06R

The question of human safety relative to exposure to RF radiation obviously predates the first ANSI guide-line established in 1966, but no enforceable Federal standards or guidelines exist for RF radiation exposure; the ANSI guideline which was revised in 1982 is voluntary or advisory. EPA has been pursuing the goal of promulgating guidance to control exposure of the public to RF radiation. In support of the regulatory activity, a report entitled Biological Effects of Radiofrequency Radiation was published in September 1984. The conclusion of the report was that biological effects occurred at a dose rate of about 1 W/kg, and that these effects may be significant under certain environmental conditions. Examples of adverse biological effects that occur in laboratory animals at dose rates of 2-6 W/kg are death and temporary male sterility. These effects as well as the behavioral changes that are the basis for the ANSI guideline can be attributed to heat stress in animals caused by absorption of RF energy. Some experimental results occur at very low exposure conditions that cause no significant thermal input; these responses are called non-thermal effects. The mechanisms of interaction of non-thermal effects and their physiological significance are a subject of scientific debate. RF radiation research budget reductions, which reflect changes in funding priorities, will leave unresolved many of the questions concerning the biological effects of RF radiation and their possible health implications. GRA

**N87-12158#** Health Effects Research Lab., Research Triangle Park, N. C.
**EFFECTS OF MICROWAVE RADIATION ON THE BLOOD-BRAIN BARRIER**
T. R. WARD, J. S. ALI, and M. D. LONG May 1986 11 p
(PB86-213220; EPA/600/D-86/113) Avail: NTIS HC A02/MF A01 CSCL 06R

An attempt is made to repeat a portion of the study by Oscar and Hawkins in which pulsed and continuous wave microwave radiation increased permeation of labeled tracers through the blood-brain barrier. At the SAR used (0.1 W/kg) the calculated average brain temperature rise in less than 0.1c. The authors found no changes in permeation. However, there were differences in experimental conditions, including type of tracers, frequency and microwave field configuration. It is possible but unlikely that one of these differences is responsible for the apparent discrepancy in results. GRA

**N87-12159** Marquette Univ., Milwaukee, Wis.
**SKELETAL MUSCLE FATIGUE: PHYSIOLOGICAL AND BIOCHEMICAL STUDIES Ph.D. Thesis**
J. M. METZGER 1985 187 p
Avail: Univ. Microfilms Order No. DA8604956

In the context of this dissertation fatigue can be described as a transient decrease in muscle force generating capacity as a result of sufficiently intense or prolonged work. The diaphragm muscle was utilized as a model to study skeletal muscle physiology and biochemistry during fatiguing work. To address the question of diaphragm adaptability animals were exercise-trained on a treadmill using a high-intensity running protocol. Following training muscle glycogen content was elevated in the diaphragm. Despite this glycogen supercompensation, the fatiguability of the diaphragm was unchanged post training. During fatigue a high correlation existed between declining force and rising lactate. In order to accurately assess the role of acidosis on contractile function glass microelectrodes were constructed and used to determine pH alterations following fatiguing stimulation. It was demonstrated for the first time in mammalian muscles, using the direct microelectrode technique, that pH declines during intense contractile activity and returns to resting levels in a time course similar to the recovery of peak force. Moreover, it was demonstrated that, in contrast to previous reports, the decline in force during fatigue is not related to perturbation in membrane electrical properties. Finally, it was observed that following high and low frequency stimulation force production recovered faster at low compared to high frequencies. Following stimulation, fusion at low frequencies increased due to fatigue induced prolongation of twitch duration. The net result being a leftward shift in the force-freqeuncy relationship thus augmenting force at low relative to high frequencies. Dissert. Abstr.

**N87-13125*** National Aeronautics and Space Administration, Washington, D.C.
**AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES**
Nov. 1986 53 p
(NASA-SP-7011(290); NAS 1.21:7011(290)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 125 reports, articles and other documents introduced into the NASA scientific and technical information system in October 1986. M.G.

**N87-13126#** Anco Engineers, Inc., Culver City, Calif.
**RADIOGRAPHIC DETERMINATION OF MASS AND INERTIAL TENSOR OF ANATOMICAL SEGMENTS Final Report**
May 1986 43 p
(Contract N00014-85-C-0594)
(AD-A169122; ANCO-1663.15) Avail: NTIS HC A03/MF A01 CSCL 06S

The Naval Medical Research and Development Command desires to nondestructively measure the inertial properties of nonhuman primate bodies and limbs, with possible extension to humans. The results can be used in building accurate body dynamics models for crash and seat ejection studies. ANCO has investigated the use of multi-axis radiographs (X-ray photographs) of anatomical segments with high energy photons, which allows the determination of total mass, center of gravity, and the inertia tensor. This technique does not require any knowledge of the nature of the tissues studied (or their absorption coefficient) and does not require expensive CT-scan equipment. It was concluded that by using relatively inexpensive and simple equipment, the inertial properties could be determined with an accuracy of 5% to 10%, except for the off-diagonal terms of the inertia tensor where the errors could be larger. This larger error, however, is of limited concern in body dynamic studies. GRA

**N87-13127#** Army Research Inst. of Environmental Medicine, Natick, Mass.
**HYPOTHERMIC EFFECTS ON VASCULAR CONTRACTILITY AND REACTIVITY**
N. R. BANDICK and D. E. ROBERTS 1 Jan. 1986 23 p
(AD-A169142) Avail: NTIS HC A02/MF A01 CSCL 06S

This study compared the reactive and contractile properties of helical strips of femoral arteries taken from normothermic rabbits and rabbits that were anesthetized with pentobarbitol and cooled to 25 C at a rate of 7 C per hour. The purpose of this comparison was to see if intrinsic factors would alter the sensitivity and/or contractility of this vascular muscle to norepinephrine during whole body hypothermia. We found that, after two hours of in-vivo hypothermia, the hypothermic derived tissue was from 10 to 100X more sensitive to norepinephrine than the normothermic derived tissue. This augmented sensitivity continued while the tissue was in-vitro for at least twelve hours. The dose-response curves of the hypothermic derived arteries were shifted to the left of the normothermic arteries resulting in a greater contractility at lower levels of agonist. Moreover, the normothermic tissue contracted slower than the hypothermic. The maximal tension developed by the strips was equivalent. This study has identified prolonged alternations of receptor sensitivities and contractility properties attributable to in-vivo influences than can, in part, explain the disruptions of blood pressure during and following whole body hypothermia. GRA

**N87-13128#** Army Research Inst. of Environmental Medicine, Natick, Mass.
**QUANTIFICATION OF RESPIRATORY MUSCLE PERFORMANCE**
S. R. MUZA Jun. 1986 17 p
(AD-A169208; USARIEM-M38/86) Avail: NTIS HC A02/MF A01 CSCL 06P

Quantification of respiratory muscle force, velocity and length are usually indirect measurements assessed from pressure, air flow and volume, respectively. Pressure produced by the respiratory muscles is measured at sites within the airways, rib cage and abdomen. Quantification of diaphragmatic tension is obtained by measurement of transdiaphragmatic pressure (P sub di) (gastric minus esophageal pressures). The strength of the inspiratory muscles working in concert is the voluntary static maximum inspiratory pressure measured at the mouth, briefly sustained near functional residual capacity (FRC). The inspiratory muscles' velocity of shortening is quantified by measuring the inspiratory flow rate (V sub I). Since the V sub I varies over the duration of inspiration (T sub I), the mean inspiratory flow rate (V sub I/T sub I) is typically used. Finally, changes in the respiratory muscles' length are inferred from measurements of volume. The duration of sustained voluntary hyperpnea is inversely related to the time-pressure integral of the diaphragm (T sub I/T sub T.P sub di/P sub di max) and the mean V sub I. Thus, measurements of pressure, flow and volume yield quantitative indices of respiratory muscle performance. GRA

**N87-13129#** Michigan Univ., Ann Arbor. Transportation Research Inst.

**ANALYSIS OF HEAD AND NECK DYNAMIC RESPONSE OF THE US ADULT MILITARY POPULATION Final Annual Technical Report, 1 Oct. 1984 - 1 Feb. 1986**

A. C. BOSIO and B. M. BOWMAN 15 Apr. 1986 135 p

(Contract N00014-81-K-0603)

(AD-A169563; UMTRI-86-14; FATR-3) Avail: NTIS HC A07/MF A01 CSCL 06S

Mechanisms of head/neck dynamic response were investigated for NBDL volunteer data in -Gx and +Gy acceleration vectors with the MVMA 2-D and VOM 3-D Crash Victim Simulation models. Computer simulation of human subject response yielded mechanical constants pertinent to the design of a Biofidelic Manikin (BFM). Improved biofidelity for a two-joint neck model was achieved by relocating the lower neck pivot point inferior and posterior to anatomic T1. In -Gx, the magnitude and duration for condyles extension, in particular, was improved while satisfactory acceleration response was maintained. Exercising the neck model at -6Gx and -15Gx showed that it was necessary to use nonlinear stiffnesses for the lower neck joint in flexion. Two modes of extension motion at the occipital condyles were seen in the volunteer subjects. The first mode was extension with rebound (some subjects demonstrating flexion). The second mode was peak extension followed by further increase in the extension motion. The two modes of condyles extension appear to depend on some pre-test condition - probably muscle tensing since the short duration of the head and neck motion in a test (300 ms) should not allow muscular reaction beginning after the onset of the test to be a factor. Simulations with a model that has passive neck elements give only the extension with rebound response, i.e., mode one response. Thus, on the basis of simulations, it can probably be said that mode one response results for subjects who are not pretensed and mode two response results for pretensed subjects. GRA

**N87-13130#** Technion - Israel Inst. of Tech., Haifa. Faculty of Medicine.

**SLEEPABILITY AND WAKEABILITY FOLLOWING SLEEP DEPRIVATION Final Report, period ending Aug. 1982**

P. LAVIE May 1986 30 p

(Contract DAJA37-81-C-0237; DA PROJ. 2Q1-61102-B-74-D)

(AD-A169578; ARI-RN-86-64) Avail: NTIS HC A03/MF A01 CSCL 06S

This research note discusses experiments investigating the infrastructure of arousal during the habitual waking day following one night of total sleep deprivation. Based on the data collected during the experiment, it can be concluded that wakeability, the ability to remain awake, and sleepability, the ability to fall asleep, following sleep deprivation, are not complimentary processes, but are probably governed by different mechanisms. The practical implications of these results to the scheduling of replacement naps are discussed. GRA

**N87-13131#** Army Research Inst. of Environmental Medicine, Natick, Mass.

**HUMAN THERMOREGULATORY MODEL FOR IMMERSION IN COLD WATER**

P. TIKUISIS, R. R. GONZALEZ, and K. B. PANDOLF Jun. 1986 35 p

(AD-A169779; USARIEM-M-39/86) Avail: NTIS HC A03/MF A01 CSCL 06S

A mathematical model of thermoregulation has been developed to simulate human physiological responses to cold-water immersion. Data were obtained from experiments where thirteen healthy male volunteers were totally immersed under resting and nude conditions for 1 h in water temperatures of 20 and 28 C. Mean measured rectal temperature (T sub re) fell by about 0.9 and 0.5 C in 20 and 28 C water for all subjects, yet mean measured metabolic rate (M) rose by about 275 and 90 W for the lean mass group (n=7) and 195 and 45 W for the normal mass group (n=6). To predict the observed T sub re and M values, the present model differed from its predecessors by (a)determining a thermally neutral body temperature profile such that the measured and predicted initial values of T sub re and M were matched, (b)including thermal inputs for shivering from the skin independent of their inclusion with the central temperature to account for the observed initial rapid rise in M, (c)confining the initial shivering to the trunk region to avoid an overly large predicted initial rate of rectal cooling, and (d) calculating the steady state of convective heat loss by assuming a zero rate of heat storage in the skin compartment. GRA

**N87-13132#** National Maritime Research Center, Kings Point, N. Y. Computer Aided Operations Research Facility.

**APPLICATION OF HEART RATE MEASUREMENTS TO MARITIME RESEARCH SIMULATOR**

E. WALD Mar. 1986 68 p

(AD-A169988; CAORF-60-7805-01) Avail: NTIS HC A04/MF A01 CSCL 06P

An experiment was performed on the Ship Simulator of the Computer Aided Operations Research Facility (CAORF) to determine the feasibility of relating the instantaneous heart rates of test subjects with the nature of their on-bridge activity at the time of measurement. It was found that experienced mariners confronted with potential collision situations on the simulator or with difficult maneuvering problems in restricted waters generally experienced elevated heart rates indicative of increased cognitive and emotional arousal. It was also found that variability of heart rate appears to be useful in differentiatng workload demands imposed on the mariner by different navigation conditions. The fact that physiological reactions were observed to occur on the simulator in situations which would be expected to be emotionally arousing indicates, first, that the simulator is recreating, to a degree, the real-world atmosphere, and second, that heart rate measurements can be usefully applied in future research to detect emotional and or cognitive levels of arousal. GRA

**N87-13133#** Beth Israel Hospital, Boston, Mass.

**FRACTURE AND VISCOELASTIC CHARACTERISTICS OF THE HUMAN CERVICAL SPINE**

W. T. EDWARDS, W. C. HAYES, Y. F. KOU, M. S. COFFEE, and A. A. WHITE, III 1986 221 p

(Contract F49620-81-K-0010)

(AD-A170002; AFOSR-86-0453TR) Avail: NTIS HC A10/MF A01 CSCL 06P

Cervical spine segments were tested both nondestructively and destructively to determine the load-displacement relationships and vertebral strength. For this study, a servo-hydraulic multi-degree of freedom material testing machine was designed and constructed. This new system, called the Planar Testing Apparatus (PTA), was used to generate motions needed to characterize the sagittal response of spine segments. A study of the viscoelastic properties of two vertebrae lumbar spine segments was conducted following the completion of the PTA to check and demonstrate the test system. The results from seven lumbar specimens were also included in this report. The cervical spine segments consisted of three vertebrae and their interconnecting soft tissue, discs, and ligaments. A noninvasive electro-mechanical displacement measuring apparatus was constructed to monitor the six degree of freedom motion of the middle vertebral body as it moved relative to the two adjacent vertebrae during the mechanical tests. Results for cervical spine specimens indicated that a low displacement rates (less than 5 mm/sec or 5 deg/sec) there was no dependence of spinal segment stiffness on displacement rate. Curves for load vs. displacement (both axila and shear) and moment vs. sagittal bending displayed large regions of small load and low slope as displacements increased. GRA

**N87-13134#** Army Research Inst. of Environmental Medicine, Natick, Mass.
**SELF-PACED HEAT ACCLIMATION PROCEDURES**
L. E. ARMSTRONG, R. W. HUBBARD, J. P. DELUCA, and E. L. CHRISTENSEN Mar. 1986 39 p
(AD-A170533; USARIEM-T-8/86) Avail: NTIS HC A03/MF A01 CSCL 06S

The purpose of this investigation was to evaluate the effectiveness of self-paced heat acclimation (SPHA) procedures. Fourteen males performed 100 nmin of intermittent exercise during 9 SPHA work-rest cycles, on eight days. Exercise consisted of 8.279 P or - 0.527 to 9.799 + or - 0.433 km of treadmill running per day. SPHA trials were effective in improving heat tolerance in that significant ($p < .05$) reductions were observed (day 1 vs day 8) in final heart rate (HR), Delta HR, final rectal temperatures (Tre), Delta Tre, final mean weighted skin temperature (Tsk), and Delta Tsk. Resting plasma volume expanded significantly ($p <. 05$) from day 1 to day 4, but sweat rate was unchanged. Group mean exercise intensities and ratings of perceived exertion were not statistically different from days 2 7, let the number of trials terminate because subjects exceeded HR and Tre safety limits (22 out of 112 trials) declined during heat acclimation (days 1-4 = 16, days 5-8 = 6). Symptoms of heat illness (piloerection, chills, dizziness, vomiting) were observed in 16.1% of all trials; 11 out of 14 subjects (78.6%) experienced one or more or these symptoms during SPHA trials. GRA

**N87-13135#** Yale Univ., New Haven, Conn. Dept. of Ophthalmology and Visual Science.
**LIMITS OF PATTERN DISCRIMINATION IN HUMAN VISION Final Report, Jan. 1983 - Dec. 1985**
J. HIRSCH 3 Feb. 1986 30 p
(Contract F49620-83-C-0026)
(AD-A170756; AFOSR-86-0569TR) Avail: NTIS HC A03/MF A01 CSCL 05J

This investigation was focused on identification of various limits of human spatial discrimination, two-dimensional sampling properties of the retinal photoreceptor lattice, and the consequences for spatial vision. Highlights from this study are briefly listed: (1) Foveal Spatial Discriminations are hyperacuity tasks; (2) The spatial-frequency discrimination function (delta f/f vs f) is segmented; (3) The discrimination segments can be related to retinal sampling; (4) Scaling mechanisms apply to low resolution tasks; (5) The photoreceptor lattice is a highly ordered hexagonal array; (6) A hexagonal component exists in spatial discrimination; and (7) A new metric model of spatial vision is based on visual sampling. GRA

**N87-13136#** Michigan Univ., Ann Arbor.
**HIGH-RESOLUTION ANALYSIS OF EYE MOVEMENTS Final Report, 15 Jun. 1983 - 15 Nov. 1984**
J. JONIDES 15 Apr. 1986 12 p
(Contract AF-AFOSR-0269-83)
(AD-A170779; AFOSR-86-0512TR) Avail: NTIS HC A02/MF A01 CSCL 06P

A computerized laboratory was constructed to monitor eye movements, to present visual stimuli, and to collect and record the performance of human subjects in information processing tasks. Author (GRA)

**N87-13137#** Harvard Medical School, Boston, Mass. Dept. of Physiology and Biophysics.
**PHARMACOLOGICAL RESETTING OF THE CIRCADIAN SLEEP-WAKE CYCLE Final Technical Report, 1 Apr. 1983 - 31 Mar. 1986**
M. C. MOORE-EDE 30 May 1986 27 p
(Contract AF-AFOSR-0194-83)
(AD-A170804; AFOSR-86-0545TR) Avail: NTIS HC A03/MF A01 CSCL 06P

This research program developed strategies to reset the timing of the circadian (approximately 24-hour) sleep-wake cycle so that individuals could be maintained fully awake in any predetermined time in the 24-hour day. This capability would be of direct benefit in minimizing the deleterious effects of jet-lag and could promote alertness in facilities which must be staffed 24 hours a day. The studies utilized a diurnal primate primate, the squirrel monkey (Saimiri sciureus), with a well defined circadian neurophysiology and sleep-wake physiology. This animal has a consolidated sleep-wake cycle that is comparable to that in humans. During the three-year period of funding, the circadian sleep-wake organization in squirrel monkeys was characterized, and the rate of resynchronization after phase shifts of environmental light-dark cycles was determined. GRA

**N87-13138#** Sloan-Kettering Inst. for Cancer Research, New York. Biophysics Lab.
**BIOLOGICAL AND CLINICAL DOSIMETRY, JULY 1, 1964 TO DECEMBER 31, 1984 Final Report**
J. S. LAUGHLIN and L. ZEITZ 1986 191 p
(Contract DE-AC02-76EV-03522)
(DE86-006947; DOE/EV-03522/T4) Avail: NTIS HC A09/MF A01

Systems for the determination of absorbed dose in biological research and clinical applications are developed. The primary method under study is the local absorbed dose calorimeter. In addition, secondary dosimetric systems such as ionization chambers, chemical dosimeters and thermoluminescent dosimeters (TLD) are being developed and applied to provide an absolute basis for the evaluation and comparison of experiments, treatments and other procedures using radiation. In keeping with these objectives this project has accomplished significant advances in the following areas: (1) local absorbed dose calorimetry; (2) neutron dosimetry; (3) dosimetry of ultra-high intensity radiation sources; (4) solid state detector and germanium gamma camera program; (5) dosimetry for brachytherapy; and (6) non-isolated sensor calorimeters. DOE

**N87-13139#** Pacific Northwest Labs., Richland, Wash.
**PHYSICAL INTERACTION OF 1-HZ TO 100 KHZ ELECTRIC AND MAGNETIC FIELDS WITH LIVING ORGANISMS**
W. T. KAUNE Apr. 1986 45 p Presented at the 22nd Annual Meeting of the National Council on Radiation Protection and Measurements, Washington, D.C., 2 Apr. 1986
(Contract DE-AC06-76RL-01830)
(DE86-012323; PNL-SA-13962; CONF-860451-1) Avail: NTIS HC A03/MF A01

The paper discusses, from a physical point of view, interactions between biological systems and electric and/or magnetic fields characterized by frequencies extending from 1 Hz to 100 kHz. DOE

**N87-13155#** Ludwig-Maximilians-Universitaet, Munich (West Germany). Orthopaedische Klinik und Poliklinik.
**INVESTIGATION OF VIBRATIONS OF THE SPINAL COLUMN OF HEALTHY SUBJECTS [SCHWINGUNGSUNTERSUCHUNGEN DER WIRBELSAEULE GESUNDER PROBANDEN]**
J. PIEHLER, F. W. HAGENA, C. J. WIRTH, F. HUETTIG (Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).), and K. SAUER (Hochschule der Bundeswehr, Munich (West Germany).) *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 114-126 1985 In GERMAN
Avail: NTIS HC A13/MF A01

Kinetics tests were conducted to determine the magnitude of the deforming forces on the human spinal column. The vibration test setup including a digital vibration control system is described. Results reveal complex spinal column characteristics: in each plane of the spine a specific transmission behavior is observed. The supposition that the transmission behavior of all other spinal column sections can be deduced from one single position is questioned. ESA

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# BEHAVIORAL SCIENCES

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

**A87-13568**
**NEUROPSYCHIATRY IN AEROSPACE MEDICINE**
D. R. JONES (Texas, University; USAF, School of Aerospace Medicine, Brooks AFB, TX; Uniformed Services University of the Health Sciences, Bethesda, MD) and J. L. PERRIEN (USAF, School of Aerospace Medicine, Brooks AFB, TX) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 538-570. refs

The psychiatric aspects of aerospace medicine are discussed. Personality and personal backgrounds which encourage or defeat adaptive behavior in pilot candidates are tabulated, noting the high scores for aberrant behavior and independence of many pilots. Psychological disorders which can disqualify a pilot are described, including fear of flying, stress reactions, substance abuse and personality and psychophysiologic disorders. M.S.K.

**A87-13656#**
**A MODEL FOR HUMAN SPATIAL ORIENTATION USING FAMILIAR OBJECT CUES**
M. NEGRIN and A. GRUNWALD (Technion - Israel Institute of Technology, Haifa) IN: Israel Annual Conference on Aviation and Astronautics, 27th, Haifa, Israel, February 27, 28, 1985, Collection of Papers . Haifa, Israel, Technion - Israel Institute of Technology, 1986, p. 190-198. refs

A mathematical model has been developed for the process employed by a human observer of estimating his position and angular orientation in space. The model is based on the following assumptions: (1) the visual field includes a perceived object familiar to the human observer; (2) the observer's familiarity with the object is modeled by a set of reference coordinates describing the object and 'internally' stored by the observer; and (3) the observer derives his position and angular orientation in space by determining the displacement and rotation to be employed on the reference object yielding the best match between the transformed object and the lines-of-sight of the perceived image. The validated model is useful in establishing guidelines for the development of visual aids in various visual control tasks like approach to landing, hovering, etc. Author

**A87-14679**
**THE PSYCHOPHYSIOLOGICAL MECHANISMS OF SELECTIVE ATTENTION [PSIKHOFIZIOLOGICHESKIE MEKHANIZMY IZBIRATEL'NOGO VNIMANIIA]**
N. F. SUVOROV and O. P. TAIROV Leningrad, Izdatel'stvo Nauka, 1985, 288 p. In Russian. refs

The main features of three types of models describing the psychophysiological mechanisms of selective attention (activation, structural-information, and economic models) are discussed, together with the neurophysiological mechanisms that correlate attention and the memory processes. Experimental studies on visual and acoustic perception, verbal signal recognition, perception of brief time intervals, and perceptual interactions have led to the formulation of hypotheses concerning the psychophysiological mechanisms of selective attention. It is considered that selective attention depends on selective simplification during information processing in the relevant sensory channels, and that the selectivity is established on the basis of the analysis of the semantic characteristics of external signals in associative brain systems. Changes in the attention patterns of schizophrenics are discussed in the frameworks of pathological psychology and psychopharmacology. I.S.

**A87-16072#**
**ETHICAL PROBLEMS OF INTERACTION BETWEEN GROUND-BASED PERSONNEL AND ORBITAL STATION CREWMEMBERS**
A. I. GRIGOREV, O. P. KOZERENKO, V. I. MIASNIKOV, and A. D. EGOROV (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 5 p. refs
(IAF PAPER 86-398)

Manned missions onboard orbital stations Salyut-6 and Salyut-7 have led to the conclusion that a long-term space mission can be viewed as a complex socioman-machine system whose effectiveness largely depends on the quality of interaction betwewen its subsystems. Psychological and medical examinations before, during and after manned missions have helped in the identification of the major points of interaction of the subsystems which require adequate monitoring and optimization using socio-psychological and organization-technical approaches: (1) arrangement and evaluation of the quality of work, (2) arrangement or proper leisure, and (3) psychological comfort in the interpersonality and intergroup relations during prolonged space missions. This paper also discusses adaptive changes in the mental and physical state due to prolonged exposure to space flight factors such as microgravity and confinement. Author

**A87-16074#**
**THE RECRUITMENT AND ORGANIZATIONAL INTEGRATION OF SPACE PERSONNEL**
K.-M. GOETERS (DFVLR, Institut fuer Flugruedizin, Hamburg, West Germany) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 5 p.
(IAF PAPER 86-401)

This paper describes the philosophy of selection of astronaut scientists. It deals mainly with psychological selection criteria oriented at the job demands. The results of the European selection campaign for the Spacelab are reported. In addition, some aspects of the organizational integration of astronauts are listed. Author

**A87-16075#**
**SPACE STATION HABITABILITY STUDY - THE RELATION BETWEEN VOLUMES, SHAPES AND COLOURS, INSIDE THE SPACE STATION AND HUMAN BEHAVIOUR**
D. B. ARCHITECT (Futuro, Florence, Italy) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 9 p. refs
(IAF PAPER 86-403)

**A87-16406**
**PERCEPTION OF SYNTHETIC SPEECH GENERATED BY RULE**
D. B. PISONI, H. C. NUSBAUM, and B. G. GREENE (Indiana University, Bloomington) IEEE, Proceedings (ISSN 0018-9219), vol. 73, Nov. 1985, p. 1665-1676. refs
(Contract NIH-NS-12179; F33615-83-K-0501)

The paper describes the results of several studies that applied measures of phoneme intelligibility, word recognition, and comprehension to assess the perception of synthetic speech. Several techniques were used to compare performance of different synthesis systems with natural speech and to learn more about how humans perceive synthetic speech generated by rule. The present findings suggest that the perception of synthetic speech depends on an interaction of several factors including the acoustic-phonetic properties of the speech signal, the requirements of the perceptual task, and the previous experience of the listener. Differences in perception between natural speech and high-quality synthetic speech appear to be related to the redundancy of the acoustic-phonetic information encoded in the speech signal. Author

**N87-12106#** Joint Publications Research Service, Arlington, Va.
**PHILOSOPHICAL ASPECTS OF ADAPTATION THEORY**
B. S. ALYAKRINSKIY *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 1 - 14 23 Jul. 1986 Trans. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 6-15
Avail: NTIS HC A07/MF A01

The general concepts of the problem of adaptation are discussed from the dialectic point of view which, according to F. Engels, is the most important pattern of thinking in natural sciences. Dialectics provides an analog and therefore a method for interpreting developmental processes, universal relationships in nature, and transition from one area of research to another. From the point of view of dialectic laws adaptation acts as a contradictory process of habituation to various environments. The contradictory pattern of the adaptive process and its result is very distinct in terms of heredity and variability. A logical enlargement of the concept of adaptation is the transition to the study of homeostasis which is assumed to be its mechanism, a property which has developed in the course of evolution and fixed in heredity. This adaptive property is contradictory in its essence because homeostasis is a unity of stability and: instability, a fluctuating constancy. In addition to the law of constancy of the inner milieu, there is a law of homeostatic deviations. This concept can be understood through an analysis of the system theory that includes a continuous variation and conservation of structure which indicates its ordered oscillation, that is, its rhythmicity. This clarifies the relationship between homeostasis and biological rhythmicity as a method of maintaining the former. Thus, a consistent analysis of the problem of adaptation can help identify transition from one area of research to another, specifically to the study of oscillatory processes in living systems. Author

**N87-12125#** Joint Publications Research Service, Arlington, Va.
**DISTINCTIONS OF VISUAL MONITORING OF INSTRUMENT READINGS IN MANEUVERED FLIGHT**
I. D. MALININ and V. A. PONOMARENKO *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 1-6 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 4-8
Avail: NTIS HC A08/MF A01

Visual monitoring of flight parameters in a maneuvering flight simulated by a pilot trainer was investigated. Eye movements were recorded using a Japanese cinecamera. It was concluded that visual monitoring and attention concentration included chained routes of predicted sequence which was determined by current events throughout the flight. The most interesting finding was that the chains of gazing switching between angular parameters of spatial position or parameters of pitch and roll flights included several components whereas the chains of gaze switching between one parameter of the angular position and one parameter of the trajectory control or between two parameters of the trajectory control included exclusively one component. Circular or closed routes of gaze switching and chained proper or open multicomponent routes were discriminated. In a complex flight the chained or circular routes between two parameters of the angular coordinates became longer. The microstructure of gaze switching within one indicator (air horizon) is described and important problems requiring further research are discussed. Author

**N87-12128#** Joint Publications Research Service, Arlington, Va.
**FORECASTING OPERATOR WORK CAPACITY DURING LONG-TERM CONTINUOUS WORK**
A. K. YEPISHKIN and A. I. SKRYPNIKOV *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 25-28 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 19-22
Avail: NTIS HC A08/MF A01

It is shown that the work capacity of operators performing continuously for 46 hours can be predicted on the basis of their electroencephalogram (EEG) and heart rate (HR). It is found that a drastic decrease of work capacity is preceded by a 20 to 30% increase of low frequency (delta and theta) activity and a 15 to 40% decrease of high frequency (alpha and beta) activity as well as by a simultaneous decrease of HR. These changes were revealed 1 to 4 hours before changes in the operator's work capacity. Author

**N87-12129#** Joint Publications Research Service, Arlington, Va.
**BIOCHEMICAL INDICATORS OF EMOTIONAL STRESS IN AIR TRAFFIC CONTROLLERS**
Y. L. KAN, V. A. KUPRIYANOV, K. F. KOROVIN, and O. O. MALINOVSKAYA *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 29-34 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 22-25
Avail: NTIS HC A08/MF A01

Air traffic controllers working in automatic and nonautomatic stations showed high values of lipid metabolism parameters as well as significant activation of the sympathoadrenal system (especially, its hormonal component). The level of the parameters under study was correlated with the workload. Author

**N87-12160#** Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
**REGISTER OF RESEARCH IN PROGRESS ON MENTAL WORKLOAD**
T. R. METZLER Feb. 1986 105 p
(AD-A168210; AAMRL-TR-86-007) Avail: NTIS HC A06/MF A01 CSCL 05H

This report documents current research on operator workload. The register was compiled from responses to a questionnaire data form sent to 76 scientists who are active in basic and applied workload research. The six sections of the register include name and key term indexes, current project descriptions, listings of workload laboratories and potential sources of research support, and a bibliography of significant publications in the area. GRA

**N87-12161#** Naval Aerospace Medical Research Lab., Pensacola, Fla.
**DEVELOPMENT OF VISION TESTS FOR AIR-TO-AIR TARGET DETECTION Interim Report**
W. A. MONACO, A. MORRIS, and P. V. HAMILTON Jul. 1985 23 p
(AD-A168309; NAMRL-RR-1314) Avail: NTIS HC A02/MF A01 CSCL 06P

This report summarizes the accomplishments leading to the development of a vision testing program currently being administered by the Naval Aerospace Medical Research Laboratory (NAMRL) at the Tactical Air Combat Training Systems; NAS, Oceana, VA. The program is designed to measure and suggest means to improve aircrew visual capabilities. Included in this report is a description of the methods used to select vision tests appropriate for determining the relationship between an individual's visual skill and his ability to detect targets in air-to-air engagements. GRA

**N87-12162#** Naval Postgraduate School, Monterey, Calif.
**AN APPLICATION OF MULTIDIMENSIONAL SCALING TO DESCRIBE STRESS AMONG NAVAL HELICOPTER PILOTS M.S. Thesis**
T. L. WALSTON, III Mar. 1986 97 p
(AD-A168367) Avail: NTIS HC A05/MF A01 CSCL 06S

The technique of multidimensional scaling is used in an attempt to determine any patterns utilized by Naval helicopter pilots when grouping a given set of stressors. Both grouping data and ranking data were collected and analyzed from a survey among pilots. Information gained through the ranking data consist of perceptions of the helicopter pilots on how the stressors affect certain performance aspects. Numerical output, as well as graphical plots, were generated to reflect these perceptions. Naval aviation, in general, is a high-stress environment. The variety of stresses

associated with flying an aircraft have an impact on the effectiveness with which that task is performed. Helicopter flying has stressful situations, many of which, are unlike those of other aircraft. The missions, flight characteristics, and environment all contribute to these difficulties. It is important for the pilot to be aware of these stressful conditions in order to capably operate the helicopter GRA

**N87-12163#** European Space Agency, Paris (France).
**EXTENDED ANALYSIS OF THE STRUCTURE OF ERROR SCORES IN PSYCHOLOGICAL APTITUDE TESTS**
K. M. GOETERS Oct. 1985 46 p Transl. into ENGLISH from "Erweiterte Strukturanalyse von Fehlerwerten in Psychologischen Leistungstests" Hamburg, West Germany Original language document was announced as N86-10780
(ESA-TT-943; DFVLR-FB-85-20; ETN-86-98241) Avail: NTIS HC A03/MF A01; original German version available at DFVLR, Cologne, West Germany DM 16.50

A series of psychological aptitude tests was analyzed with respect to human performance and reliability. A factor analysis of the test scores reveals five components of performance. Three independent error components are extracted: errors in quick visual detection of targets; difficulties in mental processing of numbers and symbols; and erroneous actions under performance stress. All three factors are the expression of a deficient control of performance. They are discussed as functional aspects of decision making and human information processing. ESA

**N87-12164#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abteilung Flugphysiologie und -Psychologie.
**PERFORMANCE REGULATION AND ERROR CONTROL IN A TEST OF PERCEPTUAL SPEED**
K. M. GOERTERS Feb. 1986 41 p In GERMAN; ENGLISH summary
(DFVLR-FB-86-13; ISSN-0171-1342; ETN-86-98181) Avail: NTIS HC A03/MF A01; DFVLR, Cologne, West Germany DM 15

A test of perceptual speed (cancellation of figures) in which usually the number of rights and wrongs (omissions) are uncorrelated, was applied to three groups with different instructions. Group 1 was told to work quickly and accurately; group 2 to take care of the speed of work, and group 3 of accuracy. Subjects who where asked by a questionnaire about their attitudes during the work period and about their general style of work, emphasized the factors speed or accuracy while neglecting the other components. This procedure does not achieve the expected success. The result confirms the functional independence of speed of work and error rate in tests of mental concentration. ESA

**N87-12165#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abteilung Flugphysiologie und -Psychologie.
**THE VALUE OF GLOBAL SELF RATINGS IN DIFFERENTIAL DIAGNOSTICS Ph.D. Thesis - Hamburg Univ., West Germany**
P. MASCHKE Apr. 1986 229 p In GERMAN; ENGLISH summary
(DFVLR-FB-86-20; ISSN-0171-1342; ETN-86-98186) Avail: NTIS HC A11/MF A01; DFVLR, Cologne, West Germany DM 66.50

Reliability, validity, and faking tendencies of a 10 dimensional personality inventory were compared with the corresponding global self ratings in a situation of job application. Global self ratings do not appear to be faked more than the personality test scales. Although there are distinct differences in reliability between self rating and personality scales, the latter attain only negligibly higher validities. Reasons for these results (unexpected from assumptions of classical testing theory) are discussed. In relation to self ratings performance, there are indications of a capability of self assessment. ESA

**N87-13140*#** New Mexico Inst. of Mining and Technology, Socorro.
**NOSL EXPERIMENT SUPPORT Final Report, 1 Jan. 1980 - 31 Jul. 1986**
M. BROOK 2 Oct. 1986 4 p
(Contract NAS8-33817)
(NASA-CR-178947; NAS 1.26:178947) Avail: NTIS HC A02/MF A01 CSCL 05I

An optical lightning detector was constructed and flown, along with Vinton cameras and a Fairchild Line Scan Spectrometer, on a U-2 during the summer of 1979. The U-2 lightning data was obtained in daylight, and was supplemented with ground truth taken at Langmuir Laboratory. Simulations were prepared as required to establish experiment operating procedures and science training for the astronauts who would operate the Night/Day Optical Survey of Thunderstorm Lightning (NOSL) equipment during the STS-2 NOSL experiment on the Space Shuttle. Data was analyzed and papers were prepared for publication. B.G.

**N87-13141*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**CREW COMMUNICATION AS A FACTOR IN AVIATION ACCIDENTS**
J. GOGUEN, C. LINDE, and M. MURPHY Aug. 1986 29 p
(NASA-TM-88254; A-86254; NAS 1.15:88254) Avail: NTIS HC A03/MF A01 CSCL 05I

The crew communication process is analyzed. Planning and explanation are shown to be well-structured discourse types, described by formal rules. These formal rules are integrated with those describing the other most important discourse type within the cockpit: the command-and-control speech act chain. The latter is described as a sequence of speech acts for making requests (including orders and suggestions), for making reports, for supporting or challenging statements, and for acknowledging previous speech acts. Mitigation level, a linguistic indication of indirectness and tentativeness in speech, was an important variable in several hypotheses, i.e., the speech of subordinates is more mitigated than the speech of superiors, the speech of all crewmembers is less mitigated when they know that they are in either a problem or emergency situation, and mitigation is a factor in failures of crewmembers to initiate discussion of new topics or have suggestions ratified by the captain. Test results also show that planning and explanation are more frequently performed by captains, are done more during crew- recognized problems, and are done less during crew-recognized emergencies. The test results also indicated that planning and explanation are more frequently performed by captains than by other crewmembers, are done more during crew-recognized problems, and are done less during-recognized emergencies.

**N87-13142#** New York Univ., New York.
**PERCEPTUAL FACTORS IN WORKLOAD: A NEUROMAGNETIC STUDY Annual Report, 1 Jan. - 31 Dec. 1985**
L. KAUFMAN and S. J. WILLIAMSON 28 Feb. 1986 55 p
(Contract F49620-85-K-0004)
(AD-A169934; AFOSR-86-0417TR; AR-1) Avail: NTIS HC A04/MF A01 CSCL 05J

A background section describes the neuromagnetic method and its history. There were an elevation of N1 and P2 (using a quasi-steady state stimulus). The fields associated with these sources increased in intensity during attention. This is not due to the activity of sources recruited during attention, but to Modulated activity of neurons in or near primary auditory cortex. This is consistent with a Triesman like filter theory of attention. Also, physical parameters of stimulation, e.q., loudness, have little or no effects. However, the effect is sharply diminished when both stimuli are presented to both ears with equal loudness. A collaboration with other investigators is planned to compare our results with results obtained in a more conventional manner. A new method for obtaining graded levels of attention is described. A visual experiment is underway, and is giving us similar results. A single-position method for determining the location, orientation and strength of the dipole source is described. This method will

be applied to a P300 study, which will follow-up an odd-ball study just completed. The latter gave results similar to those obtained previously, but the method is sufficiently insensitive to determine if changing P300 latency is due to a change in source. The planned experiment should make this possible. GRA

**N87-13143#** Essex Corp., Orlando, Fla.
**EYE MOVEMENTS AS AN INDEX OF MENTAL WORKLOAD Final Report, 15 Jul. 1985 - 14 Mar. 1986**
J. G. MAY, R. S. KENNEDY, M. C. WILLIAMS, W. P. DUNLAP, and J. R. BRANNAN 17 Mar. 1986 20 p
(Contract F49620-85-C-0121)
(AD-A169941; AFOSR-86-0416TR) Avail: NTIS HC A02/MF A01 CSCL 06E

Two investigations were carried out to assess the feasibility of using eye movement measures as nonintrusive indicants of mental workload. In the first experiment, measures of saccadic latency and eye movement velocity were obtained during alternating eye movement scans while subjects were differentially task loaded by simple, moderate, and complex auditory tone counting. The latency and eye movement velocity measures changed but did not differ reliably as tone counting complexity (workload) was increased. In the second experiment, the spatial extent of spontaneous saccades was measured under three levels of tone counting complexity. The results indicated that the extent of such eye movements varied inversely (p less than .0151) as tone counting complexity increased. This index appears to hold promise for the development of an objective indicator of mental workload. Author (GRA)

**N87-13144#** Illinois Univ., Champaign. Cognitive Psychophysiology Lab.
**THE EVENT RELATED BRAIN POTENTIAL AS AN INDEX OF INFORMATION PROCESSING AND COGNITIVE ACTIVITY. A PROGRAM OF BASIC RESEARCH. SUPPLEMENT A: NEUROMAGNETIC STUDIES Annual Progress Report, 20 Apr. 1984 - 31 Dec. 198**
L. KAUFMAN and E. DONCHIN 31 Mar. 1986 23 p
(Contract F49620-85-C-0041)
(AD-A169978; CPL-86-1A; AFOSR-86-0451TR-SUPPL-A) Avail: NTIS HC A02/MF A01 CSCL 05J

A study was conducted to evaluate the feasibility of obtaining concurrent measures of event-related potentials (ERPs), and event-related magnetic fields (ERFs). Subjects participated in an oddball task while simultaneous ERPs and ERFs were recorded. Isocontour field maps generated for the P300 component are consistent with the suggestion that the P300 may be generated in, or near, the hippocampal formation. GRA

**N87-13145#** Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
**THE FLIGHT SERVICE STATION TRAINING PROGRAM: 1981-1985 Final Report**
J. J. CONVEY Jun. 1986 18 p
(AD-A171485; DOT/FAA/AM/86-6) Avail: NTIS HC A02/MF A01 CSCL 05I

This report describes the performance of the ATC classes in the Flight Service Station Training Program 1981 to 1985 on the skills tests and laboratory exercises in Preflight (pilot briefing), Inflight, and Emergency Services. Over 80% of the final grade for the program is based on these measures. The average scores of the classes on the skills tests, especially on Inflight, have increased from 1981 to 1985. The different forms of both the Preflight test and the Emergency Services test appear to be equivalent as intended; however, Form G and Form H of the Inflight test are easier than Form D and Form E. The average scores of the classes on the laboratory tests were constant from 1981 to 1985; however, the averages on the Inflight laboratory exercises have declined steadily. Overall, these classes have performed better on the skills tests and laboratory exercises, except for Inflight, than did the reference classes of 1978 and 1979. GRA

**N87-13153#** Deutsche Gesellschaft fuer Luft- und Raumfahrt, Bonn (West Germany).
**THE MEASUREMENT OF THE PSYCHOLOGICAL WORKLOAD DURING TASK-RELATED ACTIVITIES, INCLUDING CAR DRIVING, BY COMPETING TIME INTERVAL ESTIMATION [DIE MESSUNG DER PSYCHISCHEN BEANSPRUCHUNG WAEHREND AUFGANENBEZOGENER TAETIGKEITEN EINSCHLIESSLICH FAHRZEUGFUEHRUNG DURCH KONKURRIERENDE ZEITINTERVALLSCHAETZUNGEN]**
D. WIEGAND *In its* Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 84-93 1985 In GERMAN
Avail: NTIS HC A13/MF A01

Time interval estimations were performed on subjects to determine psychological workloads of car drivers. Active time interval estimates were given by 101 subjects at rest and during activity. The estimates concerned tests related to driving and driver's choice, and a trip with a 5T truck. Distinction was made between traffic-free and traffic-loaded driving, as well as between experienced and inexperienced drivers. The results show that the dispersion of the time estimate distributions makes a highly significant distinction between the different reference loads; this is also valid for the subdivisions in the driving tests. The tests show that the measuring method is also suited for field conditions. ESA

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# MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

**A87-13557**
**PROTECTION IN THE PRESSURE ENVIRONMENT - CABIN PRESSURIZATION AND OXYGEN EQUIPMENT**
R. D. HEIMBACH (Texas A & M University, College Station; Southwest Texas Methodist Hospital, San Antonio, TX) and P. J. SHEFFIELD (USAF, School of Aerospace Medicine, Brooks AFB, TX) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 110-131.

The atmospheric conditions encountered in high-altitude flight are described, along with cabin pressurization, flight suit and oxygen supply equipment. Humans with an oxygen supply can survive at over 15,000 m altitude; above 75 km altitude, a full pressure suit or a sealed, pressurized cabin is required for survival. Pressurized commercial transport aircraft cabin atmospheres are maintained at pressures simulating 610-2438 m altitude. The environmental and physiological conditions associated with rapid depressurization of an aircraft cabin are delineated. M.S.K.

**A87-13559**
**BIODYNAMICS - TRANSITORY ACCELERATION**
J. W. BRINKLEY (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) and J. H. RADDIN, JR. (Wright State University, Brooks AFB, TX) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 162-201. refs

The physiological effects, experimental database and techniques invented for protecting aircrew from injury due to high-velocity impacts are described. Physical models are developed for the types of forces imparted (negative accelerations and momentum exchanges). Variations of the effects of impacts due to aerodynamics, penetrating or blunt impacts, and whole-body acceleration are outlined; the physiological responses of the human body to impacts are inventoried. Restraint, body support and impact attenuation methods of reducing the effects of impacts are described. M.S.K.

**A87-13560**
**BIODYNAMICS - SUSTAINED ACCELERATION**
J. E. WHINNERY (USAF, School of Aerospace Medicine, Brooks AFB, TX) and S. D. LEVERETT, JR. IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 202-249. refs

The physics of flight-induced g-forces imparted on humans are reviewed, together with the experimental programs conducted to gain quantitative data on the physiological responses of humans to sustained g-forces and to identify means of ameliorating the deleterious effects. Extensive details are provided on physiological effects and efforts to define standards for certifying air crew for particular missions. The data have also been exploited to develop training, mechanical, and positive-pressure breathing techniques. M.S.K.

**A87-13561**
**VIBRATION, NOISE, AND COMMUNICATION**
H. E. VON GIERKE and C. W. NIXON (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 250-298. refs

The effects on people of the acoustic and vibratory energies germane to aerospace environments are explored in detail, together with methods used to control those energies. Techniques for measuring and analyzing sonic and/or vibratory environments are summarized, including the instrumentation and the aerospace sources which have been identified. The types of damage that can be imparted to the body by acoustic and vibratory loads and the known methods of protecting hearing are described. Several criteria are delineated for assessing noise levels and ensuring continuous communications in various acoustic environments. M.S.K.

**A87-13579**
**HUMAN FACTORS IN AEROSPACE MEDICINE**
T. B. SHERIDAN and L. R. YOUNG (MIT, Boston, MA) IN: Fundamentals of aerospace medicine . Philadelphia, PA, Lea and Febiger, 1985, p. 815-838. refs

Design guidelines and requirements for the man-machine interface of pilot and aircraft are described. The primary interfaces in the cockpit are the information conveyed to the pilot by the avionics displays, the view out the window, the tactile feedback from the controls, and the proprioceptive perceptions of spatial orientation and motions. In-depth previews are presented of the types, potential locations and functions of various electronic displays and control apparatus, and to techniques for analyzing and controlling the pilot workload. M.S.K.

**A87-13676**
**KANE'S METHOD FOR ANALYZING CRASH SEQUENCES AND CRASHWORTHY DESIGN**
S. HANAGUD and S. SARKAR (Georgia Institute of Technology, Atlanta) IN: National Specialist's Meeting on Crashworthy Design of Rotorcraft, Atlanta, GA, April 7-9, 1986, Proceedings . Alexandria, VA, American Helicopter Society, 1986, 9 p. refs

The motion of a human body involved in a crash has been studied by using Kane's formulation. The body has been modeled as a collection of rigid bodies joined together by hinges or ball socket joints. The equations for such a general system has been formulated and numerical results have been discussed for a simple system. The response of such a system to suddenly applied deceleration has been studied. The role of a symbolic manipulation program like MACSYMA' in the formulation has been discussed. Author

**A87-13677**
**THE DEVELOPMENT OF A NEW MANIKIN PROTOTYPE AND INSTRUMENTATION SYSTEM FOR CRASH/IMPACT TESTING**
G. D. FRISCH, P. E. WHITLEY (U.S. Navy, Naval Air Development Center, Warminster, PA), and P. H. FRISCH (Applied Physics, Inc., Nanuet, NY) IN: National Specialist's Meeting on Crashworthy Design of Rotorcraft, Atlanta, GA, April 7-9, 1986, Proceedings . Alexandria, VA, American Helicopter Society, 1986, 9 p. refs

A modified state-of-the-art flexible manikin, HYBRID III, is described, which is capable of three-dimensional response to an omnidirectional input and exhibits realistic interaction with the restraint systems employed. The manikin incorporates in its chest cavity a 96-channel data acquisition and storage system, supporting four megabytes of memory. Sensors measuring injury-correlatable manikin response parameters are also incorporated, with sufficient fidelity to enable direct comparison between dummy-based data and known human response to shock and acceleration environments. The manikin meets the requirements for life support equipment testing as defined by Frisch (1982). I.S.

**A87-13706*** National Aeronautics and Space Administration, Washington, D.C.
**THE ROLE OF AUTOMATION AND ROBOTICS IN SPACE STATIONS**
D. C. BLACK (NASA, Office of Space Station, Washington, DC) IN: Space station automation; Proceedings of the Meeting, Cambridge, MA, September 17, 18, 1985 . Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1985, p. 2-9.

Automation and robotics have played important roles in space research, most notably in planetary exploration. While an increased need for automation and robotics in space research is anticipated, some of the major challenges and opportunities for automation and robotics will be provided by the Space Station. Examples of these challenges are briefly reviewed. Author

**A87-13707*** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**SPACE MISSIONS FOR AUTOMATION AND ROBOTICS TECHNOLOGIES (SMART) PROGRAM**
D. L. CIFFONE and H. LUM, JR. (NASA, Ames Research Center, Moffett Field, CA) IN: Space station automation; Proceedings of the Meeting, Cambridge, MA, September 17, 18, 1985 . Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1985, p. 10-16.

The motivations, features and expected benefits and applications of the NASA SMART program are summarized. SMART is intended to push the state of the art in automation and robotics, a goal that Public Law 98-371 mandated be an inherent part of the Space Station program. The effort would first require tests of sensors, manipulators, computers and other subsystems as seeds for the evolution of flight-qualified subsystems. Consideration is currently being given to robotics systems as add-ons to the RMS, MMU and OMV and a self-contained automation and robotics module which would be tended by astronaut visits. Probable experimentation and development paths that would be pursued with the equipment are discussed, along with the management structure and procedures for the program. The first hardware flight is projected for 1989. M.S.K.

**A87-13712**
**AN INTRODUCTION TO THE CONCEPT OF ROBOT FACTORS AND ITS APPLICATION TO SPACE STATION AUTOMATION**
W. C. CHIOU, SR. (Lockheed Research Laboratories, Palo Alto, CA) and S. A. STARKS (Texas, University, Arlington) IN: Space station automation; Proceedings of the Meeting, Cambridge, MA, September 17, 18, 1985 . Bellingham, WA, Society of Photo-Optical Instrumentation Engineers, 1985, p. 53-57.

Basic operating considerations resulting from the unique environment of space are discussed, along with those resulting from the current and projected state of Automation and Robotics (A&R) which will influence the initial layout and maintenance of the Space Station. A concept called 'robot-factors' is introduced which deals with the telerobot working environment and its

organizational relationships with other robots. The robot factors are considered from the point of view of the overall system architecture of the Space Station. Design considerations concerning the physical nature of the Space Station complex, as well as those concerning the data management system, are examined. Emphasis is on making the robot's tasks safe and easy to perform, and on the telerobot's welfare in terms of that of other cooperating telerobots in the performance of a common task. Author

**A87-13949**
**MATTER OF EASE**
W. H. GREGORY Commercial Space (ISSN 8756-4831), vol. 2, Summer 1986, p. 58-60.

The following human factors and robotics research vehicles, developed at the Massachusetts Institute of Technology, are presented: (1) Beam Assembly Teleoperator, (2) Multimode proximity Operations Device, and (3) Integrated Control Station. Underwater simulations carried out to determine which tasks in space should be accomplished by astronauts and which should be handled by machine are described. Knowledge derived from the EASE (Experimental Assembly of Structures in EVA) experiment is reviewed. K.K.

**A87-15196**
**EQUIPMENT DESIGNS FOR SPACE STATION EVA EXAMINED**
Aerospace Engineering (ISSN 0736-2536), vol. 6, Aug. 1986, p. 11-14.

A survey of projected Space Station operational requirements has revealed that EVA is called for in 193 missions. A group of EVA suit requirements has been derived, and three generic EVA suit architectures, characterized as 'soft', 'hybrid' and 'hard', have been evaluated against these requirements. Study results indicate that the hard suit concept is the most promising of the three configurations. O.C.

**A87-15245**
**MANAGEMENT OF HUMAN NUTRITION UNDER PROLONGED HYPERBARIA (REVIEW OF THE LITERATURE) [VOPROSY ORGANIZATSII PITANIIA LIUDEI V USLOVIIAKH DLITEL'NOI GIPERBARII /OBZOR LITERATURY/]**
V. L. KORSAK Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), May 1986, p. 43-46. In Russian. refs

The effects of pressure and temperature inside a submarine laboratory, the duration of submersion, the composition of the local atmosphere, and the type and amount of work performed on the appetite and digestion, the metabolism, and the physical and mental capacity of the aquanauts are discussed. Attention is given to the caloric requirements and the quantitative distribution of proteins, fats, and carbohydrates in food, as well as to the types of foods to be preferred or avoided at particular stages of submersion. I.S.

**A87-15815#**
**QUANTIFYING HUMAN PERFORMANCE IN SPACE OPERATIONS**
D. L. AKIN (MIT, Cambridge, MA) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 18 p. refs
(IAF PAPER 86-24)

Results of several experimental programs aimed at quantifying the productivities of humans and machines in the space environment, both simulated and actual, are reviewed. Through neutral buoyancy simulation and space flight verification, it has been shown that humans are highly productive in EVA structural assembly and in many of those generic tasks required for any purposeful activity in the EVA field. Further neutral buoyancy research has started to document the capabilities of humans in the control of teleoperators, specifically in tasks requiring both vehicle mobility and dexterous manipulation. V.L.

**A87-15821#**
**ENHANCED PERFORMANCE FOR THE MANNED MANEUVERING UNIT**
P. E. BINGHAM (Martin Marietta Corp., Denver, CO) IAF, International Astronautical Congress, 17th, Innsbruck, Austria, Oct. 4-11, 1986. 9 p.
(IAF PAPER 86-30)

The Manned Maneuvering Unit (MMU), its physical features, the controls, and the propulsion and electrical systems are described, and the operational experience with the MMU on its last two flights (STS 41-C and STS 51-A) is discussed. The need for more propulsion capability, indicated by the astronauts who used the MMU, will be met by the Propellant Tank Kit (PTK) being currently developed. The results of development testing in the NASA/JSC Weightless Environment Test Facility are discussed. I.S.

**A87-15826#**
**INTERIOR DESIGN OF THE U.S. SPACE STATION HABITATION MODULES**
D. C. WENSLEY (McDonnell Douglas Astronautics Co., Huntington Beach, CA) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 18 p.
(IAF PAPER 86-39)

This paper describes design concepts for the habitation modules of the Space Station. A flexible interior architecture features modularized equipment compartments that permit access for maintenance and in-orbit reconfiguration as functional requirements change. The overall interior arrangement is presented with emphasis on crew quarters, operations and maintenance work stations, galley provisions, health maintenance facilities and subsystem equipment compartments. Electrical and fluid utilities are shown. Design features to enhance crew comfort and safety are described as well as functional and design relationships with the European and Japanese modules and the U.S. laboratories. Author

**A87-15838#**
**HUMAN FACTORS FOR SPACE STATION**
J. W. BROWN and N. E. BROWN IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 10 p. refs
(IAF PAPER 86-59A)

The role of human factors in the design of the Space Station is considered. Sufficient space is required to provide day-to-day living and working areas for the crew members, and room for Station and crew support equipments. Crew safety and rescue which involve proper man/system interface, adequate provisions, in-orbit rescue capabilities, crew health maintenance, and crew training are examined. The maintenance of Space Station operations and the use of automatic systems and telerobotics in the Station are discussed. The in-space and on-ground maintenance and servicing of the Space Station are studied. I.F.

**A87-16055#**
**PROSPECTS FOR THE USE OF THE HIGHER PLANTS IN SPACE FLIGHT EXPERIMENT 'SUBSTRAT'**
T. N. IVANOVA and P. T. KOSTOV (B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia za Kosmicheski Izsledvaniia, Sofia, Bulgaria) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 6 p.
(IAF PAPER 86-374)

A large scientific program has been formulated by Bulgarian scientists for the realization of space vegetable gardens to be used by cosmonauts in space flight as sources of fresh and nutritious food. The stages in which this project is to move toward its goal are summarized, and a laboratory prototype greenhouse is described. The poor results of a first attempt to grow radishes are reviewed, and the 'Substrat' experiment conducted aboard the orbital Salyut-7 station as part of the greenhouse program is described. C.D.

**A87-16060#**
**RADIATION PROBLEMS IN MANNED SPACEFLIGHT WITH A VIEW TOWARDS THE SPACE STATION**
H. BUCKER and R. FACIUS IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 9 p.
(IAF PAPER 86-379)

The present discussion endeavors to emphasize the gaps of present knowledge and capabilities which must be closed for an effective and economic realization of a radiation protection concept for manned spaceflight. The usual convention in radiation protection to assume worst case conditions whenever the facts are unknown would unduly compromise the design and construction of the Space Station. This cogently implies the necessity and high priority of a research program to close these gaps. The attached proposals for experiments are directed towards this goal with respect to some of these gaps. Author

**A87-16071*#** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
**SPACE STATION HABITABILITY RESEARCH**
Y. A. CLEARWATER (NASA, Ames Research Center, Moffett Field, CA) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 8 p. refs
(IAF PAPER 86-397)

The purpose and scope of the Habitability Research Group within the Space Human Factors Office at the NASA/Ames Research Cente is described. Both near-term and long-term research objectives in the space human factors program pertaining to the U.S. manned Space Station are introduced. The concept of habitability and its relevancy to the U.S. space program is defined within a historical context. The relationship of habitability research to the optimization of environmental and operational determinants of productivity is discussed. Ongoing habitability research efforts pertaining to living and working on the Space Station are described. Author

**A87-16073#**
**HABITABILITY DESIGN OF EUROPEAN SPACECRAFT HERMES - ERGONOMIC ASPECTS**
A. COBLENTZ, E. FOSSIER, G. IGNAZI, and R. MOLLARD (Paris V, Universite, France) IAF, International Astronautical Congress, 37th, Innsbruck, Austria, Oct. 4-11, 1986. 6 p.
(IAF PAPER 86-399)

The development of three-dimensional human body models for studying habitability in the spacecraft environment (Hermes) is discussed. The models are applied to the analysis of man-system interfaces and the equipment constraints imposed on astronauts are considered. The characteristics of functional reach, muscular ability, and body posture in weightlessness are evaluated. Sketches of the three-dimensional models utilized in this study are provided. I.F.

**N87-12110#** Joint Publications Research Service, Arlington, Va.
**PROFESSIONAL WORK CAPACITY AND FUNCTIONAL STATE OF OPERATOR EXPOSED TO REPEATED OPTOKINETIC AND ANTIORTHOSTATIC FACTORS**
L. N. KORNILOVA, L. D. SMIRICHEVSKIY, A. V. TRUTNEV, S. L. CHEKANOVA, I. Y. YAKOVLEVA, and S. L. KRAVCHENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 43 - 48 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), Vo. 20, No. 2, Mar. - Apr. 1986, p 35-38
Avail: NTIS HC A07/MF A01

It has been shown that optokinetic stimulation that elicits sensory-autonomic manifestations of motion sickness and head-down tilt that simulates fluid redistribution in the cranial direction decrease professional abilities of the operator even after he has developed good skills. Repeated exposures to optokinetic stimulation or head-down tilt have some training effect. However, control tests that include both optokinetic stimulation and head-down tilt give evidence that their training effect is not adequate. Author

**N87-12118#** Joint Publications Research Service, Arlington, Va.
**EFFECT OF LONG-TERM STORAGE ON SOME PARAMETERS OF FAT INGREDIENT OF FREEZE-DRIED PRODUCTS**
A. K. SIVUK, A. G. KASATKINA, Y. I. STRUKOVA, V. P. NAYDINA, and Y. Y. ZHARKOVSKAYA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 93 - 97 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 69-72
Avail: NTIS HC A07/MF A01

The effect of prolonged storage at the temperature 20 +/- 5 C and relative humidity 70 to 80% on the freeze-dried food products packed in a three-layer polymer was investigated. The organoleptic parameters, fat content and fat physicochemical properties were determined in the freshly prepared foods and foods stored for 6, 10 and 14 months. The fat component of cereals and vegetables was found to change during storage: the acid and peroxide numbers increased, products of secondary oxidation accumulated and nonsaturated fatty acids decreased. Among the foodstuffs examined the buckwheat cereal and mashed potatoes proved to be most stable and edible after 14 months of storage. Author

**N87-12120#** Joint Publications Research Service, Arlington, Va.
**RECLAMATION OF WATER USED FOR WASHING BY MEANS OF REVERSE OSMOSIS DURING LONG-TERM SPACEFLIGHTS**
S. V. POLYAKOV, V. D. VOLGIN, Y. Y. SINYAK, Y. D. MAKSIMOV, and V. I. NOVIKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 106 - 109 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 78 - 80
Avail: NTIS HC A07/MF A01

Experiments on the purification of wash water by means of reverse osmosis membranes MGA-100 were performed. The membrane selectivity with respect to the major components (catamine AB, amine oxide and sodium chloride) was close to 100% whereas membrane permeability was not lower than 70% that of distilled water. The results of a field study in which 330 l of repeatedly used wash water were reclaimed showed that reverse osmosis can be effectively employed for that purpose. Author

**N87-12121#** Joint Publications Research Service, Arlington, Va.
**SANITARY AND MICROBIOLOGICAL ASPECTS OF CLOSED ENVIRONMENT OCCUPIED BY PEOPLE AND ANIMALS**
V. M. KNYAZEV, V. I. KOROLKOV, A. N. VIKTOROV, G. O. POZHARSKIY, L. N. PETROVA, and V. P. GORSHKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 20, No. 2, Mar. - Apr. 1986 (JPRS-USB-86-004) p 110 - 113 23 Jul. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 2, Mar. - Apr. 1986 p 80-82
Avail: NTIS HC A07/MF A01

Men and animals (dogs) shared an enclosed environment for 30 days. The microorganisms on their skin and in the air were examined. Specific attention was given to staphylococcal pathogens that are potential causal agents of infectious diseases in enclosed bioobjects. The data obtained suggested that conditional pathogens can be exchanged between men and animals sharing an environment and clarify the mechanism(s) of their transfer. The experimental results have been used to develop prophylactic measures against diseases caused by conditional pathogens among men and animals sharing an enclosed environment. Author

**N87-12127#** Joint Publications Research Service, Arlington, Va.
**PSYCHOPHYSIOLOGICAL ASPECTS OF COLOR-CODING OF FLIGHT AND NAVIGATION INFORMATION ON ONBOARD ELECTRONIC DISPLAYS**
A. A. OBOZNOV, A. N. BOYARSKIY, and S. I. BUTURLIN *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 20-24 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 16-19
Avail: NTIS HC A08/MF A01

Psychophysiological characteristics of pilots were compared when they used a color or a black-and-white electronic indicator in simulating a landing approach on a pilot trainer. No significant differences were seen in the objective evaluations of the visual function or in the precision with which the prescribed flight profile was maintained. However, subjective preferences were given to the color indicator. When the task was more complex (simulation of the deviated landing course), the time spent on looking for significant symbols and on recovering the necessary course decreased, if the pilots used a color indicator. It is concluded that the use of a color indicator can be redundant in performing simple tasks and therefore indifferent for pilot activities but it can be useful in performing complicated tasks when the pilot has to make a precise and quick assessment of the situation. Author

**N87-12135#** Joint Publications Research Service, Arlington, Va.
**BIOLOGICAL VALUE OF PROTEINS IN FOOD ALLOWANCE OF SALYUT ORBITAL STATION CREWS**
V. P. BYCHKOV, T. F. VLASOVA, V. N. GRYAZNOVA, Y. A. SEDOVA, A. K. SIVUK, V. A. TRETYAKOVA, and A. S. USHAKOV *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 64-69 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsin (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 44-48
Avail: NTIS HC A08/MF A01

The biological value of the protein component of three modifications of the Salyut space diet was measured in laboratory studies and in simulated space flights. Three experimental runs of up to 68 days in duration were carried out on 20 volunteers. During the study the following parameters of protein metabolism were measured: total protein and protein fractions in serum; urea, uric acid and creatinine in blood; total nitrogen, urea, ammonia, uric acid and creatinine in urine. The results obtained showed that the diet modifications provided an adequate nutritional status and a normal level of the above parameters of protein metabolism. Author

**N87-12145#** Joint Publications Research Service, Arlington, Va.
**EVALUATION OF METHOD FOR COLLECTING AND CONCENTRATING ORGANIC TRACE IMPURITIES IN AIR**
O. A. SUKHORUKOV, M. V. AZAROVA, and B. L. AVETISYANTS *In its* USSR Report: Space Biology and Aerospace Medicine (JPRS-USB-86-006) p 120-124 8 Oct. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 4, Jul. - Aug. 1986 p 81-83
Avail: NTIS HC A08/MF A01

At the present time, in gas chromatography the limit of sensitivity of ionization detectors has been virtually reached, and further raising of the range of detection of trace impurities may proceed either in the direction of increasing the amount of trace impurities per unit sample volume fed to the input of an instrument, or by means of more efficient conversion of information in the course of measurement and data processing at different stages of analysis. Concentration is one of the ways of increasing information per unit sample volume. However, in the course of concentration there could be worsening of metrological characteristics of the analytical measurement process, and there could be increased loss of material due to irreversible adsorption on sorbents and interaction of impurities with one another. Then it becomes necessary to additionally purify the gases and reagents used. All this compels us to investigate more thoroughly the different stages of analysis of trace impurities in the method needed to examine contaminants in the environment and room air. Methods were evaluated of collecting and concentrating trace impurities from the air using a standard method of preparing them (diffusion through a capillary). Author

**N87-12166*#** Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
**THE SPACE STATION: HUMAN FACTORS AND PRODUCTIVITY**
D. J. GILLAN, M. J. BURNS, C. L. NICODEMUS, and R. L. SMITH 1986 9 p
(Contract NAS9-15800)
(NASA-CR-179905; NAS 1.26:179905) Avail: NTIS HC A02/MF A01 CSCL 05H

Human factor researchers and engineers are making inputs into the early stages of the design of the Space Station to improve both the quality of life and work on-orbit. Effective integration of the human factors information related to various Intravehicular Activity (IVA), Extravehicular Activity (EVA), and teletobotics systems during the Space Station design will result in increased productivity, increased flexibility of the Space Stations systems, lower cost of operations, improved reliability, and increased safety for the crew onboard the Space Station. The major features of productivity examined include the cognitive and physical effort involved in work, the accuracy of worker output and ability to maintain performance at a high level of accuracy, the speed and temporal efficiency with which a worker performs, crewmember satisfaction with their work environment, and the relation between performance and cost. B.G.

**N87-12167#** Human Engineering Labs., Aberdeen Proving Ground, Md.
**A HELICOPTER FLIGHT EVALUATION OF KINESTHETIC-TACTUAL DISPLAYS Interim Report**
A. M. POSTON and R. S. DUNN Mar. 1986 20 p
(AD-A168302; HEL-TN-3-86) Avail: NTIS HC A02/MF A01 CSCL 01D

The kinesthetic-tactual (KT) display concept employs moveable elements incorporated in a pilot's flight control handgrips. A series of laboratory and simulator studies conducted since 1976 has shown that this touch-based display approach can substitute for visual displays or augment them in useful ways. This report describes the first helicopter flight evaluation and demonstration of KT displays. Flight performance data were collected to compare the conventional visual display condition to KT conditions. Performance results as well as pilot opinion comments are discussed along with conclusions and implications for further KT system development. This is an interim report because in-depth analysis of the flight data is still underway. The most promising potential benefits in mission applications of KT displays are for conditions where visual task demands are high; for example, helicopter terrain flight requiring continuous visual attention outside the cockpit, and where use of conventional visual displays is complicated by night vision devices. GRA

**N87-13146#** Deutsche Gesellschaft fuer Luft- und Raumfahrt, Bonn (West Germany).
**PROCEEDINGS OF A SYMPOSIUM ON THE EVALUATION OF MAN-MACHINE SYSTEMS: METHODS AND PROBLEMS [BEWERTUNG VON MENSCH-MASCHINE-SYSTEMEN. METHODEN UND PROBLEMATIK]**
1985 277 p Partly in GERMAN and ENGLISH Symposium held in Cologne, West Germany, 14-15 Nov. 1985
(DGLR-85-04; ISBN-3-922010-30-X; ETN-86-98080) Avail: NTIS HC A13/MF A01

Anthropometric handicaps in helicopter cockpits; an obstacle-warning radar for helicopters; the workload and stress of a cockpit crew; and the simulation of human service reliability in the manual control of aircraft were studied. The system-ergonomic workload in highly automated process control tasks; and psychological workload during task-related activities were analyzed. A research method to determine the quality of task mastering by navigators in ship guidance; and the vibrations of the spinal column were tested. Human factors engineering in nuclear power plant

control; and the ergonomic requirements for the design of control rooms were investigated. The possibilities of the eye-mark investigation as an anthropotechnical method to study man machine systems; measures, basic conceptions and inquiry techniques for the evaluation of man machine systems were studied. The empirical determination of the acceptable user surface in automated air conditioning systems was investigated.
ESA

**N87-13147#** Forschungsinstitut fuer Anthropotechnik, Wachtberg (West Germany)
**EVALUATION OF MAN MACHINE SYSTEMS: INTRODUCTION AND OVERVIEW [BEWERTUNG VON MENSCH-MASCHINE-SYSTEMEN, EINFUEHRUNG UND UEBERSICHT] UEBERSICHT]**
K. P. GAERTNER and W. STEIN *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 2-9 1985 In GERMAN
Avail: NTIS HC A13/MF A01

The organization, evaluation, and study of man-machine systems are discussed. Decisions to be made during each of these tasks are specified. Emprirical and model-based methods of studying man-machine systems are briefly addressed. Problems to be overcome in reconciling the various goals involved in optimizing man-machine systems are considered. ESA

**N87-13148#** Institute of Aviation Medicine, Manching (West Germany).
**ANTHROPOMETRIC HANDICAPS IN THE CONSTRUCTION OF A HELICOPTER COCKPIT [ANTHROPOMETRISCHE VORGABEN FUER DIE KONSTRUKTION EINES HUBSCHRAUBER-COCKPITS]**
G. KROH *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 10-24 1985 In GERMAN
Avail: NTIS HC A13/MF A01

Helicopter pilots were used to test the dummy cockpit of a helicopter now under dwevelopment in order to develop a data base for the seating and the steering organs. Seated tests showed that the postures assumed by the pilots during flights generally did not agree with those envisioned in the construction specifications. This was due to the relatively large discrepancy in arm length between the 5th and the 99th percentile. To prevent their arms from getting tired, the pilots pushed the seat back farther than expected by the designer. Suggestions are also briefly made for the location of the stick and pedals. ESA

**N87-13150#** Technische Univ., Berlin (West Germany). Inst. fuer Luft- und Raumfahrt.
**DETERMINATION OF THE LOAD AND STRESS OF A COCKPIT CREW DURING AIRCRAFT PILOTING USING TASK NETWORKS AND THE SIMULATION LANGUAGE SAINT [ERMITTLUNG VON PILOTENBELASTUNG BZW. -BEANSPRUCHUNG BEI DER FLUGZEUGFUEHRUNG MIT HELFE VON AUFGABENNETZ-WERKEN UND SAINT]**
M. FRICKE, U. KOPP, and D. NIEMEYER *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 34-45 1985 In GERMAN
Avail: NTIS HC A13/MF A01

The load/stress on a cockpit crew of a B 727 during an ILS CAT I flight was investigated by digital simulation of more than 20 flights. A model describing the complex working process of the flight crew and its interaction with the environment is developed. The simulation flights are described, and the various tasks engaged in by the crew during the flights are specified and discussed.
ESA

**N87-13151#** Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Hubschrauber und FLugzeuge.
**APPLICATION OF THE TASK TAXONOMY METHOD TO THE SIMULATION OF HUMAN SERVICE RELIABILITY IN THE MANUAL CONTROL OF AIRCRAFT [ANWENDUNG DER METHODE DER AUFGABENTAXONOMIE ZUR SIMULATION MENSCHLICHEN BEDIENZUVERLAESSIGKEIT BEI DER MANUELLEN STEUERUNG VON FLUGZEUGEN]**
K. BRAUSER *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 46-61 1985 In GERMAN
(MBB/LKE-301/S/PUB/216) Avail: NTIS HC A13/MF A01

The method of problem taxonomy, based on data on human reliability and aimed at obtaining improved surveying and evaluation of such data, is described. The simulation of the problem of manual steering of an aircraft pitching axis during landing approach using this method together with the simulation program SAINT is discussed. The human error probability for various steering errors obtained using the method is reported. ESA

**N87-13152#** Forschungsinstitut fuer Anthropotechnik, Wachtberg (West Germany).
**SYSTEM-ERGONOMIC WORKLOAD ANALYSIS FOR HIGHLY AUTOMATED PROCESS CONTROL TASKS [SYSTEMERGONOMISCHE BELASTUNGSANALYSEN BEI HOCHAUTOMATISIERTEN PROZESSFUEHRUNGSAUFGABEN]**
B. DOERING *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 62-83 1985 In GERMAN
Avail: NTIS HC A13/MF A01

A method to evaluate the ergonomic design of the interface operator-process guiding center in a highly automated shipbuilding industry was developed. The method determines task difficulty due to this intersection, on the basis of load factors the value of which are subjectively evaluated. The acquired information can be a basis for an improved interface design. A simulation model which reproduces the work process of the operator and the technical processes including perturbation, and which allows a comparative evaluation of different work situations was developed. The difficulties of the single tasks of the work process are classified by the model. The result of the simulation is information about the duration of the single work difficulties, as well as an integrative workload index which allows a comparative evaluation of the effects of different perturbations on the work situations. ESA

**N87-13154#** Fachhochschule, Hamburg (West Germany). Fachbereich Seefahrt.
**DEVELOPMENT OF A RESEARCH METHOD TO DETERMINE THE QUALITY OF TASK MASTERING BY NAVIGATORS IN SHIP GUIDANCE [ENTWICKLUNG EINES UNTERSUCHUNGSVERFAHRENS ZUR ERMITTLUNG DER QUALITAET DER AUFGABENBEWAELTIGUNG VON NAUTIKERN BEI DER SCHIFFSFUEHRUNG]**
J. FROESE, A. DAMICO (Merchant Marine Research Center, New York, N.Y.), U. PEDERSEN (Hapag-Lloyd A.G., Hamburg (West Germany).), and N. SABLOWSKI (Hamburg Univ. (West Germany).) *In* DGLR Proceedings of a Symposium on Evaluation of Man-Machine Systems: Methods and Problems p 94-113 1985 In GERMAN
Avail: NTIS HC A13/MF A01

An evaluation method for the effects of ship bridge occupation and installation on the quality of navigation was developed using the ship navigation and simulation program SUSAN. Preliminary results show that the method is suitable for research purposes.
ESA

**N87-13156#** Technischer Uerberwachungs-Verein Rheinland, e.V., Cologne (West Germany). Inst. fuer Unfallforschung und Ergonomie.

**REVIEW OF THE METHODS APPLIED IN THE FEDERAL REPUBLIC OF GERMANY TO INVESTIGATE HUMAN FACTORS IN NUCLEAR POWER PLANT CONTROL [UEBERLICK UEBER IN DER BRD ANGEWANDTE METHODEN ZUR UNTERSUCHUNG MENSCHLICHER FAKTOREN IN KERNKRALTWERKSWARTEN]**

D. B. THOMAS *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 127-136 1985 In GERMAN

Avail: NTIS HC A13/MF A01

Human factors evaluation methods for nuclear power plants are presented. Field studies provide primary information, but laboratory studies in which the variables can be manipulated without the contaminating influence of external factors, are required for predictions but are missing for German nuclear power plants and cannot simply be taken from other countries because the operational parameters are different. ESA

**N87-13157#** Technischer Uerberwachungs-Verein Rheinland, e.V., Cologne (West Germany). Inst. fuer Unfallforschung und Ergonomie.

**SIMULATION OF DISTURBANCES ON THE NUCLEAR POWER PLANT SIMULATOR. THE PROBLEM OF THE INTERPRETATION OF OPERATOR ACTIONS AND THEIR COGNITIVE BACKGROUNDS AS A BASIS FOR DESIGN RECOMMENDATIONS [STOERUNGSSIMULATION AM KRAFTWERKSIMULATOR - ZUM PROBLEM DER INTERPRETATION VON OPERATEURHANDLUNGEN UND DEREN KOGNITIVER HINTERGRUENDE ALS BASIS FUER GESTALTUNGSEMPFEHLUNGEN]**

G. BECKER *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 137-154 1985 In GERMAN

Avail: NTIS HC A13/MF A01

Parameters which influence the correctness of the mental model representation of unusual process evolutions were studied on a simulator in order to improve the understanding of operators in nuclear power plants. The operator's position and complex technical connections are described. Power control, steam barrier supply, and turbine condenser in a power plant are described. The simulated disturbance situation and the behavior of the operators are discussed. The results show that, even in the case of simple disturbances, error management is a very complex and diversified task. Knowledge-based, rule-based, and skill-based operator's behavior are discussed. ESA

**N87-13158#** Kraftwerk Union A.G. Reaktortechnik, Erlangen (West Germany).

**ERGONOMIC REQUIREMENTS FOR THE DESIGN OF CONTROL ROOMS. EVALUATION METHOD [ERGONOMISCHE ANFORDERUNGEN AN DIE WARTENGESTALTUNG -BEWERTUNGSMETHODE]**

W. HINZ *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 155-164 1985 In GERMAN

Avail: NTIS HC A13/MF A01

A method for the ergonomic qualitative evaluation of control rooms (command post, control stand) is presented. The aim was to develop design standards in order to secure suitable working conditions. Each operational situation is classified with respect to the action which the operators have to take in order to evaluate and influence the process. The method provides a starting point for a more objective evaluation, but requires expert designers because a number of evaluation criteria are lacking. ESA

**N87-13159#** Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

**A METHOD FOR THE OPTIMUM DESIGN OF THE MAN MACHINE INTERFACE [EIN VERFAHREN ZUR OPTIMALEN GESTALTUNG DER MENSCH-MASCHINE-SCHNITTSTELLE]**

V. BEHRENDT, H. D. HARTFIEL (Kraftwerk Union A.G. Reaktortechnik, Erlangen (West Germany).), H. R. MANNHAUPT (Technische Univ., Munich (West Germany).), W. PREUSS (Cologne Univ. (West Germany).), and D. B. THOMAS *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 165-186 1985 In GERMAN

Avail: NTIS HC A13/MF A01

A task-related, ergonomic method for the optimization of man machine systems was developed and applied to nuclear power plants. The operator's tasks and the man machine interface are analyzed. A catalog of ergonomic design recommendations is given. The relations between these recommendations and the operations are explained. The applicability of the method is demonstrated in principle, but a number of open questions still remains. ESA

**N87-13160#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugfuehrung.

**THE EYE-MARK INVESTIGATION AS AN ANTHROPOTECHNICAL METHOD TO STUDY MAN MACHINE SYSTEMS [DIE BLICKZIELUNTERSUCHUNG ALS ANTHROPOTECHNISCHE UNTERSUCHUNGSMETHODE IM MENSCH-MASCHINE-SYSTEM]**

R. UCKERMANN *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 187-199 1985 In GERMAN

Avail: NTIS HC A13/MF A01

Methods and instrumentation used in research on the sequence of eye fixations performed by an aircraft pilot as he guides an aircraft are discussed. The oculogram method, the cornea-reflex method, and the motionless method used in the DEBIC apparatus are summarized, and the apparatus used by the DFVLR are described. Research results obtained using these methods and apparatus are briefly discussed. ESA

**N87-13161#** Technische Univ., Brunswick (West Germany). Fachgebeit Arbeitswissenschaft.

**BASIC CONCEPTIONS FOR THE EVALUATION OF MAN MACHINE SYSTEMS [GRUNDKONZEPT FUER DIE BEWERTUNG VON MENSCH-MASCHINE-SYSTEMEN]**

J. H. KIRCHNER *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 200-212 1985 In GERMAN

Avail: NTIS HC A13/MF A01

The requirements for evaluating man-machine systems are given, and evaluation procedures are discussed in detail. Direct and indirect evaluation of man-machine systems is addressed. A concept for such evaluation is developed, stressing its ergonomic aspects. ESA

**N87-13162#** Dortmund Univ. (West Germany). Inst. fuer Arbeitsphysiologie.

**INQUIRY TECHNIQUES FOR THE EVALUATION OF MAN MACHINE SYSTEMS [BEFRAGUNGSTECHNIKEN BEI DER BEWERTUNG VON MENSCH-MASCHINE-SYSTEMEN]**

M. SCHUETTE *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 213-228 1985 In GERMAN

Avail: NTIS HC A13/MF A01

The study of loads imposed on a person and the resulting psychophysical consequences for that person in the context of a man-machine interaction is discussed. Both environmentally caused and task-based loads are considered. Two approaches to investigating these aspects of man-machine systems are examined, an older one-dimensional approach and a more recent multidimensional one. The resulting evaluation of loads in either absolute or relative terms is discussed. ESA

**N87-13163#** Standard Elektrik Lorenz A.G., Stuttgart (West Germany). *Forchungszentrum.*
**A MEASURE OF USABILITY**
W. FLOHRER *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 229-238 1985
Avail: NTIS HC A13/MF A01

In order to evaluate the usability of technical equipment not only the time of operation and the error rate have to be considered but also the learning process, i.e., the function time of operation versus number of repeated test trials. The analysis of data (test results), collected over many years, has shown, that the learning curve can be approximated by a simple mathematical formula; the parameters of which differ from one system, device or equipment to another but can easily be calculated. The parameters found can be used to evaluate technical equipment with respect to its usability. Such a measure of usability could enable the engineer or manager to compare technical equipment not only by technical viewpoints or costs but also by one criterion of human factors engineering. ESA

**N87-13164#** Muenster Univ. (West Germany). Psychologisches Inst. 2.
**EVALUATION OF THE BEARING AND KNOWLEDGE REQUIREMENTS OF MAN MACHINE SYSTEMS [DIE BEWERTUNG DER LERN- UND WISSENSANFORDERUNGEN VON MENSCH-MASCHINE-SYSTEMEN]**
T. BOESSER *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 239-248 1985 In GERMAN
Avail: NTIS HC A13/MF A01

The division of the learning process into an acquisition and an exercise phase is outlined. Examples of learning processes are given. The theoretical and methodological fundamentals of the evaluation method are explained. The method was tested on a number of simple examples and proves to be usable. Problems encountered in the practical application of the method are presented. The implementation of improvements is planned. ESA

**N87-13165#** Siemens A.G., Karlsruhe (West Germany). Systemtechnische Entwicklung.
**EMPIRICAL DETERMINATION AMONG SUPERINTENDENTS OF THE ACCEPTABLE USER SURFACE IN DIGITALLY AUTOMATED HEATING-VENTILATION AIR CONDITIONING SYSTEMS [EMPIRISCHE ERMITTLUNG DER FUER HAUSMEISTER AKZEPTABLEN BENUTZEROBERFLAECHE BEI DIGITAL AUTOMATISIERTEN HEIZUNGS-LUEFTUNGS-KLIMA-ANLAGEN]**
H. J. CHARWAT *In* DGLR Proceedings of a Symposium on the Evaluation of Man-Machine Systems: Methods and Problems p 249-269 1985 In GERMAN
Avail: NTIS HC A13/MF A01

Inquiries were conducted among superintendents of heating-ventilation air (HVA) conditioning systems in order to provide information for an acceptable and successful design of such systems. The user surface is only correct if it is accordance with the knowledge, the comprehension, the expectations, and the practical behavior of the potential user. The superintendents' tasks were divided into six groups. A set of increasingly concrete questions was asked for each group (method of stepwise concretization) in order to exclude any suggestive effect. Verbal understanding problems were overcome by visualization. A design of a control system based on the results of these inquiries is presented. ESA

**N87-13166*#** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
**THE ECOLOGY OF MICROORGANISMS IN A SMALL CLOSED SYSTEM: POTENTIAL BENEFITS AND PROBLEMS FOR SPACE STATION**
E. B. RODGERS Oct. 1986 61 p
(NASA-TM-86563; NAS 1.15:86563) Avail: NTIS HC A04/MF A01 CSCL 06K

The inevitble presence on the space station of microorganisms associated with crew members and their environment will have the potential for both benefits and a range of problems including illness and corrosion of materials. This report reviews the literature presenting information about microorganisms pertinent to Environmental Control and Life Support (ECLS) on the space station. The perspective of the report is ecological, viewing the space station as an ecosystem in which biological relationships are affected by factors such as zero gravity and by closure of a small volume of space. Potential sites and activities of microorganisms on the space station and their environmental limits, microbial standards for the space station, monitoring and control methods, effects of space factors on microorganisms, and extraterrestrial contamination are discussed. Author

**N87-13167*#** McDonnell-Douglas Astronautics Co., Houston, Tex.
**ADVANCED EVA SYSTEM DESIGN REQUIREMENTS STUDY Final Technical Report**
Jan. 1986 248 p
(Contract NAS9-17299)
(NASA-CR-171942; NAS 1.26:171942; MDC-W0072) Avail: NTIS HC A11/MF A01 CSCL 05H

Design requirements and criteria for the Space Station Advanced Extravehicular Activity System (EVAS) including crew enclosures, portable life support systems, maneuvering propulsion systems, and related extravehicular activity (EVA) support equipment were defined and established. The EVA mission requirements, environments, and medical and physiological requirements, as well as opertional, procedures, and training issues were considered. B.G.

**N87-13168#** Olis Engineering, Sedalia, Colo.
**CONCEPT STUDY - VEHICLE WASTE DISPOSAL SYSTEM Final Report, 1 Aug. 1985 - 28 Jan. 1986**
C. K. LORD 28 Jan. 1986 30 p
(Contract DAAE07-85-C-R089)
(AD-A169045; TACOM-TR-13155) Avail: NTIS HC A03/MF A01 CSCL 13F

This concept study was initiated to investigate the feasibility of developing a waste disposal system to process and dispose of human waste generated in combat vehicles operating in a nuclear, biological, and chemical (NBC) contaminated environment. GRA

**N87-13169#** Naval Biodynamics Lab., New Orleans, La.
**GUIDELINES FOR SAFE HUMAN EXPERIMENTAL EXPOSURE TO IMPACT ACCELERATION**
M. S. WEISS and L. S. LUSTICK 1986 33 p
(AD-A169347; NBDL-86R006) Avail: NTIS HC A03/MF A01 CSCL 06S

The objective of the human volunteer impact experiments at the Naval Biodynamics Laboratory (NBDL) is to provide a quality data base for modeling human dynamic and phsyiological responses to impact, and for establishing the relationship between dynamic response parameters and injury. To achieve this objective, the human volunteer impact experiments must be conducted at levels of impact that may produce discomfort but are safe in as much as the experiments have an acceptably low probability of producing any permanent or irreversible injury. These safe levels of impact are derived from one or more of the following sources: (1) exposures employed in previous NBDL research with human subjects; (2) human exposure data from other research sources; (3) exposures using human surrogates/human cadavers; and, (4) mathematical modeling techniques. Based on a review of these sources, limits suggested to the Committee for the Protection of

Human Subjects as safe guidelines are included. These are recommended limits for torso-restrained NBDL volunteers, where the freely moving head and neck are the anatomical segments most at risk. GRA

**N87-13170#** Department of the Air Force, Washington, D.C.
**RAPID ACTING ELECTRO-PNEUMATIC ANTI-G SUIT CONTROL VALVE Patent Application**
R. E. VANPATTEN, inventor (to Air Force) 24 Feb. 1986 23 p
(AD-D012377; US-PATENT-APPL-SN-831901) Avail: NTIS HC A02/MF A01 CSCL 13G

This patent application discloses a novel anti-G suit valve system which provides very rapid response to imminent high acceleration. The disclosed embodiments of the new valve system can be retrofitted to existing mechanical and anti-G valves to create a hybrid valve system capable of achieving the desired qualities of fast triggering of the valve in response to imminent acceleration and maximum rate inflation of the anti-G suit. The new valve system measures acceleration and, by differentiation, the rate of change of acceleration. When both acceleration and rate of change of acceleration exceed preselected values, a solenoid mounted in place of the press-to-test button on a mechanical anti-G valve is energized for a preselected period of time to fully depress the valve spindle, providing maximum rate delivery of pressurized air. The hybrid valve reverts to normal operation at the end of the preselected period of time. Another embodiment monitors an aircraft computer control system digital data bus and adds the requirement of detecting preselected signal values from the data bus to trigger the delivery of pressurized air. A modification of this embodiment requires only the detection of the preselected data bus signal values to initiate maximum rate delivery of pressurized air for the preselected period of time. The anti-G suit valve system may also be operated by manually determining the imminent likelihood of high acceleration and manually actuating the maximum rate delivery. GRA

**N87-13171#** Department of the Air Force, Washington, D.C.
**IMPROVED ANTI-G SUIT Patent Application**
T. J. JENNINGS, inventor (to Air Force) 24 Feb. 1986 14 p
(AD-D012378; US-PATENT-APPL-SN-831886) Avail: NTIS HC A02/MF A01 CSCL 15E

This patent application discloses an improved anti-G suit which incorporates stiffening inserts sized and shaped to cover each inflatable air bladder and inserted between the bladders and the anti-G suit fabric. The stiffeners may be made of polypropylene, neoprene rubber, or a composite structure of Kevlar fabric and polyethylene. A butt strap covers the buttocks of an aircrew member and is secured by belts extending across the abdominal and the high bladders of the anti-G suit. Inflation of the air bladders pulls the strap butt to compress the butt strap tightly against the aircrew member's buttocks. GRA

**N87-13172#** Computer Technology Associates, Inc., McLean, Va.
**HUMAN PERFORMANCE ASPECTS OF SMALL SCREEN DISPLAYS: A LITERATURE REVIEW REVEALING THE LACK OF SPECIFIC RESEARCH Final Report**
R. L. SHANNON and L. J. STEWART May 1986 59 p
(Contract DAAK11-84-D-0008)
(AD-A170660; HEL-TN-5-86) Avail: NTIS HC A04/MF A01 CSCL 05J

Literature from diverse disciplines pertinent to the human performance aspects of small screen displays was examined. In particular, four subtopics were focused on. They include: display size, defined as number of characters per number of lines; protocols, defined as ways users interact with a system to achieve their goals; abbreviations; and vocabulary. The results indicate the lack of specific research on small screen displays but also indicate a trend in current research interest and towards interest in the near future. The report points out other research trends and voids and contains an annotated bibliography of more than 100 source documents. Author (GRA)

# 55

# SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

**A87-16148**
**BEHAVIOR OF AGGREGATES OF CATALYTICALLY INTERACTING MACROMOLECULES (SYSERS) IN COACERVATES [POVEDENIE SOVOKUPNOSTEI KATALITICHESKI VZAIMODEISTVUIUSHCHIKH MAKROMOLEKUL/SAIZEROV/V KOATSERVATAKH]**
V. G. REDKO Biofizika (ISSN 0006-3029), vol. 31, July-Aug. 1986, p. 701-703. In Russian. refs

The behavior of aggregates of catalytically interacting macromolecules (sysers) with respect to their selectivity characteristics was analyzed for sysers in a homogeneous medium and those in coacervates, using a mathematical model. The model of a syser system consisted of a polynucleotide matrix and two protein units, representing replicational and translational proteins, respectively. It is shown that the stationary distribution of sysers in a homogeneous medium is determined by the initial matrix distribution. The results are of interest in connection with the study of prebiological evolution. I.S.

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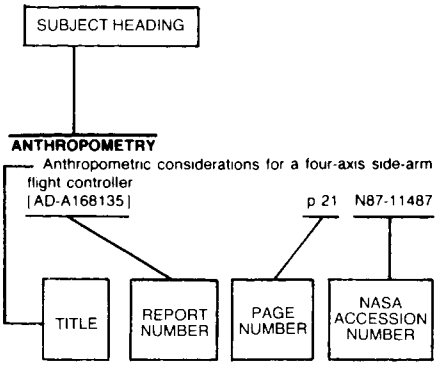


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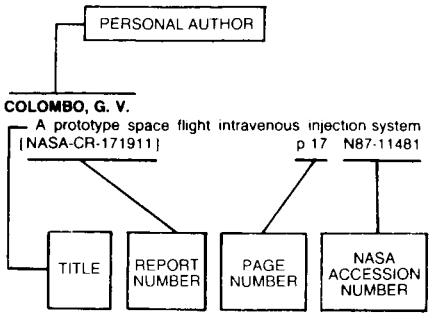


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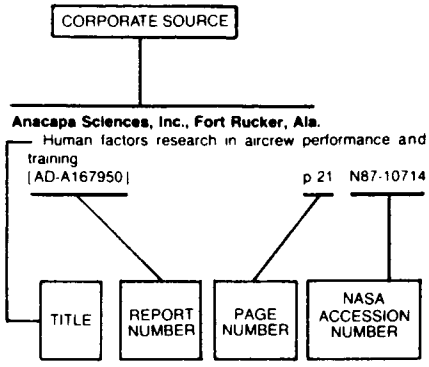


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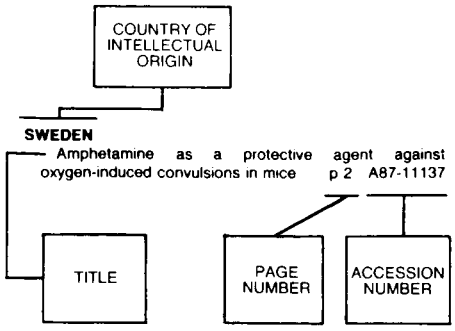


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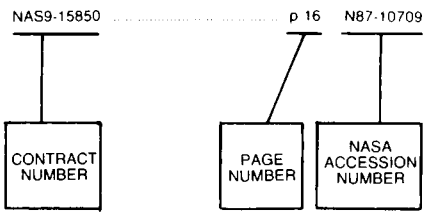


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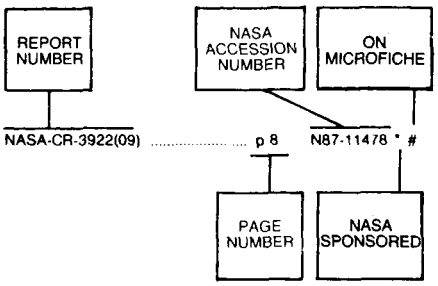


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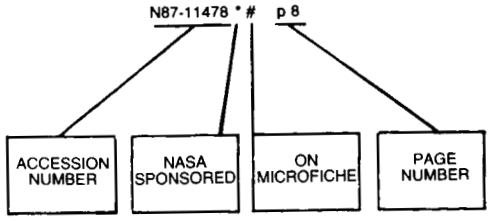


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