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Aerospace Medicine and Biology
A Continuing Bibliography with Indexes

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 322)

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 March 1989 in

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

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 163 reports, articles and other documents announced during March 1989 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 on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. 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.

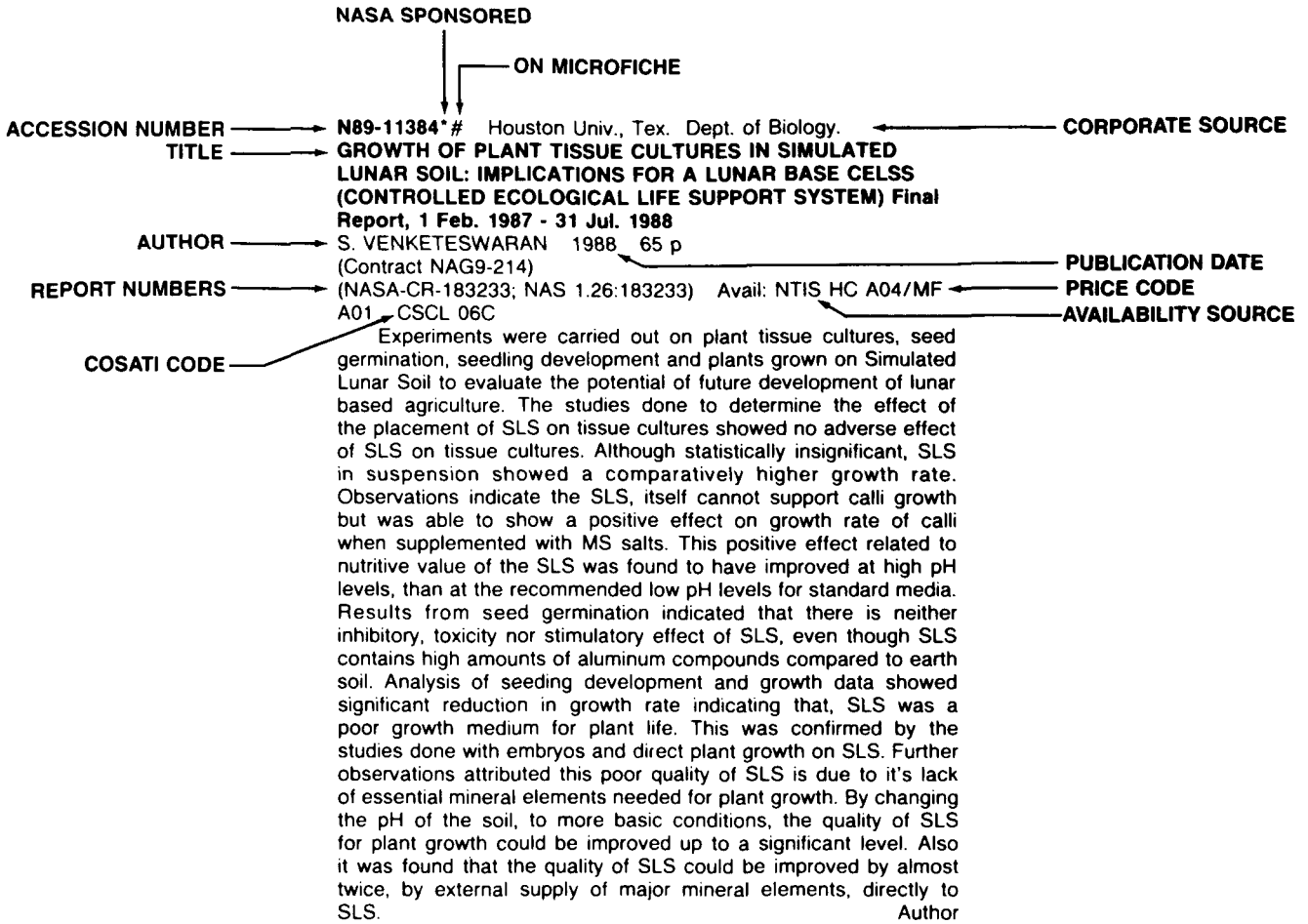
Seven indexes — subject, personal author, corporate source, foreign technology, contract, report number, and accession number — are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1989 Supplements.

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

TABLE OF CONTENTS

TYPICAL REPORT CITATION AND ABSTRACT



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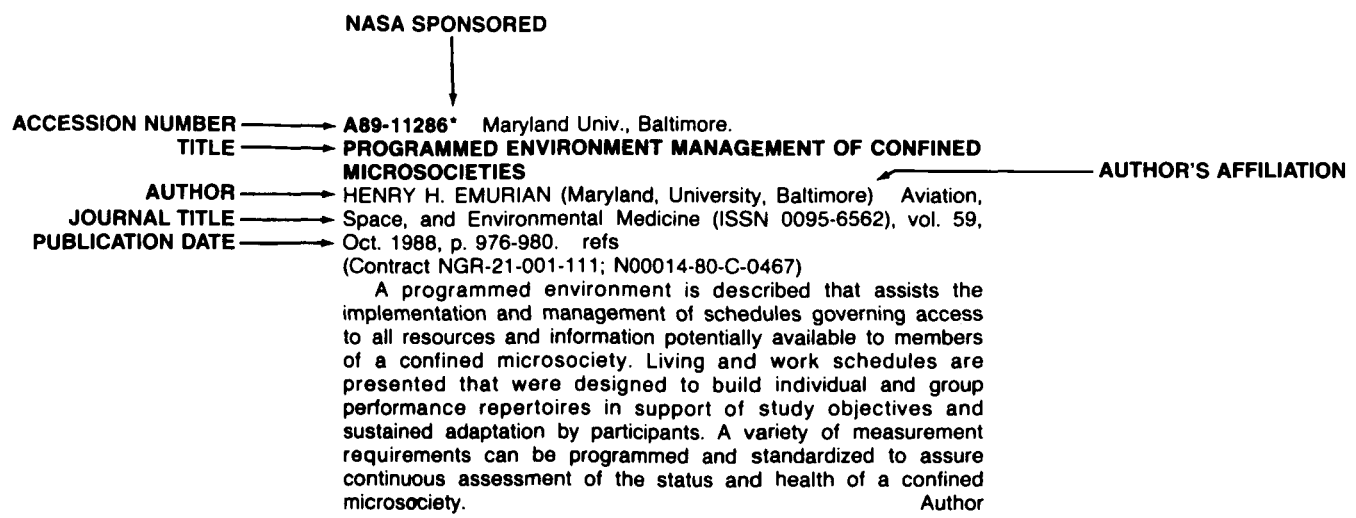


AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 322)

APRIL 1989

51

LIFE SCIENCES (GENERAL)

A89-17842*# National Aeronautics and Space Administration, Washington, DC.
TERRESTRIAL IMPLICATIONS OF MATHEMATICAL MODELING DEVELOPED FOR SPACE BIOMEDICAL RESEARCH
BARBARA F. LUJAN, RONALD J. WHITE (NASA, Life Sciences Div., Washington, DC), JOEL I. LEONARD (Lockheed Engineering and Sciences Corp., Washington, DC), and R. SRINI SRINIVASAN (*Krug International, Houston, TX*) *IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988.* 12 p. refs (IAF PAPER 88-505)

This paper summarizes several related research projects supported by NASA which seek to apply computer models to space medicine and physiology. These efforts span a wide range of activities, including mathematical models used for computer simulations of physiological control systems; power spectral analysis of physiological signals; pattern recognition models for detection of disease processes; and computer-aided diagnosis programs. Author

A89-18456
THERMAL VISUALIZATION OF THE INTERHEMISPHERIC ASYMMETRY OF THE BRAINS OF ANIMALS [TERMOVIZUALIZATSIIA MEZHPOLUSHARNOI ASIMMETRII MOZGA ZHIVOTNYKH]
G. D. KUZNETSOVA, N. I. NEZLINA, and E. V. PETROVA (AN SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 302, no. 2, 1988, p. 484-487. In Russian. refs

Noninvasive thermal encephaloscopy was used to study interhemispheric relationships in stressed animals. The activities of the right and left brain hemispheres were compared in animals exposed to pain stress and so-called animal hypnosis. B.J.

A89-18561
AN EXPERIEMENTAL AND THEORETICAL INVESTIGATION OF THE DYNAMICS OF LYMPHOPOIESIS DURING PROLONGED EXPOSURE TO IONIZING RADIATION [EKSPERIMENTAL'NOE I TEORETICHESKOE ISSLEDOVANIE DINAMIKI LIMFOPOEZA PRI PROLONGIROVANNOM OBLUCHENII]
T. M. ZUKHBAIA and O. A. SMIRNOVA (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 28, Sept.-Oct. 1988, p. 626-631. In Russian. refs

The effect of prolonged exposure to ionizing radiation (22 h/day by 0.1, 0.4, 0.8, 1.1, 2.0, and 4.0 Gy) by Cs-137 on the dynamics of lymphopoiesis in rats was investigated and the results were compared with those of a mathematical analysis. A mathematical model, represented by a system of nine nonlinear differential equations, was developed that describes the dynamics of lymphopoiesis taking into account the mechanism regulating the reproduction of bone-marrow blast cells. Data on the kinetics of lymphopoiesis and the dynamics of cell damage obtained by inspecting the bone marrow of exposed rats agreed well with the results of the mathematical model. I.S.

A89-18563
EARLY EFFECTS OF LOW-LEVEL IONIZING RADIATION IN RELATIVELY LOW DOSES ON THE NEUROMEDIATORY SYSTEMS RESPONSIBLE FOR THE CENTRAL REGULATION OF THE HYPOTHALAMIC-PITUITARY-ADRENOCORTICAL SYSTEM [RANNIE EFFEKTY VLIIANIIA IONIZIRUIUSHCHEI RADIATSII V OTNOSITEL'NO NEBOL'SHIKH DOZAKH NA NEIROMEDIATORNYE SISTEMY, OTVETSTVENNYE ZA TSENTRAL'NUIU REGULIATSIIU GIPOTALAMO-GIPOFIZ-ADRENOKORTIKAL'NOI SISTEMY]
M. IU. TAITS, T. V. DUDINA, T. S. KANDYBO, and A. I. ELKINA (*AN BSSR, Institut Fiziologii, Minsk, Belorussian SSR*) Radiobiologiia (ISSN 0033-8192), vol. 28, Sept.-Oct. 1988, p. 660-662. In Russian. refs

A89-18564
SOME FEATURES OF THE RESPONSE OF MAMMALIAN NERVE CELLS TO LOW-LEVEL RADIATION [NEKOTORYE OSOBENNOSTI REAKTSII NERVNYKH KLETOK MLEKOPITAIUSHCHIKH NA MALYE DOZY RADIATSII]
A. O. DUDKIN (AN SSSR, Leningradskii Institut Iadernoi Fiziki, Gatchina, USSR) Radiobiologiia (ISSN 0033-8192), vol. 28, Sept.-Oct. 1988, p. 663-667. In Russian. refs

The reactions of brain cells to ionizing radiation were investigated by monitoring the dynamics of electrophysiological characteristics in rat brain sections irradiated by X-rays of varying doses and dose rates. It was found that the radiation-induced short-duration increase in the spontaneous activity observed in irradiated neurons depends on the dose intensity. The most intensely manifested reactions were observed upon an exposure to 2 x 10 to the 8th sec long X-ray pulses in the dose range 0.00003 to 0.0006 Gy. It was found that the X-ray-induced reactions could be suppressed almost completely by an addition to the incubation media of caffeine, euphyllyn, or norepinephrine in concentrations of 0.0001 to 0.001 M. I.S.

A89-18565
PATHOMORPHOLOGICAL CHANGES IN RAT BRAIN NEURONS LONG AFTER EXPOSURES TO CARBON IONS AND GAMMA RAYS [PATOMORFOLOGICHESKIE IZMENENIIA NEIRONOV GOLOVNOGO MOZGA KRYS V OTDALENNOM PERIODE POSLE OBLUCHENIIA IONAMI UGLERODA I GAMMA-IZLUCHENIEM]
G. N. KRIVITSKAIA, V. I. DEREVIAGIN, R. A. KABITSINA, B. S. FEDORENKO, and O. S. SMIRNOV (AMN SSSR, Institut Mozga, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 28, Sept.-Oct. 1988, p. 681-685. In Russian.

A89-18566
RADIOPROTECTIVE EFFICIENCY, TOXICITY, AND THE MECHANISM OF ACTION OF BIS(BETA-DIMETHYLOCTYL AMMONIUM ETHYL) DISULFIDE [RADIOZASHCHITNAIA AKTIVNOST', TOKSICHNOST' I MEKHANIZM DEISTVIIA BIS/BETA-DIMETILOKTIL AMMONIIETIL/ DISUL'FIDA]
V. G. VLADIMIROV, IU. E. STREL'NIKOV, N. I. LIBIKOVA, I. I.

KRASIL'NIKOV, and A. V. KOKUSHKINA (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Radiobiologiia (ISSN 0033-8192), vol. 28, Sept.-Oct. 1988, p. 686-690. In Russian. refs

The levels of the radioprotective efficiency and toxicity of bis(beta-dimethyloctyl ammonium ethyl) disulfide and its analogs were investigated in mice, rats, and dogs injected with 2-15 mg/kg doses of these compounds 15-30 min prior to exposures to Co-60. It was found that bis(dimethyloctyl ammoniuim ethyl) disulfide and some of its analogs are effective in small (6-15 mg/kg) doses. It is suggested that the mechanism of the radioprotective activity of these chemicals involves both a temporary inhibition of DNA synthesis in radiosensitive tissues and an inhibition of oxidative reactions. I.S.

A89-18567
RADIOPROTECTIVE EFFICIENCY OF COMPLEXES OF COPPER, COBALT, AND ZINC WITH SUBSTITUTED ACYLHYDRAZONES [RADIOZASHCHITNAIA AKTIVNOST' KOMPLEKSOV MEDI, KOBAL'TA I TSINKA S ZAMESHCHENNYMI ATSILGIDRAZONAMI]
O. V. ARAPOV, L. S. ARESTOVA, O. F. ALFEROVA, I. I. KRASIL'NIKOV, and L. A. KHORSEEVA (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Radiobiologiia (ISSN 0033-8192), vol. 28, Sept.-Oct. 1988, p. 691-694. In Russian. refs

Several metallic complexes of substituted acylhydrazones with bivalent Cu, Co, and Zn, were synthesized and tested with respect to their radioprotective efficiency in mice exposed to gamma rays. Several of these preparations were found to have radioprotective efficiency in doses well below those of traditional sulfur-containing radioprotective preparations. Moreover, these metallic complexes exhibited low toxicity. I.S.

A89-18568
COMBINED EFFECT OF A CONSTANT MAGNETIC FIELD AND IONIZING RADIATION [KOMBINIROVANNOE DEISTVIE POSTOIANNOGO MAGNITNOGO POLIA I IONIZIRUIUSHCHIKH IZLUCHENII]
V. I. SHEIN (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 28, Sept.-Oct. 1988, p. 703-706. In Russian. refs

The effect of a constant magnetic field (CMF) with fields strengths of 7958, 95.493, and 278.521 A/m on the level of the biological effects induced by ionizing radiation (as evaluated by cell counts in peripheral blood and bone marrow) was investigated in mice exposed to gamma rays at different times of the CMF exposures. It was found that a 6-h-long exposure to CMF resulted in an elevated resistance of mice to ionizing radiation, increasing their survival rates significantly. It is suggested that exposures to SMF stimulate biological processes in general, increasing the ability of an organism to resist the effects of adverse environments. I.S.

A89-18573
ROLE OF CHOLINERGIC MECHANISMS IN ALTERATIONS OF RABBIT BRAIN FUNCTIONAL ACTIVITY CAUSED BY MOTION SICKNESS [O ROLI KHOLINERGICHESKIKH MEKHANIZMOV V IZMENENII FUNKTSIONAL'NOI AKTIVNOSTI MOZGA KROLIKOV PRI UKACHIVANII]
V. F. MAKSIMUK and N. A. SKOROMNYI (AN SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 74, Aug. 1988, p. 1109-1119. In Russian. refs

The effect of scopolamine on motion-sickness-induced changes in the cerebral bloodflow, oxygen tension, heart rate, as well as the bioelectric activity of the motor, auditory, and visual cerebral-cortex zones of rabbits were investigated using a hydrogen clearance technique to monitor these parameters. It was found that an injection of scopolamine (0.5 mg/kg) altered the character and the direction of motion-sickness-induced changes in the total and regional cerebral bloodflow, but did not affect oxygen tension in the cortical structures of the brain or alleviate motion-sickness-induced bradycardia. Examination of the EEGs of experimental animals showed that scopolamine increased activation processes and stimulated total bioelectric activity, especially in the motor zones of the brain. It is suggested that the protective action of scopolamine is related to its central cholinolytic activity and to the alleviation of hemodynamic and bioelectric-activity changes caused by motion sickness. I.S.

A89-18574
CHANGES IN THE SENSITIVITY OF ALPHA(2)-D AND BETA(1)-ADRENOREACTIVE SYSTEMS DURING INTENSE COOLING IN COLD-ACCLIMATED RATS [IZMENENIIA CHUVSTVITEL'NOSTI ALPHA/2/-D I BETA/1/-ADRENOREAKTIVNYKH SISTEM PRI INTENSIVNOM OKHLAZHDENII AKKLIMIROVANNYKH K KHOLODU KRYS]
V. I. KULINSKII, G. E. GERTSOG, N. IU. PLOTNIKOV, and V. G. BEZGACHEV (Krasnoiarskii Gosudarstvennyi Meditsinskii Institut, Krasnoyarsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 74, Aug. 1988, p. 1120-1125. In Russian. refs

The effect of hypothermia on the sensitivity of alpha(2) and beta(1) adrenoactive receptors in rats acclimated to cold, as compared to control rats, was investigated using the method of Kulinskii et al. (1985) to measure the sensitivity of alpha(2) receptors and the Arnold and McAuliff (1969) method to measure the beta(1)-receptor sensitivity. It was found that, at control conditions (22-24 C), rats acclimated to cold (at 3 + or - 1 C for eight weeks) differed from control animals by an increased beta(1)-adrenoreactivity and a decreased alpha(2)-adrenoreactivity. Upon an exposure to intense cold (-24 C) up to hypothermia below 25 C, the beta(1)-adrenoreactive systems of acclimated rats were found to retain the original sensitivity, whereas the sensitivity of their alpha(2)-adrenoreactive systems declined more rapidly than that of control rats. I.S.

A89-18575
CONJUGATED THERMOREGULATORY AND HEMODYNAMIC EFFECTS OF CENTRALLY ADMINISTERED BOMBESIN [SOPRIAZHENNYE TERMOREGULIATSIONNYE I GEMODINAMICHESKIE EFFEKTY PRI TSENTRAL'NOM VVEDENII BOMBEZINA]
A. T. MAR'IANOVICH, IU. I. SHIPILOV, and V. N. TSYGAN (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 74, Aug. 1988, p. 1186-1190. In Russian. refs

The effects of bombesin on the hemodynamic and thermoregulatory systems of mammals were investigated using rabbits injected with a C-terminal nonapeptide of bombesin into the lateral brain ventricle. It was found that bombesin increased arterial pressure (by an average 21 mm Hg) and decreased heart rate (by about 89.5/min) on the 10th minute of its infusion. Bombesin also acted to increase the motor activity and to decrease rectal temperature. The finding that bombesin-induced changes in the cardiovascular system were conjugated with changes in thermoregulatory indices indicates that the effect of this peptide was mediated by reciprocal changes of the tone of different regions of the sympathetic nervous system. I.S.

A89-18639
PARTICIPATION OF ERYTHRON IN THE ADAPTATION TO MUSCLE LOADS [UCHASTIE ERITRONA V ADAPTATSII K MYSHECHNYM NAGRUZKAM]
L. S. GOROZHANIN and S. B. NAZAROV (Ivanovskii Gosudarstvennyi Meditsinskii Institut, Ivanovo, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 19, Oct.-Dec. 1988, p. 74-90. In Russian. refs

This paper discusses the characteristics of the erythron reaction to muscle loads of various magnitudes. Special consideration is given to the significance of changes in various hematological indices in the monitoring of athletes' health status during a training process. It is shown that the type of a muscle-training regimen affects the type of the erythron reactions. I.S.

A89-18737 State Univ. of New York, Brooklyn.
REGULATION OF MYOFIBRILLAR ACCUMULATION IN CHICK MUSCLE CULTURES - EVIDENCE FOR THE INVOLVEMENT OF CALCIUM AND LYSOSOMES IN NON-UNIFORM TURNOVER OF CONTRACTILE PROTEINS
GERI SILVER and JOSEPH D. ETLINGER (New York, State University, Downstate Medical Center, Brooklyn) Journal of Cell Biology (ISSN 0021-9525), vol. 101, Dec. 1985, p. 2383-2391. Research supported by NASA, Hirshl Trust, and Muscular Dystrophy Association. refs
(Contract NIH-HL-31494)

The effects of calcium on the synthesis and the degradation of individual myofibrillar proteins were investigated using primary chick-leg skeletal muscle cultures labeled with S-35-methionine (for protein accumulation experiments) or Ca(2+)-45 (for calcium efflux experiments). It was found that the turnover of individual contractile proteins is regulated nonuniformly by a calcium-dependent mechanism involving lysosomes. The results also indicate that contractile proteins are released from the myofibril before their breakdown to amino acids. I.S.

A89-18738* State Univ. of New York, Brooklyn.
REGULATION OF CA(2+)-DEPENDENT PROTEIN TURNOVER IN SKELETAL MUSCLE BY THYROXINE
RICHARD J. ZEMAN, PAUL L. BERNSTEIN, ROBERT LUDEMANN, and JOSEPH D. ETLINGER (New York, State University, Brooklyn) Biochemical Journal (ISSN 0264-6021), vol. 240, 1986, p. 269-272. Research supported by the Muscular Dystrophy Association and Hirschl Trust Fund. refs
(Contract NAG2-162; NIH-5-R01-H121970)

Dantrolene, an agent that inhibits Ca(2+) mobilization, improved protein balance in skeletal muscle, as thyroid status was increased, by altering rates of protein synthesis and degradation. Thyroxine (T4) caused increases in protein degradation that were blocked by leupeptin, a proteinase inhibitor previously shown to inhibit Ca(2+)-dependent nonlysosomal proteolysis in these muscles. In addition, T4 abolished sensitivity to the lysosomotropic agent methylamine and the autophagy inhibitor 3-methyladenine, suggesting that T4 inhibits autophagic/lysosomal proteolysis.
Author

A89-18800
INFLUENCE OF AN AMINO-ACID RESIDUE ON THE OPTICAL PROPERTIES AND ELECTRON TRANSFER DYNAMICS OF A PHOTOSYNTHETIC REACTION CENTRE COMPLEX
EDWARD J. BYLINA, DOUGLAS C. YOUVAN (MIT, Cambridge, MA), CHRISTINE KIRMAIER, LYNDA MCDOWELL, and DEWEY HOLTEN (Washington University, Saint Louis, MO) Nature (ISSN 0028-0836), vol. 336, Nov. 10, 1988, p. 182-184. NSF-USDA-supported research. refs

A89-19374
SNAKES, BLOOD CIRCULATION AND GRAVITY
HARVEY B. LILLYWHITE (Florida, University, Gainesville) Scientific American (ISSN 0036-8733), vol. 259, Dec. 1988, p. 92-98. refs

The differences in the circulatory systems of terrestrial, semiarboreal, arboreal, and sea snakes that allow these animals to cope with the demands of gravity are described. Physiological changes that occur in these snakes as they assume different postures are considered. The mechanisms of cardiovascular regulation that are involved may be relevant to understanding how gravity affects human beings in outer space. C.D.

A89-19394
ATRIAL NATRIURETIC FACTOR ATTENUATES THE PULMONARY PRESSOR RESPONSE TO HYPOXIA
SERGE ADNOT, PIERRE ETIENNE CHABRIER, CHRISTIAN BRUN-BUISSON, ISABELLE VIOSSAT, and PIERRE BRAQUET (Institut National de la Sante et de la Recherche Medicale; Hopital Henri Mondor, Creteil; Institut Henri Beaufour, Les Ulis, France) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, Nov. 1988, p. 1975-1983. refs

A89-19395
MUSCLE PERFUSION AND OXYGENATION DURING LOCAL HYPEROXIA
D. L. BREDLE, W. E. BRADLEY, C. K. CHAPLER, and S. M. CAIN (Alabama, University, Birmingham; Queen's University, Kingston, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, Nov. 1988, p. 2057-2062. Research supported by the Medical Research Council of Canada. refs
(Contract NIH-HL-14693; NIH-HL-26927; NIH-5-T32-HL-07553-05)

The mechanism involved in the effect of local hyperoxia on the whole-body and the muscle oxygen uptake was investigated in anesthetized dogs whose hindlimb muscles were perfused with hyperoxic autologous blood, while the animals were ventilated with room air. The results confirm the hypothesis that the reduction in the O2 uptake with hyperoxic ventilation is due to the local effects of high oxygen pressure to restrict blood flow and to reduce the effective distribution of the blood in the capillaries. I.S.

A89-19396
METABOLIC AND CIRCULATORY RESPONSES OF NORMOXIC SKELETAL MUSCLE TO WHOLE-BODY HYPOXIA
D. L. BREDLE, C. K. CHAPLER, and S. M. CAIN (Alabama, University, Birmingham; Queen's University, Kingston, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, Nov. 1988, p. 2063-2068. Research supported by the Medical Research Council of Canada. refs
(Contract NIH-HL-14693; NIH-HL-26927; NIH-5-T32-HL-07553-05)

The effects of whole-body hypoxia on the metabolic and circulatory characteristics of a normoxic skeletal muscle were investigated. Innervated hindlimbs of eight dogs were perfused with autologous blood kept normoxic by a membrane oxygenator, while the animals were ventilated with 9 percent O2 in N2; similar periods with normoxic ventilation preceded and followed the hypoxic period. A second group of dogs was pretreated with the specific beta-2 blocker ICI 118,551. The results obtained indicate that global hypoxia increases the demand for O2 in muscle when the local O2 supply is not limited, and that beta-2 receptors are necessary for this response. I.S.

A89-19397
REGIONAL HEMODYNAMIC RESPONSES TO HYPOXIA IN POLYCYTHEMIC DOGS
R. L. STORK, D. L. BREDLE, C. K. CHAPLER, and S. M. CAIN (Alabama, University, Birmingham; Queen's University, Kingston, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, Nov. 1988, p. 2069-2074. Research supported by the Canadian Medical Research Council. refs
(Contract F33615-82-D-0627; NIH-HL-26927; NIH-HL-14693)

The combined effects of hypoxia and polycythemia on the hemodynamic characteristics of the resting skeletal muscle and the gut of fasted anesthesized ventilated dogs were investigated. One group of dogs served as normoxic controls, while the other was ventilated with 9 percent O2-in N2 for 30 min between periods of normoxia. It was found that, in dogs ventilated with hypoxic gas mixture, the decrease of O2 delivery experienced by a resting skeletal muscle after the induction (by an increased extraction) of polycythemia caused the muscle to vasodilate much more promptly than in normocythemic dogs ventilated with a hypoxic gas mixture. It was concluded that vital tissues such as heart and brain, that normally respond to hypoxia by vasodilation, were forced to compete for a limited supply of O2 with the resting skeletal muscle, which is usually constricted by hypoxia. I.S.

A89-19400* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
INFLUENCE OF SPACEFLIGHT ON RAT SKELETAL MUSCLE
THOMAS P. MARTIN, V. REGGIE EDGERTON, and RICHARD E. GRINDELAND (NASA, Ames Research Center, Moffett Field, CA; California, University, Los Angeles) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, Nov. 1988, p. 2318-2325. refs
(Contract NCA2-IR-390-502)

The effect of a 7-day spaceflight (aboard NASA's SL-3) on the size and the metabolism of single fibers from several rat

muscles was investigated along with the specificity of these responses as related to the muscle type and the size of fibers. It was found that the loss of mass after flight was varied from 36 percent in the soleus to 15 percent in the extensor digitorum longus. Results of histochemical analyses showed that the succinate dehydrogenase (SDH) activity in muscles of flight-exposed rats was maintained at the control levels, whereas the alpha-glycerol phosphate dehydrogenase (GPD) activity was either maintained or increased. The analyses of the metabolic profiles of ATPase, SDH, and GPD indicated that, in some muscles, there was an increase in the poportion of fast oxidative-glycolytic fibers. I.S.

A89-19622
THE NEURAL BASIS FOR LEARNING OF SIMPLE MOTOR SKILLS
STEPHEN G. LISBERGER (California, University, San Francisco) Science (ISSN 0036-8075), vol. 242, Nov. 4, 1988, p. 728-735. refs
(Contract NIH-EY-03878; NSF BNS-84-44605)

The vestibulo-ocular reflex (VOR) is a simple movement that has been used to investigate the neural basis for motor learning in monkeys. The function of the VOR is to stabilize retinal images by generating smooth eye movements that are equal and opposite to each head movement. Learning occurs whenever image motion occurs persistently during head turns; as a result image stability is gradually restored. A hypothesis is proposed in which the output from the cerebellar cortex of the flocculus guides learning; the locus of learning is in the brain stem, in VOR pathways that are under inhibitory control from the flocculus. Other parallel VOR pathways do not receive inputs from the flocculus and are not subject to learning. Similarities among the VOR and other motor systems suggest some organizing principles that may apply in many forms of motor learning. Author

A89-19623
PERSPECTIVES ON COGNITIVE NEUROSCIENCE
PATRICIA S. CHURCHLAND (California, University, La Jolla) and TERRENCE J. SEJNOWSKI (Salk Institute; California, University, La Jolla) Science (ISSN 0036-8075), vol. 242, Nov. 4, 1988, p. 741-745. Research supported by the General Electric Co., James S. McDonald Foundation, NSF, USAF, and U.S. Navy. refs

The development of techniques which have led to a convergence of neuroscience and cognitive science is discussed. The levels of analysis and experimental processes which are used to study the various organizational levels in the nervous system are examined. The study of color vision is presented as an example of interaction between psychology and physiology. Techniques such as blood flow analysis with positron emission tomography and magnetic resonance imaging are described, including the experimental capabilities provided by combining various techniques. R.B.

A89-19829* State Univ. of New York, Brooklyn.
CLENBUTEROL, A BETA(2)-AGONIST, RETARDS ATROPHY IN DENERVATED MUSCLES
RICHARD J. ZEMAN, ROBERT LUDEMANN, and JOSEPH D. ETLINGER (New York, State University, Brooklyn) American Journal of Physiology: Endocrinology and Metabolism (ISSN 0193-1849), 1987, p. E152-E155. Research supported by the Muscular Dystrophy Association and Hirschl Trust Fund. refs
(Contract NAG2-162; NIH-HL-31494)

The effects of a beta(2) agonist, clenbuterol, on the protein content as well as on the contractile strength and the muscle fiber cross-sectional area of various denervated muscles from rats were investigated. It was found that denervated soleus, anterior tibialis, and gastrocnemius muscles, but not the extensor digitorum longus, of rats treated for 2-3 weeks with clenbuterol contained 95-110 percent more protein than denervated controls. The twofold difference in the protein content of denervated solei was paralleled by similar changes in contractile strength and muscle fiber cross-sectional area. I.S.

A89-19830* State Univ. of New York, Brooklyn.
SLOW TO FAST ALTERATIONS IN SKELETAL MUSCLE FIBERS CAUSED BY CLENBUTEROL, A BETA(2)-RECEPTOR AGONIST
RICHARD J. ZEMAN, ROBERT LUDEMANN, THOMAS G. EASTON, and JOSEPH D. ETLINGER (New York, State University, Brooklyn) American Journal of Physiology: Endocrinology and Metabolism (ISSN 0193-1849), 1988, p. E726-E732. Research supported by the Muscular Dystrophy Association. refs
(Contract NAG2-162; NIH-AR-37145)

The effects of a beta(2)-receptor agonist, clenbuterol, and a beta(2) antagonist, butoxamine, on the skeletal muscle fibers of rats were investigated. It was found that chronic treatment of rats with clenbuterol caused hypertrophy of histochemically identified fast-twitch, but not slow-twitch, fibers within the soleus, while in the extensor digitorum longus the mean areas of both fiber types were increased; in both muscles, the ratio of the number of fast-twitch to slow-twitch fibers was increased. In contrast, a treatment with butoxamine caused a reduction of the fast-twitch fiber size in both muscles, and the ratio of the fast-twitch to slow-twitch fibers was decreased. I.S.

A89-19840* Rice Univ., Houston, TX.
THE STIMULATION OF ARACHIDONIC ACID METABOLISM IN HUMAN PLATELETS BY HYDRODYNAMIC STRESSES
SRIDHAR RAJAGOPALAN, LARRY V. MCINTIRE (Rice University, Houston, TX), ELIZABETH R. HALL, and KENNETH K. WU (Texas, University, Houston) Biochimica et Biophysica Acta (ISSN 0005-2760), vol. 958, 1988, p. 108-115. Research supported by the Robert A. Welch Foundation. refs
(Contract NIH-1-R01-HL-18672; NIH-HL-17437; NIH-P01-NS-23327; NAG9-207)

The effects of stimulating human platelets by thrombin and by hydrodynamic stresses on the platelets' arachidonic acid metabolism were investigated using (1-C-14)-arachidonic acid label and a specially designed viscometer that ensured laminar shear flow with a nearly uniform shear rate throughout the flow region. It was found that platelets activated by thrombin formed principally thromboxane A2, 12-hydroxy 5,8,10-heptadecatrienoic acid and 12-hydroxy 5,8,10,14-eicosatetraenoic acid (12-HETE). On the other hand, platelets activated by shear, formed only 12-HETE (although arachidonic acid metabolism was stimulated); no cyclooxygenase metabolites were detected. Results indicate that platelets may greatly increase their 12-HETE production when activated by passage through a high-stress region of the circulation, such as an atherosclerotic stenosis. I.S.

A89-19842* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
MANGANESE OXIDATION IN PH AND O2 MICROENVIRONMENTS PRODUCED BY PHYTOPLANKTON
LAURIE L. RICHARDSON (NASA, Ames Research Center, Moffett Field, CA; Wisconsin, University, Milwaukee), CARMEN AGUILAR, and KENNETH H. NEALSON (Wisconsin, University, Milwaukee) Limnology and Oceanography (ISSN 0024-3590), vol. 33, 1988, p. 352-363. Research supported by the Milwaukee Shaw Foundation. refs
(Contract NAGW-1047; NCC2-369)

This paper reports on the oxidation of Mn(II) by pure cultures of Chlorella. It is shown that these cultures establish strong microgradients of pH and O2 concentration due to their photosynthetic activity, and it is demonstrated that Mn oxidation in the pelagic zone of Oneida Lake, New York, is limited to a microzone of high pH and O2 associated with the near-surface aggregates of phytoplankton cells. The data suggest that visible light is important in catalyzing Mn oxidation by driving the photosynthetic removal of CO2 with concomitant increases in pH. I.S.

A89-19846* Texas Univ., Houston.
ISOELECTRIC FOCUSING ANALYSIS OF ANTIBODY CLONOTYPE CHANGES OCCURRING DURING IMMUNE RESPONSES USING IMMOBILIZED PH GRADIENTS

KEITH A. KNISLEY and L. SCOTT RODKEY (Texas, University, Houston) Electrophoresis (ISSN 0173-0835), vol. 9, 1988, p. 183-186. refs
(Contract NIH-AI-20590; NAS9-17403)

Serum was collected from rabbits at 2-day intervals following a single injection with tetanus toxoid or at weekly intervals following multiple injections with Micrococcus lysodeikticus cell walls. These sera were analyzed for the presence of individual clonotypes of specific antitetanus or antimicrococcal antibodies by isoelectric focusing in immobilized pH gradients with added carrier ampholytes followed by affinity immunoblotting. The affinity immunoblots obtained clearly defined both the rapid disappearance and late appearance of distinct subsets of antibody clonotypes during the response. These data demonstrate the application of affinity immunoblotting combined with immobilized pH gradients for detecting the subtle changes in specific antibody clonotype patterns which occur during an immune response. Author

A89-20025
INTRON EXISTENCE PREDATED THE DIVERGENCE OF EUKARYOTES AND PROKARYOTES
MING-CHE SHIH, PETER HEINRICH, and HOWARD M. GOODMAN (Harvard University; Massachusetts General Hospital, Boston) Science (ISSN 0036-8075), vol. 242, Nov. 25, 1988, p. 1164-1166. Research supported by Hoechst AG. refs

Nucleotide sequences for the nuclear genes encoding chloroplast (GapA and GapB) and cytosolic (GapC) glyceraldehyde-3-phosphate dehydrogenases (GAPDHs) from Arabidopsis thaliana were determined. Comparison of nucleotide sequences indicates that the divergence of chloroplast and cytosolic GAPDH genes precede the divergence of prokaryotes and eukaryotes. In addition, some intron-exon junctions are conserved among GapB, GapC, and chicken GAPDH genes. These results provide evidence at the molecular level to support the idea that introns existed before the divergence of prokaryotes and eukaryotes. Author

A89-20232
BIOTEX, A PROJECT FOR CONDUCTING BIOTECHNOLOGICAL EXPERIMENTS UNDER MICROGRAVITY [BIOTEX, EIN VORHABEN ZUR DURCHFUEHRUNG VON BIOTECHNOLOGISCHEN EXPERIMENTEN UNTER MIKROGRAVITATION]
S. WALTHER, V. MANG (MBB-ERNO, Bremen, Federal Republic of Germany), U. FRIEDRICH, and V. SOBICK (DFVLR, Cologne, Federal Republic of Germany) IN: Yearbook 1987 II; DGLR, Annual Meeting, Berlin, Federal Republic of Germany, Oct. 5-7, 1987, Reports. Bonn, Deutsche Gesellschaft fuer Luft- und Raumfahrt, 1987, p. 655-661. In German.
(DGLR PAPER 87-067)

The design of experiments in electrically induced cell fusion, electrophoresis, and cell culture which are to be performed as part of the BIOTEX microgravity project is addressed. The scientific instruments to be used are identified and their location in the instrument rack is shown. The features of the experiments to be performed are discussed, and the relevant instrumentation is shown and described. C.D.

N89-13866# Wisconsin Univ., Madison.
CARBON MONOXIDE METABOLISM BY PHOTOSYNTHETIC BACTERIA Progress Report
P. W. LUDDEN and G. P. ROBERTS 1988 4 p
(Contract DE-FG02-87ER-13691)
(DE88-011569; DOE/ER-13691/T1) Avail: NTIS HC A02/MF A01

The photosynthetic bacterium, Rhodospirillum rubrum, is capable of converting carbon monoxide to CO2 and cellular material. Because carbon monoxide is a major industrial pollutant in this country and a product of the biological oxidation of CO is the product of H2, a major industrial feedstock, this process has practical importance. The oxidation of carbon monoxide to CO2 by microorganisms is a major component of the carbon monoxide cycle on earth. We have isolated the enzyme responsible for this process from Rhodospirillum rubrum. Carbon monoxide dehydrogenase is an iron - sulfur, nickel- and zinc-containing enzyme. The enzyme is quite stable to heat and amendable to purification, however, it is very labile to oxygen, and all experiments must be conducted anaerobically. We are studying the activities of this enzyme, its regulation and its induction by its substrate carbon monoxide. The enzyme is absent in cells that have not been exposed to carbon monoxide, but cells produce the enzyme at a maximal rate upon exposure to carbon monoxide for as little as ten minutes. Oxygen, a potent and irreversible inhibitor of this enzyme, represses its synthesis. DOE

N89-13867*# National Aeronautics and Space Administration, Washington, DC.
THE 1987-1988 NASA SPACE/GRAVITATIONAL BIOLOGY ACCOMPLISHMENTS
THORA W. HALSTEAD, ed. Nov. 1988 200 p Prepared in cooperation with George Washington Univ., Washington, D.C.
(Contract NASW-4324)
(NASA-TM-4079; NAS 1.15:4079) Avail: NTIS HC A09/MF A01 CSCL 06C

Individual technical summaries of research projects of the NASA Space/Gravitational Biology Program, for research conducted during the period January 1987 to April 1988 are presented. This Program is concerned with using the characteristics of the space environment, particularly microgravity, as a tool to advance knowledge in the biological sciences; understanding how gravity has shaped and affected life on earth; and understanding how the space environment affects both plant and animal species. The summaries for each project include a description of the research, a list of the accomplishments, an explanation of the significance of the accomplishments, and a list of publications. Author

N89-13868# New Mexico State Univ., Las Cruces. Dept. of Biology.
VIBRIO FISCHERI SYMBIOSIS GENE REGULATION Annual Report, Aug. 1987 - Aug. 1988
PAUL V. DUNLAP 12 Aug. 1988 8 p
(Contract N00014-87-K-0727; RR04106)
(AD-A198846) Avail: NTIS HC A02/MF A01 CSCL 06C

The goals of our research are to investigate the molecular mechanisms controlling luminescence gene expression of the symbiotic, light-organ bacterium Vibrio fischeri; and to identify and investigate the regulation of other symbiosis functions in this marine bacterium. During the past year, we have: (1) completed studies in Escherichia coli cya and crp mutants on expression of the luxR gene that demonstrate cAMP and CRP activate transcription of luxR and that the LuxR protein, possibly working in concert with auto-inducer, represses transcription from the luxR promoter (transcription negative auto-regulation); (2) isolated mutants of V. fischeri apparently deficient in adenylate cyclase and CRP, and demonstrated the requirement for cAMP and CRP in autoinduction of luminescence and in iron regulation of luminescence; (3) initiated studies in E. coli of the role of autoinducer in luxR negative autoregulation; and, (4) initiated work toward development of a gene transfer system for V. fischeri. GRA

N89-13869# John B. Pierce Foundation of Connecticut, New Haven.
MICROWAVE IRRADIATION AND COLD EXPOSURE Final Report, 18 Jul. 1984 - 17 Jul. 1985
ELEANOR R. ADAIR 17 Aug. 1988 12 p
(Contract N00014-84-C-0535)
(AD-A198875; JBP-ONR-3) Avail: NTIS HC A03/MF A01 CSCL 06G

A pilot study investigated the consequences of chronic exposure (40 h/wk) to 2450-MHz CW microwaves, or sham exposure, in a cold (18 C) environment on the thermoregulatory responses, both behavioral and physiological, of squirrel monkeys. Four animals exposed to microwaves at 20 mW/cm2 exhibited responses that indicated slight amelioration of the mild cold stress while four sham-exposed animals sustained no thermoregulatory deficits.

Although the sample size was too small to yield statistically reliable data, general trends in the results support the view that exposure to microwaves of moderate intensity in the work environment is benign in terms of long-term effects on thermoregulatory processes. GRA

N89-14155*# North Carolina State Univ., Raleigh. Dept. of Botany.
GASEOUS EMISSIONS FROM PLANTS IN CONTROLLED ENVIRONMENTS
DENIS T. DUBAY *In* NASA, John F. Kennedy Space Center, NASA/ASEE Summer Faculty Fellowship Program: 1988 Research Reports p 1-18 Oct. 1988
Avail: NTIS HC A24/MF A01 CSCL 06C

Plant growth in a controlled ecological life support system may entail the build-up over extended time periods of phytotoxic concentrations of volatile organic compounds produced by the plants themselves. Ethylene is a prominent gaseous emission of plants, and is the focus of this report. The objective was to determine the rate of ethylene release by spring wheat, white potato, and lettuce during early, middle, and late growth stages, and during both the light and dark segments of the diurnal cycle. Plants grown hydroponically using the nutrient film technique were covered with plexiglass containers for 4 to 6 h. At intervals after enclosure, gas samples were withdrawn with a syringe and analyzed for ethylene with a gas chromatograph. Lettuce produced 10 to 100 times more ethylene than wheat or potato, with production rates ranging from 141 to 158 ng g-dry/wt/h. Wheat produced from 1.7 to 14.3 ng g-dry/wt/h, with senescent wheat producing the least amount and flowering wheat the most. Potatoes produced the least amount of ethylene, with values never exceeding 5 ng g-dry/wt/h. Lettuce and potatoes each produced ethylene at similar rates whether in dark period or light period. Ethylene sequestering of 33 to 43 percent by the plexiglass enclosures indicated that these production estimates may be low by one-third to one-half. These results suggest that concern for ethylene build-up in a contained atmosphere should be greatest when growing lettuce, and less when growing wheat or potato. Author

N89-14167*# Connecticut Univ., Storrs. Dept. of Molecular and Cell Biology.
HORMONAL REGULATION OF WHEAT GROWTH DURING HYDROPONIC CULTURE
DONALD WETHERELL *In* NASA, John F. Kennedy Space Center, NASA/ASEE Summer Faculty Fellowship Program: 1988 Research Reports p 440-454 Oct. 1988
Avail: NTIS HC A24/MF A01 CSCL 06C

Hormonal control of root growth has been explored as one means to alleviate the crowding of plant root systems experienced in prototype hydroponic biomass production chambers being developed by the CELSS Breadboard Project. Four plant hormones, or their chemical analogs, which have been reported to selectively inhibit root growth, were tested by adding them to the nutrient solutions on day 10 of a 25 day growth test using spring wheat in hydroponic cultures. Growth and morphological changes is both shoot and root systems were evaluated. In no case was it possible to inhibit root growth without a comparable inhibition of shoot growth. It was concluded that this approach is unlikely to prove useful for wheat. Author

N89-14658# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES
4 Aug. 1987 204 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-87-008) Avail: NTIS HC A10/MF A01

JPRS Report ULS-87-008 of 4 August 1987: Science and Technology; USSR: Life Sciences, contains reports on the following: hypokinesia, muscle tissue, gas metabolism, myocardium, hypoxia, and hemodynamic responses.

N89-14659# Joint Publications Research Service, Arlington, VA.
EFFECTS OF CALCITONIN AND RETABOLIL ON RAT FEMUR IN HYPOKINESIA Abstract Only
I. V. ROGACHEVA *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 1 4 Aug. 1987 Transl. into ENGLISH from Patologicheskaya Fiziologiya i Eksperimentalnaya Terapiya (Moscow, USSR), no. 4, Jul. - Aug. 1986 p 53-56
Avail: NTIS HC A10/MF A01

Therapeutic trials were conducted with calcitonin and Retabolil (nandrolone decanoate) in the case of femoral osteoporosis induced by immobilization in Wistar rats (180 to 200 g). Immobilization consisted of support elimination by tibial amputation. In the control animals immobilization led to diminished femoral growth, thinning of cortical layers, and frank osteoporosis. Animals treated with either calcitonin (2 U MRC, S.C, every other day) or Retabolil (0.2 ml, once every 10 days) for 40 days did not present any evidence of improvement in terms of underlying femoral changes. However, administration of a combination of calcitonin + Retabolil prevented further atrophy of the femur. The effectiveness of the combined therapy was attributed to prevention of bone protein catabolism by Retabolil and of mineral loss by calcitonin. Author

N89-14661# Joint Publications Research Service, Arlington, VA.
INFLUENCE OF HIGH TEMPERATURE ON TOTAL GAS METABOLISM OF ANIMALS WITH LIMITATION OF MOTOR ACTIVITY Abstract Only
R. M. KAFIZOVA *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 66 4 Aug. 1987 Transl. into ENGLISH from Uzbekskiy Biologicheskiy Zhurnal (Tashkent, USSR), no. 5, Sep. - Oct. 1986 p 29-31
Avail: NTIS HC A10/MF A01

A study was made of gas metabolism in 50 white rats exposed to high temperatures with limited motor activity. The animals were exposed to temperatures of 40 to 42 C for 2 hours each day, some in restrictive 8x15x8 cm cages which limited their motor activity. Oxygen consumption, carbon dioxide liberation, respiratory coefficient, body temperature and mass were recorded on days 1, 15, 30 and 60 of the experiments before and after exposure to the high temperatures. Exposure to heat was found to decrease oxidative processes in the organism independently of motor activity status. This decrease was still stronger in animals exposed to heat with limitation of motor activity. In both cases, the animals adapted to the conditions of the experiments. Author

N89-14662# Joint Publications Research Service, Arlington, VA.
INFLUENCE OF EMOTIONAL-PAIN STRESS ON CONTRACTILE FUNCTION OF MYOCARDIUM DURING LONG-TERM HYPOKINESIA Abstract Only
A. I. SAULYA *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 67-68 4 Aug. 1987 Transl. into ENGLISH from Byulleten Eksperimentalnoy Biologii i Meditsiny (Moscow, USSR), v. 98, no. 12, Dec. 1984 p 651-653
Avail: NTIS HC A10/MF A01

A study was made of the influence of emotional-pain stress on the contractile function of the myocardium of animals which had been maintained in long-term hypokinesia. Experiments were performed on 64 male Wistar rats following 60 days in small movement-restricting cages and exposure to 6-hr alarm neurosis. The results indicated that long-term hypokinesia caused a significant increase in the amplitude of contraction, speed of contraction and relaxation of the isolated posterior left ventricular papillary muscle, i.e., a depression in the contractile function of the cardiac muscle. The main parameters of the contractile function of the mycardium of the smaller hearts in the experimental animals which has not grown as a result of long-term hypokinesia were many times higher after stress than in the control group. The data indicate that the stress depression of the contractile function is less dangerous for animals following long-term hypokinesia than for the control animals. Long term hypokinesia may represent a chronic stress factor, causing partial adaption to stress and thus increasing the resistance of the heart to stress. thus increasing

the resistance of the heart to stress. References 7 : 5 Russian, 2 Western. Author

N89-14663# Joint Publications Research Service, Arlington, VA.
CORRECTION OF ACUTE HYPOXIA-INDUCED CHANGES IN BLOOD COAGULATION IN RABBITS Abstract Only
V. V. BAKANSKAYA *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 71-72 4 Aug. 1987 Transl. into ENGLISH from Fiziologicheskiy Zhurnal (Kiev, USSR), v. 32, no. 2, Mar. - Apr. 1986 p 217-221
Avail: NTIS HC A10/MF A01

Experimental therapeutic trials were conducted with rabbits to assess the utility of combined therapy with rheopolyglucin and nicotinic acid in overcoming hypercoagulation induced by acute hypoxic hypoxia. Exposing the animals to conditions simulating an altitude of 8000 m for 1 h in a pressure chamber accelerated coagulation and thrombogenesis, whereas pretreatment of the rabbits with rheopolyglucin (5 ml, i.v.) and nicotinic acid (10 mg/kg, i.m.) prevented the onset of hypercoagulation. Administration of rheopolyglucin and nicotinic acid to control rabbits was without marked effect on blood coagulation status, with the exception that the fibrinolytic system showed some activation and blood levels of free haparin were somewhat elevated. These changes were felt to underlie the therapeutic efficacy of the combined therapy in preventing hypercoagulation. Author

N89-14664# Joint Publications Research Service, Arlington, VA.
FUNCTIONAL SIGNIFICANCE AND MECHANISMS OF VARIABILITY IN BARORECEPTOR REFLEX Abstract Only
N. A. STEPOCHKINA *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 72 4 Aug. 1987 Transl. into ENGLISH from Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenova (Leningrad, USSR), v. 72, no. 11, Nov. 1986 p 1473-1485 Original language document was announced in IAA as A87-35825
Avail: NTIS HC A10/MF A01

Data obtained on the functional role of the aortic and carotid sinus baroreceptors and on the modulations of the baroreceptor reflex effected by the skeletal muscle contractions are analyzed. Special attention is given to the suppressive effects of muscular activity, pain stimuli, and various cortical areas on the baroreceptor reflex. The effect of respiration on the baroreflex is examined together with the role of the baroreceptor reflex in the onset of nonrespiratory sinusal arrhythmia. and demonstrates the flexibility of the cardiovascular system in meeting various physiological requirements. References 96: 12 Russian, 84 Western. Author

N89-14665# Joint Publications Research Service, Arlington, VA.
SYSTEMIC HEMODYNAMIC SHIFTS IN HYPOXIA Abstract Only
NURMATOV, A. V. SAMOYLENKO, and B. I. TKACHENKO *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 73 4 Aug. 1987 Transl. into ENGLISH from Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenova (Leningrad, USSR), v. 72, no. 11, Nov. 1986 p 1515-1522
Avail: NTIS HC A10/MF A01

Anesthetized cats were employed in a study designed to assess the hemodynamic effects of light and moderate hypoxia. Using an O2/N2 inhalation mixture containing 14 percent O2 or 10 percent O2 resulted in hemodynamic shifts attributable largely to a decrease in peripheral vascular resistance. The venous return increased by 4.6 percent in the 14 percent O2 experiment, and by 21 percent in the 10 percent O2 studies. The increase in the cardiac output was due to the increase in the stroke volume since the heart rate decreased in both hypoxic states. The reduction in blood presure was more pronounced with moderate hypoxia than with light hypoxia, and in both cases the increase in the venous return was primarily due to the greater inflow from the superior vena cava. The latter phenomenon may reflect the fact that a greater portion of the cardiac output was directed to the cranial circulation to assure an adequate oxygen supply to the brain. Author

N89-14666*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
BIO-REACTOR CELL CULTURE PROCESS Patent Application
DAVID A. WOLF, inventor (to NASA) and RAY SCHWARZ, inventor (to NASA) (Krug International, Houston, TX.) 30 Jun. 1988 25 p (NASA-CASE-MSC-21293-1; NAS 1.71:MSC-21293-1; US-PATENT-APPL-SN-213559) Avail: NTIS HC A03/MF A01 CSCL 06C

A bio-reactor system is described in which a tubular housing contains an internal circularly disposed set of blade members and a central tubular filter all mounted for rotation about a common horizontal axis and each having independent rotational support and rotational drive mechanisms. The housing, blade members and filter preferably are driven at a constant slow speed for placing a fluid culture medium with discrete microbeads and cell cultures in a discrete spatial suspension in the housing. Replacement fluid medium is symmetrically input and fluid medium is symmetrically output from the housing where the input and the output are part of a loop providing a constant or intermittent flow of fluid medium in a closed loop. NASA

N89-14667# Oak Ridge National Lab., TN.
INTRODUCTION OF THE PROCEEDINGS OF THE TENTH SYMPOSIUM ON BIOTECHNOLOGY FOR FUELS AND CHEMICALS
CHARLES D. SCOTT, ELIAS GREENBAUM, and CHARLES E. WYMAN (Midwest Research Inst., Golden, CO.) 1988 14 p Symposium held in Gatlinburg, TN, 16 May 1988
(Contract DE-AC05-84OR-21400; DE-AC02-83CH-10093)
(DE88-016361; CONF-880521-5) Avail: NTIS HC A03/MF A01

Bioprocessing systems continue to have an important place in the fermentation industry and for environmental control technology, but new opportunities continue to appear. For example, the production of polymers or polymer precursers as well as other types of products useful in the materials industry can be produced by bioprocessing concepts. This symposium, the tenth in a series, covered the above topic as well as research and development in a variety of other areas important to the efficient and environmentally acceptable production and use of fuels and chemicals. This meeting is held as a forum for the discussion of innovative processing concepts with particular emphasis on applied research and process research in early phases of development. General sessions on thermal/chemical conversion of biomass and bioconversion concepts were held and special sessions were held on biological processing of fossil fuels and on biological production of materials. Several discussion groups were also organized.
DOE

N89-15017*# National Aeronautics and Space Administration, Washington, DC.
EXOBIOLOGY EXPERIMENT CONCEPTS FOR SPACE STATION Abstract Only
LYNN D. GRIFFITHS (Management and Technical Services Co., Washington, DC.) and DONALD L. DEVINCENZI *In* NASA, Lyndon B. Johnson Space Center, Experiments in Planetary and Related Sciences and the Space Station 1 p Nov. 1987 Previously announced as N86-27152
Avail: NTIS HC A09/MF A01 CSCL 06C

The exobiology discipline uses ground based and space flight resources to conduct a multidiscipline research effort dedicated to understanding fundamental questions about the origin, evolution, and distribution of life and life related molecules throughout the universe. Achievement of this understanding requires a methodical research strategy which traces the history of the biogenic elements from their origins in stellar formation processes through the chemical evolution of molecules essential for life to the origin and evolution of primitive and, ultimately, complex living species. Implementation of this strategy requires the collection and integration of data from solar system exploration spacecraft and ground based and orbiting observatories and laboratories. The Science Lab Module (SLM) of the Space Station orbiting complex may provide an ideal setting in which to perform certain classes

of experiments which form the cornerstone of exobiology research. These experiments could demonstrate the pathways and processes by which biomolecules are synthesized under conditions that stimulate the primitive earth, planetary atmospheres, cometary ices, and interstellar dust grains. Exobiology experiments proposed for the Space Station generally fall into four classes: interactions among gases and grains (nucleation, accretion, gas-grain reactions), high energy chemistry for the production of biomolecules, physical and chemical processes occurring on an artificial comet, and tests of the theory of panspermia. Author

52

AEROSPACE MEDICINE

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

A89-17834#
STUDY OF COSMONAUTS' WORKING CAPACITY BY MEANS OF PSYCHO-PHYSIOLOGICAL METHODS AND INSTRUMENTATION OF SPECIAL DESIGN
G. IV. RADKOVSKI and P. ST. GETSOV (B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia za Kosmicheski Izsledvaniia, Sofia, Bulgaria) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 10 p. refs
(IAF PAPER 88-480)

The procedures and apparatus used to test the work capacity of Soviet space crews during flight are reviewed. The tests are intended to explore the sensory, motor, and mental activities; operative memory; attention; and emotional and volitional stability of crew members under various flight conditions and their effect on work capacity. Particular attention is given to the Sredetz psychological test apparatus first flown on Salyut 6 and the Pleven-87 apparatus for combined physiological and psychological testing. T.K.

A89-17835*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
MEDICAL CONSIDERATIONS FOR EXTENDING HUMAN PRESENCE IN SPACE
C. S. LEACH, L. F. DIETLEIN, S. L. POOL, and A. E. T. NICOGOSSIAN (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 9 p. refs
(IAF PAPER 88-484)

The medical factors affecting the duration of manned space missions are reviewed. Topics addressed include the effects of weightlessness on body fluids, the cardiovascular system, red blood cells, the musculoskeletal system, the immune system, and the nervous system and the problems encountered in readaptation to normal gravity for each of these systems. Also discussed are the effects of radiation exposure, altered circadian rhythms, and closed environments. Plans for in-flight health care on the International Space Station are briefly outlined. T.K.

A89-17836*# National Aeronautics and Space Administration, Washington, DC.
LONG-TERM FOLLOW UP OF ASTRONAUT HEALTH INDICES
A. E. NICOGOSSIAN (NASA, Washington, DC), E. MOSELEY, C. LEACH-HUNTOON, and S. POOL (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 5 p.
(IAF PAPER 88-485)

Ground-based research and reevaluation of flight data is currently in progress in order to develop suitable and operationally acceptable medical standards for extended-duration manned space missions. The large amount of data obtained thus far constitutes a unique data base representative of the astronaut population. In this paper, preliminary 10-year findings of prospective studies established in 1977 are described, and results obtained from retrospective studies conducted on data accumulated prior to the 1977 establishment of medical selection standards are summarized. C.D.

A89-17838#
EFFECTS OF ANGIOTENSIN BLOCKADE ON THE SPLANCHNIC CIRCULATION IN NORMOTENSIVE MAN
CARSTEN STADEAGER, BIRGER HESSE, OLE HENRIKSEN, NIELS JUEL CHRISTENSEN, FLEMMING BONDE-PETERSEN (Hvidovre Hospital; Glostrup Hospital; Herlev Hospital; Copenhagen, University; National Hospital, Denmark) et al. IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 24 p. Research supported by the Danish Space Board, Merck, Sharp and Dohme, and Leo Pharmaceutical Products. refs
(IAF PAPER 88-493)

The effects of angiotensin converting enzyme inhibition (ACE-I) by enalapril on splanchnic (n = 10) and central hemodynamics (n = 9) were examined in moderately salt depleted healthy volunteers, at rest and during 15-20 minutes of lower body negative pressure (LBNP) reducing mean arterial pressure by 10 mm Hg. It is found that in normal, sodium depleted man acute ACE-I decreases splanchnic vascular resistance at rest and abolishes splanchnic vasoconstriction during LBNP. Furthermore, it may interfere with autonomic nervous system control of the circulation. Author

A89-17839*# Universities Space Research Association, Houston, TX.
VESTIBULAR-RELATED NEUROSCIENCE AND MANNED SPACE FLIGHT
MAKOTO IGARASHI (Universities Space Research Association, Houston, TX) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 6 p. refs
(Contract NAG2-289; NIH-NS-10940; NIH-NS-07237; NAS9-14546)
(IAF PAPER 88-495)

The effects of weightlessness on the human vestibular system are examined, reviewing the results of recent investigations. The functional, neurophysiological, and neurochemical changes which occur during adaptation to weightlessness are discussed; theoretical models proposed to explain the underlying mechanism are outlined; and particular attention is given to the author's experiments on squirrel monkeys. There, good correlations were found between (1) the recovery of locomotor balance function in the acute compensation phase after unilateral labyrinthectomy and (2) the bilateral imbalance in the optical density of GABA-like immunoreactivity. T.K.

A89-17840#
SPACE TRAVEL AND IMPROVEMENT OF KNOWLEDGE IN MEDICINE
H. HAASE (Gesellschaft fuer Weltraumforschung und Raumfahrt der DDR, Berlin, German Democratic Republic) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 9 p. refs
(IAF PAPER 88-501)

The benefits to medicine of astronautical science are discussed. The 12-point program of the World Health Organization is reviewed, and the influences of astronautics on ideas about the limits of human performance and adaptability and on concepts about the physiological norm are considered. Relevant results from hypokinesis research, vestibular research, studies of bone metabolism and the erythrocytic system are reviewed. The effects of artificial atmospheres on man and the psychological aspects of space medicine are addressed. Gains in knowledge about the biological role of the earth's gravity are summarized, and present-day research motivations for biomedical engineering are examined. Finally, the influence of astronautics on biotechnology and materials sciences is considered. C.D.

A89-17841*# National Aeronautics and Space Administration, Washington, DC.
APPLICABILITY OF MATHEMATICAL MODELING TO PROBLEMS OF ENVIRONMENTAL PHYSIOLOGY
RONALD J. WHITE, BARBARA F. LUJAN (NASA, Life Sciences Div., Washington, DC), JOEL I. LEONARD (Lockheed Engineering and Sciences Corp., Washington, DC), and R. SRINI SRINIVASAN (Krug International, Houston, TX) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 9 p. refs
(IAF PAPER 88-504)

The paper traces the evolution of mathematical modeling and systems analysis from terrestrial research to research related to space biomedicine and back again to terrestrial research. Topics covered include: power spectral analysis of physiological signals; pattern recognition models for detection of disease processes; and, computer-aided diagnosis programs used in conjunction with a special on-line biomedical computer library. Author

A89-18562
ESTIMATING THE LEVEL AND THE RADIOSENSITIVITY OF THE HUMAN HAEMOPOIETIC STEM-CELL POOL FROM THE NUMBER OF ENDOCOLONIES OF NONDIFFERENTIATED CELLS FORMED AGAINST THE BACKGROUND OF POSTIRRADIATIONAL BONE-MARROW APLASIA [OTSENKA UROVNIA I RADIOCHUVSTVITEL'NOSTI STVOLOVOGO KROVETVORNOGO PULA CHELOVEKA PO CHISLU ENDOKOLONII NEDIFFERENTSIROVANNYKH KLETOK, FORMIRUIUSHCHIKHSIA NA FONE POSTLUCHEVOI APLAZII KOSTNOGO MOZGA]
L. A. SUVOROVA and G. P. GRUZDEV (Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 28, Sept.-Oct. 1988, p. 632-635. In Russian. refs

A89-18640
GEOMAGNETIC FIELD AND THE HUMAN ORGANISM [GEOMAGNITNOE POLE I ORGANIZM CHELOVEKA]
O. S. RAEVSKAIA (AMN SSSR, Nauchno-Issledovatel'skii Institut Normal'noi Fiziologii, Moscow, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 19, Oct.-Dec. 1988, p. 91-108. In Russian. refs

This paper discusses literature data concerning the effects of the geomagnetic field (GMF) and artificial electromagnetic fields on the human organism, with special attention given to the reactions of a healthy organism and those of individuals affected by various pathological conditions, such as preeclampsia, cardiovascular diseases, rheumatism, and chronic liver ailments. It is shown that, in a healthly individual, GMF variations affect various EEG and EKG indices as well as indices of central nervous system activity. It was found that abrupt and significant changes in the 3-h K-indices are accompanied by an appearance of stress reactions that have an individual character. I.S.

A89-19392
ATRIAL NATRIURETIC PEPTIDE IN ACUTE MOUNTAIN SICKNESS
PETER BAERTSCH, SIDNEY SHAW, MARIO FRANCIOLLI, MARKUS P. GNAEDINGER, and PETER WEIDMANN (Bern, Universitaet, Switzerland) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, Nov. 1988, p. 1929-1937. Research supported by the Kommission fuer sportwissenschaftliche Forschung and SNSF. refs

The role of the atrial natriuretic peptide (ANP) in acute mountain sickness (AMS) was investigated. Levels of circulating ANP in 25 mountaineers were measured at an altitude of 550 m and then 6, 18, and 42 h after arrival at an altitude of 4559 m, which was climbed in 24 h starting from 3220 m. Eleven subjects were found to develop severe AMS, associated with pulmonary edema and facial edema. In these sujects, urine flow and sodium excretion decreased, while plasma aldosterone, antidiuretic hormone (ADH), and ANP increased. These variables did not change significantly in unaffected subjects, with the exception of a decrease of plasma aldosterone. Reduced diuresis in AMS-affected subjects is explained by the fact that the increased plasma aldosterone and ADH were overriding the expected renal action of ANP. The association of AMS with facial and pulmonary edema is compatible with the hypothesis that ANP may contribute to edema formation by its action on transcapillary fluid exchange. I.S.

A89-19393
DECREASED CARDIAC RESPONSE TO ISOPROTERENOL INFUSION IN ACUTE AND CHRONIC HYPOXIA
J.-P. RICHALET, P. LARMIGNAT, C. RATHAT, A. KEROMES, P. BAUD (Association pour la Recherche en Physiologie de l'Environnement; Institut National de la Sante et de la Recherche Medicale, Creteil, France) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 65, Nov. 1988, p. 1957-1961. Research supported by the Ministere des Affaires Sociales of France and Laboratoires Sandoz. refs

A89-19398
PULMONARY GAS EXCHANGE IN ANDEAN NATIVES WITH EXCESSIVE POLYCYTHEMIA - EFFECT OF HEMODILUTION
GERARD MANIER, HERVE GUENARD, YVES CASTAING, NICOLE VARENE, and ENRIQUE VARGAS (Bordeaux II, Universite, France; Instituto Boliviano de Biologia de Altura, La Paz, Bolivia) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, Nov. 1988, p. 2107-2117. Research supported by the Comites Departementaux Contre les Maladies Respiratoires et la Tuberculose, Plastimed Laboratory, and Cernep Synthelabo Laboratory. refs
(Contract CNRS-84-MR/6)

A89-19399
ENDOGENOUS HORMONES SUBTLY ALTER WOMEN'S RESPONSE TO HEAT STRESS
A. J. CARPENTER and S. A. NUNNELEY (USAF, School of Aerospace Medicine, Brooks AFB, TX) Journal of Applied Physiology (ISSN 0161-7567), vol. 65, Nov. 1988, p. 2313-2317. refs

The effect of hormonal changes taking place during the menstrual cycle on the thermoregulatory responses of women working in dry hot environment was investigated by measuring maximal aerobic capacity during treadmill running. Measurements of hormone levels were carried out during three points in the hormone cycle: (1) menstrual flow, (2) 3-5 days during the midcycle including ovulation, and (3) in the middle of the luteal phase. The results suggest that the menstrual cycle alters temperature regulation without obvious alterations in the sweat output or the steady-state metabolic rate. These changes are so subtle that they can be easily missed if hormonal status is not carefully monitored concomitant with heat stress tests. Finally, the magnitudes of the changes are small and do not impair a woman's ability to work in dry heat. I.S.

A89-19826* Rice Univ., Houston, TX.
THE EFFECT OF FLUID MECHANICAL STRESS ON CELLULAR ARACHIDONIC ACID METABOLISM
L. V. MCINTIRE, J. A. FRANGOS, B. G. RHEE (Rice University, Houston, TX), S. G. ESKIN (Baylor College of Medicine, Houston, TX), and E. R. HALL (Texas, University, Houston) New York Academy of Sciences, Annals (ISSN 0077-8923), vol. 516, Dec. 28, 1987, p. 513-524. Research supported by the Robert A. Welch Foundation. refs
(Contract NAG9-207; NIH-HL-18672; NIH-HL-17437; NIH-NS-23327)

The effect of sublytic levels of mechanical perturations of cells on cell metabolism were investigated by analyzing the products of arachidonic acid (used as a marker metabolite) in blood platelets, polymorphonuclear leucocytes, and cultured umbilical-vein endothelial cells after the suspensions of these cells were subjected to a shear stress in a modified viscometer. It is shown that the sublytic levels of mechanical stress stimulated the arachidonic acid metabolism in all these cell types. Possible biological implications of this stress-metabolism coupling are discussed. I.S.

A89-19844* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
BEST ESTIMATE OF LUMINAL CROSS-SECTIONAL AREA OF CORONARY ARTERIES FROM ANGIOGRAMS
P. L. LEE (California Institute of Technology, Jet Propulsion Laboratory, Pasadena; California State University, Northridge) and R. H. SELZER (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) Medical Physics (ISSN 0094-2405), vol. 15, July-Aug. 1988, p. 576-580. refs
(Contract NIH-HL-23619)

We have reexamined the problem of estimating the luminal area of an elliptically-shaped coronary artery cross section from two or more radiographic diameter measurements. The expected error is found to be much smaller than the maximum potential error. In the cae of two orthogonal views, closed form expressions have been derived for calculating the area and the uncertainty. Assuming that the underlying ellipse has limited ellipticity (major/minor axis ratio less than five), it is shown that the average uncertainty in the area is less than 14 percent. When more than two views are available, we suggest using a least-squares fit method to extract all available information from the data. Author

A89-19879#
STUDY ON PILOT WORKLOAD - HORMONE RESPONSE TO FLIGHT STRESS
HIDEO TARUI Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 28, Dec. 1987, p. 155-163. In Japanese, with abstract in English. refs

This study deals with the endocrine responses to flight stress in F-4EJ fighter pilots engaged in seven successive sortie missions. Saliva and urine sampling was made prior to first flight, just after each sortie, and on a nonflight (control) day. The following hormones were measured: saliva cortisol and urine 17-OHCS, free cortisol, and catecholamines. It is suggested that changes in these hormones may reflect physical and mental stress of the pilots during the successive flights. Author

A89-19880#
THE ESTIMATION OF ATHEROSCLEROSIS IN PHYSICAL EXAMINATION FOR FLYING DUTY - AN EXAMINATION ABOUT SERUM VALUE OF HIGH DENSITY LIPOPROTEIN AND ATHEROGENIC INDEX
NOBORU YONETSU, AZUSA KIKUKAWA, and TOMOMITSU AKAMATSU Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 28, Dec. 1987, p. 165-178. In Japanese, with abstract in English. refs

The results of total-cholesterol and high-density-lipoprotein measurements in 809 Japanese military pilots are reported and analyzed statistically. The data are presented in extensive graphs and characterized in detail. About 10 percent of the pilots over 40 years old were found to have atherogenic index values (determined from the serum lipid measurements) indicative of atherosclerotic changes. Smoking and obesity were identified as risk factors for atherosclerosis, while exercise and moderate alcohol use were preventive factors. T.K.

A89-19881#
EFFECTS OF CHLORPHENIRAMINE ON THE EEG
ASAO KOBAYASHI, ATSUSHI KADOO, MARI SAKAUCHI, and YOSHINORI MIYAMOTO Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 29, March 1988, p. 1-9. In Japanese, with abstract in English. refs

The changes induced in resting EEG and auditory evoked potential amplitudes by orally administered chlorpheniramine maleate (CM) are investigated experimentally in six healthy male subjects. The results of EEGs and auditory tests performed 1, 3.5, 5, and 24 h after administration of 4, 10, or 20 mg of CM are presented in extensive tables and graphs and discussed in detail. The EEG Beta 1 band is found to be significantly affected by CM in plasma concentrations of 4.0-7.2 ng/ml. T.K.

A89-20661
COMBINED ATROPINE AND 2-PAM CL EFFECTS ON TRACKING PERFORMANCE AND VISUAL, PHYSIOLOGICAL, AND PSYCHOLOGICAL FUNCTIONS
DAVID M. PENETAR, GUNILLA HAEGERSTROM-PORTNOY, and REESE T. JONES (Letterman Army Institute of Research; Smith-Kettlewell Eye Research Foundation; California, University, San Francisco) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1125-1132. refs

Combinations of atropine and 2-PAM Cl were studied for their effects on a pursuit tracking task, six visual functions, heart rate and blood pressure, and cognitive functions as measured by six psychological tests. Tracking performance in both bright light and dim light was significantly degraded up to 3.5 h after injection. High-contrast and low-contrast near acuity was significantly altered up to 6 h after injection, whereas accommodation and pupil size remained altered for 24 h. Elevated pulse rates were observed for 4 h. Elevated systolic blood pressures were observed for 2 h, while diastolic pressures remained elevated for 6 h. Overall, the observed effects of these two drugs in combination are qualitatively similar to those of atropine alone, although they are of greater magnitude. On two measures (accommodation and diastolic blood pressure), 2-PAM Cl was found to significantly potentiate the atropine effect. Author

A89-20662
INTERACTIVE EFFECTS OF PHYSICAL WORK AND CARBON MONOXIDE ON COGNITIVE TASK PERFORMANCE
DAVID E. BUNNELL and STEVEN M. HORVATH (California, University, Santa Barbara) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1133-1138. refs
(Contract EPA-R-811596)

The effect of the exposure to carbon monoxide combined with physical work on the cognitive performance was evaluated in humans subjected to three levels of CO and three workloads, resulting in nine measured conditions for each subject. Following bolus CO administration, the subjects exercised or rested for 50 min before performing five cognitive tasks. It was found that performance on the second of the two sequentially presented Stroop word-color interference tasks (using identical stimuli but with instructions reversed) was impaired with the increasing levels of carboxyhemoglobin (HbCO), suggesting a reduced ability to adapt to a new response set. For visual search test at rest, performance was improved with increasing HbCO level, but was impaired with increasing HbCO levels when it followed physical work. Elevated HbCO had no effect on spatial processing, short-term memory, simple reaction time, or psychomotor tracking. I.S.

A89-20663
DECOMPRESSION SICKNESS AND BUBBLE FORMATION IN FEMALES EXPOSED TO A SIMULATED 7.8 PSIA SUIT ENVIRONMENT
G. A. DIXON, J. R. FISCHER (USAF, School of Aerospace Medicine, Brooks AFB, TX), and R. W. KRUTZ, JR. (Krug International Corp., Technology Services Div., San Antonio, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1146-1149. refs

The susceptibility to decompression sickness of female subjects during simulated EVA (three consecutive 6-h-long exposures to 7.8 psia suit pressure) was investigated. During each exposure, the subjects participated in exercise workloads similar to those expected during a typical EVA scenario. Forty-three percent of the subjects were found to experience intravenous bubbling during at least one of the three exposure days, while 17 percent developed decompression sickness (DCS). The results suggest that female subjects may suffer more delayed DCS symptoms than their male counterparts were found earlier to suffer under the same experimental conditions. I.S.

A89-20664* Pennsylvania State Univ., University Park.
PREDICTION OF PHYSICAL WORKLOAD IN REDUCED GRAVITY
JOSEPH H. GOLDBERG (Pennsylvania State University, University Park) and JOHN W. ALRED (NASA, Johnson Space Center, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1150-1157. Previously announced in STAR as N88-14867. refs

The background, development, and application of a methodology to predict human energy expenditure and physical workload in low gravity environments, such as a Lunar or Martian base, is described. Based on a validated model to predict energy expenditures in earth-based industrial jobs, the model relies on an elemental analysis of the proposed job. Because the job itself need not physically exist, many alternative job designs may be compared in their physical workload. The feasibility of using the model for prediction of low gravity work was evaluated by lowering body and load weights, while maintaining basal energy expenditure. Comparison of model results was made both with simulated low gravity energy expendiure studies and with reported Apollo 14 Lunar EVA expenditure. Prediction accuracy was very good for walking and for cart pulling on slopes less than 15 deg, but the model underpredicted the most difficult work conditions. This model was applied to example core sampling and facility construction jobs, as presently conceptualized for a Lunar or Martian base. Resultant energy expenditures and suggested work-rest cycles were well within the range of moderate work difficulty. Future model development requirements were also discussed. Author

A89-20665* California Univ., Los Angeles.
OCULAR TORSION IN UPRIGHT AND TILTED POSITIONS DURING HYPO- AND HYPERGRAVITY OF PARABOLIC FLIGHT
SHIRLEY G. DIAMOND and CHARLES H. MARKHAM (California, University, Los Angeles) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1158-1162. refs
(Contract NAG9-179)

Four subjects considered resistant to motion sickness were tested in KC-135 parabolic flight to examine ocular torsion at hypo-gravity and hypergravity. Three of these subjects showed no significant torsion at zero G in either the upright position or when tilted 30 deg to right or left. At 1.8 G in the tilted positions, they showed greater ocular counterrolling than at 1 G. None of these three subjects became motion sick. The fourth subject showed eye torsion toward his left in all positions at zero G. This leftward bias could also be seen at 1.8 G when tilted left ear down, the side that induces rightward counterrolling. There he had less eye torsion than at 1 G. This subject became motion sick. These results support the hypothesis that asymmetry of the utricular system may be well compensated in the normal 1 G environment, but unmasked in unaccustomed gravitational situations, suggesting a possible predictive test for space adaptation syndrome. Author

A89-20666
ESTIMATION OF BODY FLUID VOLUMES USING TETRAPOLAR BIOELECTRICAL IMPEDANCE MEASUREMENTS
HENRY C. LUKASKI and WILLIAM W. BOLONCHUK (USDA, Human Nutrition Research Center, Grand Forks, ND) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1163-1169. refs

A89-20667
CENTRAL SEROUS CHORIORETINOPATHY IN U.S. AIR FORCE AVIATORS - A REVIEW
R. P. GREEN, JR., D. W. CARLSON, T. J. TREDICI (USAF, School of Aerospace Medicine, Brooks AFB, TX), and J. P. DIECKERT (USAF, Medical Center, Lackland AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1170-1175. refs

This paper reports on the results of clinical and aeromedical ophthalmic examinations, both initial and follow-up, performed on 47 USAF pilots affected by idiopathic central serous chorioretinopathy (ICSC). Ninety-seven percent of pilots were ultimately returned to flight status after the initial examination. Of these, 51 percent had recurrent episodes of ICSC, 17 percent had bilateral ICSC, and 13 percent underwent laser photocoagulation. Visual acuity was found to correlate with active disease, and there was a trend toward poor stereopsis and diminished color vision with the worsening of visual acuity. I.S.

A89-20668
PERIOD PREVALENCE OF ACUTE NECK INJURY IN U.S. AIR FORCE PILOTS EXPOSED TO HIGH G FORCES
RODGER D. VANDERBEEK (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1176-1180. refs

This report presents the findings from a prevalence study of acute neck injury, resulting from high G forces, in pilots of high-performance aircraft. A sample of 437 pilots from three different aircraft with varying performance capabilities was surveyed by means of an anonymous questionnaire. Stratified sample data were analyzed to determine the strength of association of injury prevalence with pilot age, type of aircraft, and type of flying environment. Of the surveyed pilots, 50.6 percent stated thay had some type of acute neck injury in the preceding three-month period. Higher aircraft performance was associated with increased injury prevalence. Increased age was associated with increased prevalence of major injury. Preventive strategies may be helpful in reducing injury frequency and avoiding serious injuries. Author

A89-20669
FATAL PULMONARY DECOMPRESSION SICKNESS - A CASE REPORT
JAY C. NEUBAUER (USAF, Aeromedical Services, England AFB, LA), JAMES P. DIXON (USAF, School of Aerospace Medicine, Brooks AFB, TX), and CHARLES M. HERNDON (USAF, Hospital, George AFB, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1181-1184. refs

This paper discusses a case of recent fatality due to decompression effects involving the pulmonary system. Pathologically, this case was similar to cases presented in the past. The findings emphasize many of the risk factors for decompressional sickness, such as age and obesity, and point out the necessity of maintaining only the highest standards of physical health in those who fly high-performance aircraft. I.S.

A89-20670* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SPACE MOTION SICKNESS DURING 24 FLIGHTS OF THE SPACE SHUTTLE
JEFFREY R. DAVIS, JAMES M. VANDERPLOEG, PATRICIA A. SANTY, RICHARD T. JENNINGS, and DONALD F. STEWART (NASA, Johnson Space Center, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1185-1189. refs

This paper examines the incidence and the severity of space motion sickness (SMS) during 24 flights of the Space Shuttle, using a standardized questionnaire administered to all crewmembers postflight. It was found that, for 85 crewmembers, the incidence of SMS during a first Shuttle flight was 67 percent, of which 30 percent were mild cases, 24 percent moderate, and 13 percent severe. Crewmembers with a second flight showed a reduction in SMS incidence, but the change was not significant compared with the first flight. It is suggested that variability in crewmember training and flight experience may explain some of the differences observed. I.S.

N89-13870# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. USSR: LIFE SCIENCES
27 Sep. 1988 35 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-88-016) Avail: NTIS HC A03/MF A01

Translations of various articles from Russian periodicals are

translated and presented. All articles are under the general heading of Life Sciences. Some more specific areas are: Aerospace Medicine, Agricultural Science, Biochemistry, Biophysics, Genetics, Immunology, Industrial Medicine, Laser Bioeffects, Molecular Biology, Nonionizing Radiation Effects, Pharmacology and Toxicology, Physiology, and Public Health.

N89-13871# Joint Publications Research Service, Arlington, VA.
ASSESSMENT OF PAIRED ACTIVITY OF OTOLITHIC APPARATUS OF HEALTHY MEN BY STUDY ON PARALLEL SWINGS Abstract Only
E. I. MATSNEV, V. K. GAVRILIN, and I. YA. YAKOVLEVA *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 1 27 Sep. 1988 Transl. into ENGLISH from Vestnik Otorinolaringologii (Moscow, USSR), no. 2, Mar. - Apr. 1988 p 28-33
Avail: NTIS HC A03/MF A01

Subjects (51 healthy males, ranging in age from 24 to 41 years) were positioned on a swing so that the longitudinal axis of the body coincided with the plane of rocking of parallel swings. They swung sequentially in three positions (on the back, on the right side and on the left side) and compensatory eye movements were recorded. Compensatory eye movements of the right eye and left eye were measured separately. Otolithic assymetry was recorded in 38 percent of the subjects. Physiological variance of values of assymetry of compensatory eye movements of the subjects was 7.21 + or - 0.86 degrees. The assymetry coefficient was 26.2 + or - 2.8 percent. The amplitude of compensatory eye movements of the right eye with the subject on his right side was 9.69 + or - 0.60 degrees and that of the left eye with the subject on the left side was 14.32 + or - 0.94 degrees. The amplitude of movements of the lower eye when the subject was on his side did not always exceed the amplitude of movements of the other eye. In some cases compensatory eye movements began several minutes (3 to 4) after swinging began. Author

N89-13872* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 316)
Nov. 1988 59 p
(NASA-SP-7011(316); NAS 1.21:7011(316)) Avail: NTIS HC A04; NTIS standing order as PB88-912300. $9.00 domestic. $18.00 foreign CSCL 06E

This bibliography lists 146 reports, articles, and other documents introduced into the NASA scientific and technical information system in October, 1988. Author

N89-13873# Washington Univ., St. Louis, MO. Dept. of Neurology.
RELATING SENSITIVITY AND CRITERION EFFECTS TO THE INTERNAL MECHANISMS OF VISUAL SPATIAL ATTENTION Technical Report, 1 May 1988 - 1 May 1989
GORDON L. SHULMAN and MICHAEL I. POSNER 30 Apr. 1988 18 p
(Contract N00014-86-K-0289; RR04206)
(AD-A197088; TR-88-2-ONR) Avail: NTIS HC A03/MF A01 CSCL 06D

A recent paper raises the important issue of how to relate the parameters d' and beta to the internal mechanisms that process visual stimuli. This commentary considers the widely held view that d' changes reflect a variety of mechanisms leading to perception, but that beta changes reflect a single high level decision mechanism that is postperceptual and under conscious control. In a complex highly parallel, multi-level system, both sensitivity and criterion shifts may influence perception in lawful ways - neither being necessarily more basic and important. The paper, raises some methodological considerations that qualify Muller and Findlay's results. It is not argued that probability manipulations produce beta shifts in detection tasks and d' shifts in identification tasks is necessarily wrong. The implication Muller and Findlay along with others often draw from this kind of result - that detection tasks involve radically different selection mechanisms than identification tasks is questioned. In the following discussion, the terms d' and beta will refer to the quantities one computes from data collected to the theoretical variables that may underly changes in these measured quantities. GRA

N89-13874# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
IMPROVED ESTIMATION OF BODY HEAT DISTRIBUTION DURING COOLING: A FIRST ATTEMPT
B. FARNWORTH and G. HAVENITH Nov. 1987 37 p
(IZF-1987-38; TD-88-0287; ETN-88-93451) Avail: NTIS HC A03/MF A01

Cooling and rewarming experiments on supine (resting) subjects, instrumented with heat flow sensors, allowed analysis of time constants for skin temperature change. For the chest, during cooling, a short time constant of 5 min, and a long time constant of 20 min, depending of the fat layer thickness, are found. Heat resistances, depending on skin temperatures, and time constants suggest a simple core and shell system, although the data are not conclusive. For the arm, during cooling, a short time constant comparable to the chest is observed, whereas the long time constant suggests that the arm cools as a whole, like dead material. Model calculations show that the associated blood flow does not deliver a significant amount of heat, which suggests an effective counter current heat exchange. During heating, however, the blood flow is dominant. When a model is considered, consisting of head and trunk with chest characteristics, and arms and legs with arm characteristics, a significantly better but not perfect calculation of heat storage during cooling is obtained. ESA

N89-13875# Connecticut Univ., Storrs. Biomedical Engineering Lab.
HUMAN AUDITORY AND VISUAL UNIMODAL AND BIOMODAL CONTINUOUS EVOKED POTENTIALS Summary Report, Sep. 1983 - Nov. 1987
ZVI Z. GOLDMAN Mar. 1988 88 p
(Contract F33615-81-K-0510)
(AD-A198845; AAMRL-TR-88-016) Avail: NTIS HC A05/MF A01 CSCL 06D

This research has adapted the phase-lock technique in recording of Continuous Evoked Potentials (CEPs, also referred to as steady-state potentials) for monitoring of the auditory and visual sensory channel engagement and for stimulus parameter-space characterization of the Auditory-Visual Interaction effect (AxV). Sensory interaction was concluded whenever response variations of one sensory channel could be attributed to parameter changes of an additional stimulus, simultaneously presented to another sensory channel. GRA

N89-13876# Naval Health Research Center, San Diego, CA.
APPLIED ANTHROPOLOGY ON THE ICE: A MULTIDISCIPLINARY PERSPECTIVE ON HEALTH AND ADAPTATION IN ANTARCTICA Final Report
LAWRENCE A. PALINKAS and E. K. ERIC GUNDERSON 31 May 1988 21 p
(Contract NSF DPP-87-16461; DA PROJ. 3M1-62770-A-870)
(AD-A198926; NHRC-88-21) Avail: NTIS HC A03/MF A01 CSCL 06J

This paper describes the health and adaptation of Antarctic winter-over personnel and outlines some of the ways in which applied medical anthropology can play a central role in understanding and improving health and performance under conditions of prolonged isolation in an extreme environment. The history of social and behavioral science research on the human experience in Antarctica is reviewed. Of particular interest are the sources and symptoms of stress among winter-over personnel, the relationship between stress and illness, and the moderating influence of personality, social support, and culture in this relationship. Scientists and support personnel who winter-over in the Antarctic experience a number of physiological and psychological changes which are a response to the harsh environmental conditions and prolonged isolation. However, the long-term record of health and performance among winter-over

personnel subsequent to Antarctic duty suggest that a certain positive benefit may be acquired from the experience. This is perhaps due to the role of station microcultures which enable individuals to cope with the stress of prolonged isolation in an extreme environment. The holistic perspective of anthropology would allow for an examination of the respective contributions of group and individual processes to adaptation. GRA

N89-13877# New York Univ., New York. Dept. of Psychology.
HIGHER ORDER MECHANISMS OF COLOR VISION Annual Progress Report, 15 Sep. 1986 - 14 Mar. 1988
JOHN KRAUSKOPF 29 Jun. 1988 16 p
(Contract AF-AFOSR-0334-86; AF PROJ. 2313)
(AD-A198093; AFOSR-88-0740TR) Avail: NTIS HC A03/MF A01 CSCL 05H

This report covers activities since September 15, 1986. The main accomplishments have been: (1) a comprehensive study of the effects of chromatic content, blur and contrast of targets on vernier acuity and on stereo acuity; (2) the use of a new method of measuring chromatic discrimination under conditions of constant adaptation; and (3) continuation of the study of the chromatic properties of single cells in the monkey cortex. GRA

N89-13878# State Univ. of New York, Albany.
THE EFFECTS OF ROTARY MOTION ON TASTE AND ODOR RATINGS: IMPLICATIONS FOR SPACE TRAVEL Final Report, 22 Jun. - 28 Aug. 1987
ANN M. TENNISSEN, LARRY L. LESHER (Geo-Centers, Inc., Newton, Mass.), and ARMAND V. CARDELLO Dec. 1987 34 p
Prepared for Battelle Columbus Labs., Ohio
(Contract DAAL03-86-D-0001)
(AD-A198241) Avail: NTIS HC A03/MF A01 CSCL 06D

Astronauts have reported that food eaten in space tastes different or bland. This experiment was designed to investigate the possible role of the motion component of space travel as a contributor to taste and/or odor preference shifts. Two subjects from the Ashton Graybiel Spatial Orientation Laboratory were used to examine the effects of motion in a rotating room on taste and odor ratings. Solutions of NaCl, sucrose, citric acid, and quinine sulfate for taste tests and 10 food odorants for odor tests were rated on both intensity and pleasantness qualities before and after time spent in a rotating room. There was an effect of this motion in one subject whose ratings differed significantly on post-rotation tests. This fact lends support to the idea that motion may be a part of the reported taste changes in space. GRA

N89-13879* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 317)
Dec. 1988 70 p
(NASA-SP-7011(317); NAS 1.21:7011(317)) Avail: NTIS HC A05 CSCL 06E

This bibliography lists 182 reports, articles and other documents introduced into the NASA scientific and technical information system in November, 1988. E.R.

N89-14660# Joint Publications Research Service, Arlington, VA.
HOLOGRAPHIC RECORDING OF DEFORMATION WAVES IN MUSCLE TISSUE Abstract Only
V. S. SINYAKOV *In its* JPRS Report: Science and Technology. USSR: Life Sciences p 13 4 Aug. 1987 Transl. into ENGLISH from Byulleten Eksperimentalnoy Biologii i Meditsiny (Moscow, USSR), v. 102, no. 10, Oct. 1986 p 495-498
Avail: NTIS HC A10/MF A01

Waves were recorded by two methods: static and dynamic. The static method involved measuring the bending of the surface of the muscle as a function of static force acting on the muscle through a circular stamp. In the dynamic studies, a shear deformation wave was created, the profile of which was recorded by holographic interferometry. The interferograms revealed that at frequencies from 200 to 500 Hz the vibrator creates deformation waves which penetrate into the muscle tissue deeply enough to be used to study the muscle tissues, the skin having practically no influence on the interference picture. The method is suitable for investigation of the biomechanical properties of human muscles and, also, for determination and investigation of heterogeneities in any elastic-viscous material. Author

N89-14668# Army Research Inst. of Environmental Medicine, Natick, MA.
THE EFFECTS OF DIFFERENT RUN TRAINING PROGRAMS ON PLASMA RESPONSES OF BETA-ENDORPHIN, ADRENOCORTICOTROPIN AND CORTISOL TO MAXIMAL TREADMILL EXERCISE
WILLIAM J. KRAEMER, STEVEN J. FLECK, ROBIN CALLISTER, MARILYN SHEALY, and GARY A. DUDLEY Apr. 1988 29 p
Prepared in cooperation with US Olympic Committee, Colorado Springs, CO; Ohio Univ., Athens; Bionetics Corp., Kennedy Space Center, FL; and Connecticut Univ., Storrs
(AD-A197472; USARIEM-M056-88) Avail: NTIS HC A03/MF A01 CSCL 06J

The purpose of this study was to examine the effects of three different run training programs on plasma responses of beta-endorphin (beta-EP) adrenocorticotropin (ACTH) and cortisol to maximal treadmill exercise. Significant exercise-induced increases in plasma beta-EP, ACTH, cortisol and blood lactate were observed for both pre- and post-training tests. The SI group demonstrated significant post-training increases in beta-EP, ACTH, cortisol and peak 5 min post-exercise blood lactate concentrations in response to maximal exercise. No training-induced hormonal changes were observed for the E group. The C group exhibited significant post-training decreases in plasma beta-EP, ACTH and blood lactate concentrations in response to maximal exercise, while resting and post-exercise plasma cortisol measures were significantly increased in the post-training test. These data suggest that different run training programs produce differential effects on plasma beta-EP, ACTH and cortisol in response to maximal exercise, and these responses may be linked to anaerobic metabolic factors. GRA

N89-14669# Research Solutions, Inc., Columbus, GA.
EFFECTS OF LOW AND HIGH OXYGEN TENSIONS AND RELATED RESPIRATORY CONDITIONS ON VISUAL PERFORMANCE: A LITERATURE REVIEW Final Report
FREDERICK N. DYER Jul. 1988 276 p
(Contract DAAL03-86-D-0001)
(AD-A198688; USAARL-88-7) Avail: NTIS HC A13/MF A01 CSCL 06D

Research was reviewed on the effects of hypoxia, hyperoxia, hypocapnia, and hypercapnia on a large number of visual and ocular processes. These included absolute visual sensitivity, dark adaptation, visual acuity, contrast sensitivity, depth perception, stereopsis, fields of peripheral and central vision, critical flicker/fusion frequency, color vision, afterimages, other entoptic phenomena, persistence of vision following ischemia, the standing potential, the electroretinogram, ganglion cell and optic-tract responses, visual evoked responses, ocular vessels, blood flow, intraocular pressure, intraocular oxygen, the pupil, accommodation, myopia, the crystalline lens, convergence, heterophoria, reading, other eye movements, and the cornea. Research was also reviewed on the potential toxic effects of hyperbaric oxygenation on vision. GRA

N89-14670# Calspan Corp., Buffalo, NY.
THE EFFECT OF PYRIDOSTIGMINE BROMINE ON INFLIGHT AIRCREW PERFORMANCE Final Report, 2 Jan. 1984 - 13 Dec. 1987
VALERIE J. GAWRON, SAMUEL G. SCHIFLETT, JAMES C. MILLER, JOHN F. BALL, TIMOTHY SLATER, FAUST R. PARKER, MARY M. LLOYD, DAVID J. TRAVALE, and RONALD J. SPICUZZA (Systems Research Labs., In., California, MD.) Jul. 1988 183 p
(Contract F33615-83-C-3603)
(AD-A198828; USAFSAM-TR-87-24) Avail: NTIS HC A09/MF A01 CSCL 15F

The effects of a chemical defense pretreatment drug, pyridostigmine bromide (PB), on inflight aircrew performance were assessed using the Total Inflight Simulation (TIFS) aircraft. The TIFS aircraft was used to supply appropriate control dynamics, handling characteristics, and cockpit instrumentation for a tactical transport simulation. Twenty-one C-130 pilots flew two familiarization flights and four data flights. During two of the data flights, PB was given to both members of the aircrew. Following are the specific conclusions: Aircrews successfully completed their assigned mission; airdrop inaccuracies and navigation errors in time and distance were not specifically related to PB; pilot flight performance and crew coordination were not affected by PB; PB and crew order significantly interacted with copilot and postflight tests; PD did not significantly affect subjective workload, fatigue, or mood; acetylcholinesterase (AChE) percent inhibition (26.8 percent) levels and plasma PB levels (17.3 nanograms/milliliter) were within expected mean peak values, but varied greatly between subjects; inflight symptoms were reported infrequently--those symptoms reported were slight to moderate in degree of severity and were not PB specific; and subjects and observers did not discriminate beyond chance between PB and placebo conditions. PB, in the dosage and regimen used for this flight test, provides a safe operational pretreatment for tactical aircrews flying a simulated airdrop mission under a chemical warfare threat. GRA

N89-14671# Pacific Northwest Labs., Richland, WA.
PROGRESS IN LUNG MODELING BY THE ICRP TASK GROUP
A. C. JAMES and A. BIRCHALL Sep. 1988 34 p Presented at the Workshop on Biological Assessment of Occupational Exposure to Actinides, Versailles, France, 30 May 1988
(Contract DE-AC06-76RL-01830)
(DE88-015934; PNL-SA-15781; CONF-880514-5) Avail: NTIS HC A03/MF A01

The Task Group has reviewed the data on: (1) morphology and physiology of the human respiratory tract; (2) inspirability of aerosols and their deposition in anatomical regions as functions of respiratory parameters; (3) clearance of particles within and from the respiratory tract; and (4) absorption of different materials in the blood in humans and in animals. Evidence for evaluating the relative sensitivities of different tissues within the respiratory tract, and for defining cells at risk, has also been reviewed. On these grounds, the Task Group proposes a new model which predicts the deposition, retention and systemic uptake of materials, enabling doses absorbed by different respiratory tissues and other body organs to be evaluated. In the proposed model, clearance is described in terms of competition between the processes moving particles to the oropharynx or to lymph nodes and that of absorption into the blood. From studies with human subjects, characteristic rates and pathways are defined to represent mechanical clearance of particles from each region, which do not depend on the material. Conversely, the absorption rate is determined solely by the material: it is assumed to be the same in all parts of the respiratory tract and in other animal species. For several of the radiologically important forms of actinides, adsorption rates can be derived from animal experiments, or, in some cases, directly from human data. Otherwise, default values are used, based on the current D, W, and Y classification system. DOE

N89-14672# Colorado State Univ., Fort Collins. Program in Neuronal Growth and Development.
CIRCUIT BEHAVIOR IN THE DEVELOPMENT OF NEURONAL NETWORKS Final Report, 1 Mar. 1987 - 28 Feb. 1988
STANLEY B. KATER and BARBARA C. HAYES 28 Feb. 1988 4 p
(Contract AF-AFOSR-0147-87; AF PROJ. 2312)
(AD-A198040; AFOSR-88-0784TR) Avail: NTIS HC A02/MF A01 CSCL 06D

The goal of this research has been to devise methods for accurately recording the activity of neuronal networks. The initial objective was to obtain multi-point recordings from neurons using extracellular electrical signals. For several reasons, this methods is now regarded with some skepticism: (1) Only neurons with very fast rising action potentials have been successfully recorded from because of the high-pass characteristics of extracellular electrodes (2) Only neuronal somata can be recorded from; (3) The primary interactions between neurons are on small neurites which are not routinely accessible by these methods; (4) Stimulation through these electrodes is quite possible, however, the efficacy of stimulation is only known when an alternative recording device is in place. Optical methods have been used with success for monitoring not just the extracellular events of neurons but also the intracellular changes in toxic activity. An extremely reliable method has been also the intracellular changes in ionic activity. An extremely reliable method has been developed, using the dye Fura 2, for analyzing calcium currents, in circuit behavior. This work allows examination of the ensemble activity of specific sets of neurons given precise classes of input in order to assess the integrative qualities of the network and the specific classes of solutions to computational problems. GRA

N89-14673# Loyola Univ., Chicago, IL. Hearing Inst.
INFORMATION PROCESSING OF COMPLEX SOUNDS IN THE ANTEROVENTRAL COCHLEAR NUCLEUS Final Report, Sep. 1986 - Mar. 1988
WILLIAM P. SHOFNER Apr. 1988 14 p
(Contract AF-AFOSR-0326-86; AF PROJ. 2313)
(AD-A198576; AFOSR-88-0850TR) Avail: NTIS HC A03/MF A01 CSCL 06D

Experiments currently in progress are designed to quantify the information in the average firing rates of cochlear nucleus neurons. Single unit responses to best frequency tone bursts are recorded, and Receiver Operating Characteristic (ROC) curves are generated from empirical spike count distributions. In order to quantify the amount of information present for an increase in discharge rate, the area under the ROC curve, P(A), is computed. For a given difference in the means of two spike count distributions regular units (such as choppers) typically give larger P(A) values than do some irregular units (such as choppers) typically give larger P(A) values than do some irregular units (primary-like or transient chopper units). These results suggest that rate information may be enhanced in certain subsystems of the cochlear nucleus. Single unit recording experiments will be carried out in the cochlear nucleus to establish whether a rate-place representation of tones and tones in noise are preserved by the chopper units (stellate cells) of the AVCN. To obtain an objective measure of how much information is present in the average discharge rate, techniques derived from Signal Detection Theory are applied to empirical spike count distributions obtained. GRA

N89-14674# Tours Univ. (France). Lab. de Biophysique Medicale.
CARDIOVASCULAR SYSTEM AND SPACE ENVIRONMENT Final Report [SYSTEME CARDIOVASCULAIRE ET ENVIRONNEMENT AEROSPATIALE]
A. RONCIN 27 Sep. 1988 93 p In FRENCH
(Contract DRET-85-136)
(ETN-89-93600) Avail: NTIS HC A05/MF A01

A linear electronic scanning device with curved detector was developed in order to measure blood flux in studies concerning acceleration and microgravity conditions. The curved sensor is adjusted to a resonance of 3.5 MHz and is used both for heart or large blood vessel measurements. The onboard device allows to visualize the structures and to measure blood flow in a Doppler coded mode. The associated electronic circuits are detailed. The functional tests carried out show adequate performance. ESA

N89-14675* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Jan. 1989 75 p
(NASA-SP-7011(318); NAS 1.21:7011(318)) Avail: NTIS HC A05; NTIS standing order as PB89-912300, $10.50 domestic, $18.00 foreign CSCL 06E

This bibliography lists 223 reports, articles, and other documents

introduced into the NASA scientific and technical information system in December, 1988. Author

N89-14676*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EYE AND HEAD MOTION DURING HEAD TURNS IN SPACEFLIGHT
WILLIAM E. THORNTON, JOHN J. URI, THOMAS P. MOORE (Methodist Hospital, Indianapolis, IN.), and SAM L. POOL Jul. 1988 26 p
(NASA-TM-100466; S-580; NAS 1.15:100466) Avail: NTIS HC A03/MF A01 CSCL 06P

Eye-head motion was studied pre-, in- and postflight during single voluntary head turns. A transient increase in vestibulo-ocular reflex (VOR) gain occurred early in the flight, but later trended toward normal. This increased gain was produced by a relative increase in eye counterrotation velocity. Asymmetries in gain with right and left turns also occurred, caused by asymmetries in eye counterrotation velocities. These findings were remarkably similar to those from Soviet primate studies using gaze fixation targets, except the human study trended more rapidly toward normal. These findings differ substantially from those measuring VOR gain by head oscillation, in which no significant changes were found inflight. No visual disturbances were noted in either test condition or in normal activities. These head turn studies are the only ones to date documenting any functional change in VOR in weightlessness. Author

N89-14677*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
STUDIES OF THE HORIZONTAL VESTIBULO-OCULAR REFLEX ON STS 7 AND 8
WILLIAM E. THORNTON, JOHN J. URI, THOMAS P. MOORE (Methodist Hospital, Indianapolis, IN.), and SAM L. POOL Sep. 1988 55 p
(NASA-TM-100468; S-583; NAS 1.15:100468) Avail: NTIS HC A04/MF A01 CSCL 06P

Unpaced voluntary horizontal head oscillation was used to study the Vestibulo-Ocular Reflex (VOR) on Shuttle flights STS 7 and 8. Ten subjects performed head oscillations at 0.33 Hz + or - 30 deg amplitude under the followng conditions: VVOR (visual VOR), eyes open and fixed on a stationary target; VOR-EC, with eyes closed and fixed on the same target in imagination; and VOR-S (VOR suppression), with eyes open and fixed on a head-synchronized target. Effects of weightlessness, flight phase, and Space Motion Sickness (SMS) on head oscillation characteristics were examined. A significant increase in head oscillation frequency was noted inflight in subjects free from SMS. In subjects susceptible to SMS, frequency was reduced during their Symptomatic period. The data also suggest that the amplitude and peak velocity of head oscillation were reduced early inflight. No significant changes were noted in reflex gain or phase in any of the test conditions; however, there was a suggestion of an increase in VVOR and VOR-ES gain early inflight in asymptomatic subjects. A significant difference in VOR-S was found between SMS susceptible and non-susceptible subjects. There is no evidence that any changes in VOR characteristics contributed to SMS. Author

53

BEHAVIORAL SCIENCES

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

A89-17900
THE PSYCHOLOGY OF FLIGHT TRAINING
ROSS TELFER (Newcastle, University, Australia) and JOHN BIGGS (University of Hong Kong, Hong Kong) Ames, IA, Iowa State University Press, 1988, 175 p. refs

The fundamental principles of educational psychology and psychologically based teaching techniques are examined in an introduction for flight instructors. Chapters are devoted to the skills required of aircraft pilots, learning and memory, teaching flying skills, motivation and arousal as general behavioral determinants, the motivation and self-concept of student pilots, evaluating learning, and special aspects of training and instruction. Extensive diagrams, graphs, and tables are provided. T.K.

A89-18799
DIRECTION OF SELF-MOTION IS PERCEIVED FROM OPTICAL FLOW
WILLIAM H. WARREN, JR. and DANIEL J. HANNON (Brown University, Providence, RI) Nature (ISSN 0028-0836), vol. 336, Nov. 10, 1988, p. 162, 163. refs

Computer-generated displays of optical flow are used here to show that humans can perceive their direction of self-motion during stationary fixations, pursuit eye movememnts, and with displays that simulate the effects of eye movements. It is concluded that optical flow is sufficient for perceiving the direction of self-motion. Evidence is provided for a theory based on differential element motion. C.D.

A89-19877#
PSYCHOLOGICAL ASPECTS OF FLIGHT APTITUDE AND ADAPTATION TO FLYING
MIYAKO OKAUE Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 28, Dec. 1987, p. 111-139. In Japanese, with abstract in English. refs

Factors affecting the progress of students in a pilot-training program are discussed from a psychological perspective. The general criteria applied in the selection of candidate pilots are briefly reviewed, and particular attention is given to the effects of program design (type of trainer aircraft and flight hours), training methods (training-flight duration, use of simulators, syllabus design), interpilot and pilot-instructor relationships, and psychologically traumatic experiences during training flights. T.K.

A89-19882#
PSYCHOLOGICAL STUDY ON MOOD STATES OF FIGHTER PILOTS BEFORE FLIGHTS
MIYAKO OKAUE and ZENJI TAKASHIMA Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 29, March 1988, p. 21-42. In Japanese, with abstract in English. refs

Results are presented from a study employing psychological self-evaluation questionnaires to explore the relationship between fighter-pilot preflight moods and mission difficulty, postflight moods and physical well-being, flight experience, and other factors. The data are presented in extensive tables and graphs (in English) and discussed in detail. Significantly increased preflight mood instability was found for difficult flight missions. T.K.

N89-13880# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
QUALITATIVE DEPTH AND SHAPE FROM STEREO, IN AGREEMENT WITH PSYCHOPHYSICAL EVIDENCE
DAPHNA WEINSHALL Dec. 1987 22 p
(Contract N00014-85-K-0124)
(AD-A197259; AD-E900802; AI-M-1007) Avail: NTIS HC A03/MF A01 CSCL 05H

This paper concentrates on the problem of obtaining depth information from binocular disparities. It is motivated by the fact that implementing registration algorithms and using the results for depth computations is hard in practice with real images due to noise and quantization errors. We will show that qualitative depth information can be obtained from stereo disparities with almost no computations, and with no prior knowledge (or computation) of camera parameters. The only constraint is that the epipolar plane of the fixation point includes the X-axes of both cameras. We derive two expressions that order all matched points in the images

in two distinct depth-consistent fashions from image coordinates only. One is a tilt-related order lambda, which depends only on the polar angles of the matched points, the other is a depth-related order chi. Using lambda for tilt estimation and point separation (in depth) demonstrates some anomalies and unusual characteristics that have been observed in psychophysical experiments, most notably the induced size effect. Furthermore, the same approach can be applied to estimate some qualitative behavior of the normal to the surface of any object in the field of view. More specifically, one can follow changes in the curvature of contour on the surface of an object, with either x- or y-coordinate fixed. GRA

N89-13881# Bolt, Beranek, and Newman, Inc., Cambridge, MA.
HUMAN PLAUSIBLE REASONING Interim Report, Sep. 1985 - Sep. 1988
ALLAN COLLINS, MARK BURSTEIN, and MICHELLE BAKER Jul. 1988 14 p
(Contract MDA903-85-C-0411; DA PROJ. 2Q1-61102-B-74-F)
(AD-A197426; ARI-RN-88-68) Avail: NTIS HC A03/MF A01 CSCL 12E

This research note describes the current state of implementation of a cognitive computer model of human plausible reasoning, based on the theory described by Collins and Michalski. The note's goal is to use simulation as a way to test and refine the theory. This required developing appropriate memory organization and search techniques to support this style of inference, finding ways to estimate similarity in specific contexts, and to investigate ways of combining the sometimes contradictory conclusions reached when inferences of different types are used to answer questions. GRA

N89-13882# Pennsylvania Univ., Philadelphia.
DIRECT ACCESS BY SPATIAL POSITION IN VISUAL MEMORY. PART 3. THE ROLES OF UNCERTAINTY ABOUT POSITION, TARGET, AND RESPONSE IN INFORMATION RETRIEVAL Technical Report No. 4, 1 Sep. 1985 - 31 Aug. 1987
SAUL STERNBERG, RONALD L. KNOLL, and DAVID L. TUROCK 15 Aug. 1988 44 p Prepared in cooperation with AT and T Bell Labs., Murray Hill, N.J.
(Contract N00014-85-K-0643; RR04206; RR04204)
(AD-A198740) Avail: NTIS HC A03/MF A01 CSCL 05H

Storage time has dramatic effects on the retrieval of visual information specified by location. In this study we use two new experimental procedures to assess the roles in the retrieval process of uncertainty about location, target, and response, and of changes in such uncertainty with storage time. In one procedure we provided advance information of the set of alternative locations that might be queried by the probe. Insofar as spatial uncertainty plays a role in processing of the probe, this manipulation would especially benefit small arrays, and should steepen the function that relates mean reaction time to array size. In a second procedure we provided advance information of the set of alternative target stimuli and responses. Insofar as stimulus uncertainty and response uncertainty play roles in generation of the response, this manipulation would also especially benefit small arrays, and should have a similar effect on the array-size function. In sharp contrast to these expectations, we found no effect of our manipulations on the time to retrieve information from visual memory. The results add support to an explanation of the effects of storage time which attributes them to the rapid transformation of an initial random-access visual memory into a sequential-access memory. GRA

N89-13883# California Univ., Irvine. Center for the Neurobiology of Learning and Memory.
NEUROBIOLOGY OF LEARNING AND MEMORY: MODULATION AND MECHANISMS Final Report
JAMES L. MCGAUGH, NORMAN M. WEINBERGER, GARY LYNCH, and RICHARD H. GRANGER 1988 23 p
(Contract N00014-84-K-0391)
(AD-A198815) Avail: NTIS HC A03/MF A01 CSCL 06O

It has been known for many years that the retention of newly-acquired information can be modulated by a variety of treatments if the treatments are administered shortly after training. Such findings suggest that the processes underlying memory storage may be modulated by endogenous systems activated by training experiences. Our research has examined the possibility that hormonal systems activated by training may serve this role. Our recent work has focussed on the central mechanisms underlying the effects, on memory modulation, of treatments affecting adrenergic and opiate receptor systems. The findings of our recent research supported by this contract strongly suggest that treatments affecting adrenergic receptor systems as well as opiate receptor systems modulate memory through influence involving noradrenergic receptors in the amygdala. GRA

N89-13884# Army Research Inst. of Environmental Medicine, Natick, MA.
COGNITIVE PERFORMANCE, MOOD STATES, AND ALTITUDE SYMPTOMATOLOGY IN 13-21 PERCENT OXYGEN ENVIRONMENTS Technical Report, Mar. - Apr. 1987
B. L. SHUKITT, R. L. BURSE, L. E. BANDERET, D. R. KNIGHT (Naval Submarine Medical Research Lab., Groton, Conn.), and A. CYMERMAN 1 Jun. 1988 45 p
(AD-A198816; USARIEM-T-18-88) Avail: NTIS HC A03/MF A01 CSCL 06J

To reduce the risk of and damage from fires, naval engineers have suggested reducing the oxygen concentration in submarines below the normal ambient level of 21 percent (PO2 = 159 torr). However, reductions to 13 percent oxygen (PO2 = 99 torr) may produce decrements in mental and physical performance, changes in mood states, or symptoms of acute mountain sickness (AMS). To investigate these possibilities, thirteen male sailors were confined and tested in a hypobaric chamber for fifteen days, where they experienced oxygen concentrations of 21, 17, 21, 13, and 21 percent for three days at each concentrations with 0.9 percent carbon dioxide and the balance nitrogen. The subjects took one 30-minute battery of cognitive tasks most mornings and a different 30-minute battery of cognitive tasks every afternoon. They also completed the Clyde Mood Scale and the Environmental Symptoms Questionnaire (ESQ) every afternoon following cognitive testing. It appears that normobaric oxygen concentrations as low as 17 percent are not likely to produce adverse effects on cognition, mood states, or AMS symptomatology. Oxygen concentrations as low as 13 percent are likely to adversely affect some performance tasks and moods, however, as well as induce AMS in about one-third of the exposed individuals. These effects are quite similar to those observed in mountain climbers at the same PO2, whose responses well may be predictive of the effects of oxygen concentrations in between 13 and 17 percent oxygen. GRA

N89-13885# Naval Health Research Center, San Diego, CA.
A REVIEW OF PSYCHOLOGICAL STUDIES IN THE US ANTARCTIC PROGRAMME Final Report
E. K. ERIC GUNDERSON and LAWRENCE A. PALINKAS 28 Apr. 1988 18 p
(Contract NSF DPP-87-16461)
(AD-A198924; NHRC-88-17) Avail: NTIS HC A03/MF A01 CSCL 05H

Psychological studies were initiated at U.S. Antarctic stations during the International Geophysical Year of 1957 to 1958. Attitude and symptom questionnaires, supervisor ratings, and sociometric tests were administered to several wintering groups. A more comprehensive program of psychological studies, designed to develop selection criteria for screening Antarctic personnel, was instituted in 1962 by the U.S. Navy. A general concept of individual performance or adjustment emerged from earlier studies that included three essential components: task motivation, emotional stability, and social compatibility. Two methods, supervisor ratings and peer nominations, were used to measure these behavior components, and convergent and discriminant validities were evaluated. Regression equations were then developed to predict each behavior factor for each of three occupational groups, Navy construction personnel, Navy Administrative and technical personnel, and civilian scientists. Recent studies have focused on the impact of wintering-over stresses on long-term health and

adjustment of participants. The stressors associated with prolonged isolation in a harsh environment appear to be mediated by personality, environmental, and sociocultural factors. GRA

N89-14678# Katholieke Universiteit, Nijmegen (Netherlands). Psychologisch Lab.
SPACING EFFECTS IN LEARNING DESCRIBED BY THE SAM MODEL. COMPARING THREE VERSIONS OF THE SAM MODEL
M. VANWINSUM-WESTRA 1987 45 p
(PB88-204060; REPT-87-MA-04) Avail: NTIS HC A03/MF A01 CSCL 05I

In learning, repetition is known to improve performance, but the form of presentation (massed or spaced) is also a factor in recall. The report presents a model for spacing and repetition based on the SAM theory for memory retrieval. Three versions of the model are compared. Two are related to a verbal theory, the so-called components level theory, in which context fluctuation is used to explain spacing effects. In the third, decay of trace strength is used. GRA

N89-14679 New South Wales Univ., Kensington (Australia). School of Psychiatry.
AN INQUIRY INTO PANIC AND ITS DIFFERENTIATION FROM OTHER TYPES OF ANXIETY Ph.D. Thesis
PHOEBE E. HOLT Mar. 1988 3 p
Avail: Issuing Activity

A review is presented and investigations reported into the distinction between panic and other types of anxiety. Agoraphobia, panic disorder and social phobia patients were compared on the symptoms they reported during periods of panic, phobic, anticipatory and generalized anxiety. Panic anxiety was found to consist of greater ratings of hyperventilatory symptoms, depersonalization and fears of impending doom than anticipatory anxiety. However, this distinction was not unique to patients with agoraphobia and panic disorder. Other comparisons were made. The results were most compatible with the idea of panic as a severe form of anxiety which occurs as a result of a particular association between somatic symptoms of anxiety and fears of impending doom. Also, the great overlap in symptoms and additional diagnoses between panic and other anxiety disorders suggest that the former group be considered as a variant of other anxiety disorders rather than a categorically distinct disorder.
Author

N89-14680# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.
FURTHER INVESTIGATION OF CONTRAST SENSITIVITY AND VISUAL ACUITY IN PILOT DETECTION OF AIRCRAFT Final Report, Jun. 1986 - Jun. 1987
MELVIN R. ONEAL and ROBERT E. MILLER, II Jan. 1988 38 p
(AD-A198434; AAMRL-TR-88-002) Avail: NTIS HC A03/MF A01 CSCL 06D

The relationship between visual function and aircraft detection was investigated using 67 U.S.A.F. pilots. Contrast sensitivity was measured using the 2-AFC technique on the Optronix and with the Vistech chart. Visual acuity was assessed at three (3, 6, and 85 percent) chart contrasts. Pilots detected an approaching T-38 jet during 8 landings in 8 separate groups. Mean detection distance ranged from 4.77 to 6.73 miles for each group. For these partly-cloudy to cloudy test conditions, neither contrast sensitivity nor visual acuity correlated well with detection distance. There was a lack of consistency for the contrast sensitivity at any particular spatial frequency to correlate with detection. The best indicator of subjects with worse detection distances was performance on the visual acuity charts, but lower contrast sensitivity rarely identified the subjects with shorter detection distances. Neither contrast sensitivity nor visual acuity was able to identify the pilots with the best detection distances. GRA

N89-14681# New York Univ., New York.
PERCEPTUAL FACTORS IN WORKLOAD: A NEUROMAGNETIC STUDY Final Technical Report, 1 Jan. 1985 - 31 Dec. 1987
LLOYD KAUFMAN and SAMUEL J. WILLIAMSON 13 Jun. 1988 25 p
(Contract F49620-85-K-0004)
(AD-A198487; AFOSR-88-0861TR) Avail: NTIS HC A03/MF A01 CSCL 06E

This final report includes descriptions of substantive experimental studies of neural phenomena related to attention and auditory perception. It also describes efforts to enhance the superconducting instruments and other devices needed for the rapid and accurate accumulation of neuromagnetic data, and advances made in techniques for calibrating these instruments and for analyzing neuromagnetic data. The substantive experiments included a major study of the magnetic N100 phenomena and its sources and how they are affected by selective attention. Its relationship to the electrical N100 is considered, and required future research described. Also, work on the magnetic P300 phenomenon is described. This work confirmed earlier studies showing that the equivalent current dipole source is located in or near the hippocampal formation. The localization of multiple auditory sources is described. Improvements in instrumentation include the installation of a new gantry for purposes of evaluation, the design of a novel device for quantifying positions in magnetic resonance images, and the development of a graphics program for depicting a current dipole in the heads of subjects are also described. New methods for calibrating multisensor systems were developed, and the details are provided in the report. Finally, an opportunity arose during the course of this project to locate a very small metallic object accidentally embedded in the back of a human patient.
GRA

N89-14682# Naval Postgraduate School, Monterey, CA.
MENTAL MODELS FOR TIME DISPLAYED TASKS M.S. Thesis
JOYCE D. FLEISCHMAN Jun. 1988 64 p
(AD-A198536) Avail: NTIS HC A04/MF A01 CSCL 23B

The study described in this thesis attempts to determine whether there is a mental model for time-ordered tasks. The results of this study may be used to assist in the design of cockpit display formats for the Intelligent Air Attack System (IAAS) in the F/A-18, A-6 or other Navy and Air Force tactical aircraft, and may be applicable to telecommunications systems as well. Basic human factors engineering concepts and the characteristics of IAAS and of the Naval Telecommunications System are described. The approach and methodology for determining whether there is a consistent mental model for time-ordered tasks is discussed, and the results of a survey are presented. Based on this survey, it was determined that mental models for time-ordered tasks are not always the same, but instead are task-dependent. Schedules are most logically presented in a calendar-like format. For telecommunications related tasks, a front-to-back format is recommended. For time-ordered events in an aircraft cockpit, a top-to-bottom display order was preferred by a majority of study participants, but aviators preferred a left-to-right presentation.
GRA

N89-14683*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Facility, Edwards, CA.
DEVELOPMENT AND USE OF INTERACTIVE DISPLAYS IN REAL-TIME GROUND SUPPORT RESEARCH FACILITIES
DONALD C. RHEA, KVIN R. HAMMONS, JACQUELINE C. MALONE, and MICHAEL C. NESEL Jan. 1989 26 p Presented at the AIAA 27th Aerospace Meeting, Reno, NV, 9-12 Jan. 1989
(NASA-TM-101694; H-1529; NAS 1.15:101694) Avail: NTIS HC A03/MF A01 CSCL 05I

The NASA Western Aeronautical Test Range (WATR) is one of the world's most advanced aeronautical research flight test support facilities. A variety of advanced and often unique real-time interactive displays has been developed for use in the mission control centers (MCC) to support research flight and ground testing. These dispalys consist of applications operating on systems

described as real-time interactive graphics super workstations and real-time interactive PC/AT compatible workstations. This paper reviews these two types of workstations and the specific applications operating on each display system. The applications provide examples that demonstrate overall system capability applicable for use in other ground-based real-time research/test facilities. Author

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

A89-17636*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TELEROBOTICS FOR THE EFFICIENT UTILIZATION OF SPACE
GIULIO VARSI (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 13 p. refs
(Contract NAS7-918)
(IAF PAPER 88-023)

Telerobotics is a new technology that is being developed to perform remote manipulation in space. It seeks to accommodate the needs arising from a rapidly increasing investment in space assets and from the large costs deriving from human operations in space, especially EVA. Telerobotics applies advanced automation and artificial intelligence technology and combines the immediacy of execution of teleoperation (the replication at a distance of the physical motions of the operator) with the efficiency and precision of supervised robotic autonomy (the accomplishment of assignments through machine task decomposition and interpretation of sensor information). One of the key goals of this approach is the achievement of a seamless transition between teleoperation and supervised autonomy. The basis of this technology and of the NASA telerobotics research and development activities are described. They consist of five elements: core research, laboratory integration testbed, mission analysis, application demonstrations and flight experiments. Current advances, both in research and system integration are reported including the first integration of the laboratory testbed and quantitative comparisons obtained in a buoyant facility. Planned future goals are outlined. Author

A89-17637#
ROBOTICS AND ARTIFICIAL INTELLIGENCE IN SPACE
GERARD BERGER and JEAN-LOUIS LACOMBE (Matra Espace, Velizy-Villacoublay, France) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 11 p. refs
(IAF PAPER 88-024)

European studies of the space applications of robotics are reviewed. External robotics research are discussed, including the development of the Service Manipulator System, the Robotic In-orbit Servicing Demonstrator Experiment, the Platform Manipulator System, the Man-tended Servicing Unit, and the Hermes Robot Arm. Also, internal robotics systems for the Columbus pressurized modules, telescience, and artificial intelligence applications are examined. R.B.

A89-17666#
RADIATION PROTECTION OF ASTRONAUTS IN LEO
G. MELKONIAN (Avions Marcel Dassault Breguet Aviation, Saint-Cloud, France) and J. BOURRIEAU (ONERA, Centre d'Etudes et de Recherches de Toulouse, France) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 12 p. refs
(IAF PAPER 88-079)

Radiological protection for space flights is often perceived as a technico-scientific problem. All this is the result of the effects of radiation encountered in space and manned flight conditions. The main characteristics of this radiation come from its complex composition and its large energy spectrum which must be taken into account as well as flux variations by both solar activity and the vehicle position on orbit. Inside a vehicle, structures constitute irregularly distributed shields and lead to a specific dose at each location. To be able to protect the crew, it is first necessary to understand the threat and therefore to identify the radiation environment: extraterrestrial and orbital. As the environment varies with both the orbit position and time, the dose received in each critical organ during missions must be determined and compared with acceptable limits. To counter the threat, which may exceed acceptable limits, a strategy is required, including the complementary aspects of prevention, detection, protection and possibly treatment. Author

A89-17930
MAXIMUM PROTECTION ANTI-G SUITS AND THEIR LIMITATIONS
EARL H. WOOD (Mayo Medical School, Rochester, MN) SAFE Journal, vol. 18, Fall 1988, p. 30-40. refs
(Contract N66001-87-C-0079)

Because of long, very expensive lead times, development of maximally effective synergistic anti-G suit, straining, pressure breathing systems has precedence over physiologically more certain and greater safety potential inherent in development of a pilot acceptable, high G, fully horizontal, preferably prone, position cockpit. The possibility of anatomic damage to skeletal, cardiovascular or anatomically fragile pulmonary systems during contemplated sustained 9-12Gz testing of current and future models of maximally effective G suit systems should, however, not be disregarded. Author

A89-18078#
SITUATION AWARENESS AND THE PVI LINK
RAYMOND F. HANSON (General Dynamics Corp., Fort Worth, TX) IN: AIAA/IEEE Digital Avionics Systems Conference, 8th, San Jose, CA, Oct. 17-20, 1988, Technical Papers. Part 1. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 193-195. refs
(AIAA PAPER 88-3885)

This paper discusses a new project, the purpose of which is to define and establish a pilot-vehicle-interface (PVI) link between the fighter designers and combat mission success. Software tools have been selected and will be used to analyze avionic sensor volumes, examine existing air-to-air mission databases, and identify and evaluate measures of merit. The project will establish methodologies and objective measures. The results will be validated with a credible and traceable process which defines the elements of situation awareness in design terms. Author

A89-18079#
COLOR LIQUID CRYSTAL DISPLAYS ON THE FLIGHT DECK - HUMAN ENGINEERING CONSIDERATIONS
ALAN R. JACOBSEN (Boeing Commercial Airplanes, Seattle, WA) IN: AIAA/IEEE Digital Avionics Systems Conference, 8th, San Jose, CA, Oct. 17-20, 1988, Technical Papers. Part 1. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 197-202. refs
(AIAA PAPER 88-3886)

This paper examines the human engineering factors that influence the design requirements of liquid crystal displays (LCD) that are to be used on the flight deck of transport aircraft. An overview of the perceptual studies and evaluations being conducted at Boeing on the visual performance and image quality of LCDs is also described. This work examines how these performance parameters of the emerging LCD technology can be made to meet the needs and requirements for avionics displays. Author

A89-18081#
AIRCREW TESTING - A PSYCHOMOTOR DEVICE WITH PEDALS
CLIFF L. HOUSE (Southwest Missouri State University, Springfield, MO) IN: AIAA/IEEE Digital Avionics Systems Conference, 8th, San Jose, CA, Oct. 17-20, 1988, Technical Papers. Part 1. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 207-212.
(AIAA PAPER 88-3888)

An efficient and cost-effective device for measuring the capabilities of aircrew personnel for conventional aircraft, space vehicles, and remotely piloted aircraft or space vehicles is presented. This device, a hands and feet light indication coordinator, is a determiner relating to aircrew intelligence. The complete hand-foot test is in conjunction with the eye and brain of the tested individual. K.K.

A89-18130*# Sterling Software, Palo Alto, CA.
AN EVALUATION OF INTERACTIVE DISPLAYS FOR TRAJECTORY PLANNING AND PROXIMITY OPERATIONS
ADAM R. BRODY (Sterling Software, Inc., Palo Alto, CA), STEPHEN R. ELLIS, ART GRUNWALD, and RICHARD F. HAINES (NASA, Ames Research Center, Moffett Field, CA) IN: AIAA/IEEE Digital Avionics Systems Conference, 8th, San Jose, CA, Oct. 17-20, 1988, Technical Papers. Part 2. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 542-547.
(AIAA PAPER 88-3963)

Rendezvous, docking, and other Space Station proximity operations will be routine in nature in years to come. However, the specific parameters describing each maneuver, such as initial range and position, will vary from mission to mission so a means for depicting and interacting with graphic representations of proposed mission plans is necessary. Orbital operations are inherently non-intuitive due to non-linearities in the equations of motion of orbiting vehicles. Consequently, relative motion between two spacecraft cannot always be easily visualized. For these reasons, real time interactive visual aids and planning tools will be helpful, if not necessary, for future missions both in pre-flight training and on-orbit. Two such displays, Navie and eivaN, are currently available for examination and human factors testing. Since the docking tasks were fundamentally different with each device and because Navie imposed more constraints on the users than eivaN did, the orbital mechanics effects had a more pronounced effect on the Navie results. Author

A89-18131#
SOFTWARE, HARDWARE, AND RAPID PROTOTYPING CONSIDERATIONS IN ADVANCED CREW STATIONS DESIGN
JAMES M. SUITER and TOM G. SHARPE (Rockwell International Corp., Cedar Rapids, IA) IN: AIAA/IEEE Digital Avionics Systems Conference, 8th, San Jose, CA, Oct. 17-20, 1988, Technical Papers. Part 2. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 548-551.
(AIAA PAPER 88-3964)

This paper stresses the importance of a unified approach to rapid prototyping, software design, and hardware design in advanced crew station development. Crew station development utilizes expertise from many diverse fields in a process which creates the crew station product. Rapid prototyping provides the 'look and feel' for early and continued evaluation of the crew station pilot interface. The capability to provide an efficient transition from rapid prototypes to production systems is important. Product hardware and software design are affected by the need for a rapid prototyping capability. System and prototype architecture and interfaces are factors involved in the transition from prototype to production. Trade-offs can be made in software and hardware design to smooth the prototype to production transition. With display subsystems, high-level graphics interfaces and modular hardware design result from software, hardware and rapid prototyping considerations. Author

A89-18136#
TELEROBOTICS (SUPERVISED AUTONOMY) FOR SPACE APPLICATIONS
W. S. OTAGURO, L. O. KESLER, and D. D. BEEBE (McDonnell Douglas Astronautics Co., Huntington Beach, CA) IN: AIAA/IEEE Digital Avionics Systems Conference, 8th, San Jose, CA, Oct. 17-20, 1988, Technical Papers. Part 2. Washington, DC, American Institute of Aeronautics and Astronautics, 1988, p. 580-584.
(AIAA PAPER 88-3970)

This paper describes a telerobotic implementation as applied to autonomous guidance and control of platforms such as the Manned Maneuvering Unit (MMU), and mechanisms such as the Remote Manipulator System (RMS) using developed imaging tracker technology. With space qualified hardware such as the MMU and RMS which use cameras to monitor its operation under man's control, the approach adopted by MDAC used a developed imaging tracker system with enhanced positioning algorithms to provide the autonomous guidance and control of platforms and mechanisms. The modification of this imaging tracker into a robotic controller is presented. Its application to NASA's Extra-Vehicular Activity (EVA) retriever development and telerobotic operation is described. Author

A89-18866
ROTORCRAFT PILOT'S ASSOCIATE
DAVID G. TELLES and JAMES W. WASSON (McDonnell Douglas Helicopter Co., Mesa, AZ) IN: AHS, Annual Forum, 44th, Washington, DC, June 16-18, 1988, Proceedings. Alexandria, VA, American Helicopter Society, 1988, p. 213-218.

The Advanced Rotorcraft Technology Integration program sponsored by the U.S. Army's LHX Project Manager has formulated the characteristics of an AI technology-based Rotorcraft Pilot's Associate (RPA) which would proceed to reduce not only the overall piloting workload, but the cognitive workload of the pilot, as well. The RPA is based on a real-time implementation of cooperating expert systems capable of digesting large quantities of battlefield data and presenting clearly-defined recommendations to the pilot. O.C.

A89-18872
CAPITALIZING ON TODAY'S TECHNOLOGY BY USING COMPUTER BASED TRAINING/INTERACTIVE VIDEO DISC TO ENABLE EFFECTIVE AND EFFICIENT TRAINING TO BE CONDUCTED AND MANAGED IN THE WORK PLACE
THOMAS C. HELMACY (United Technologies Corp., Sikorsky Aircraft Div., Stratford, CT) IN: AHS, Annual Forum, 44th, Washington, DC, June 16-18, 1988, Proceedings. Alexandria, VA, American Helicopter Society, 1988, p. 251-254.

On-The-Job Training (OJT), because of extensive training and management time requirements, tends to be an unorganized trial and error method of learning. Today through the use of computers and video disk it is possible to overcome this age-old problem and make OJT far more efficient and effective. Computer Based Training/Interactive Video Disk (CBT/IVD) is a management tool that provides for learning while avoiding the costly damage to equipment and the agony of personal injuries associated with previous OJT approaches. CBT/IVD is particularly conducive to training in the work-place because of its size, durability, and cost. Author

A89-19556
ROBOTIC TELEPRESENCE - APPLICATIONS OF HUMAN CONTROLLED ROBOTS IN AIR FORCE MAINTENANCE
RONALD G. JULIAN and TIMOTHY R. ANDERSON (USAF, Armstrong Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Aerospace simulation III; Proceedings of the SCS Multiconference, San Diego, CA, Feb. 3-5, 1988. San Diego, CA, Society for Computer Simulation International, 1988, p. 59-67. refs

The major technology required to perform human-controlled robotic servicing of military aircraft during sortie regeneration in a chemical, radiological, or biological attack is described. 'Robotic teleservicing' is presented as a solution to the requirement of

rearming and servicing aircraft without exposing humans. Robotic telepresence is designed to sense information at the robot work site and feed the information back to the human operator in a manner that is consistent with 'normal' direct human perception. K.K.

A89-19857#
ANALYSIS OF HUMAN ACTIVITIES DURING SPACE MISSIONS - OUTLINES OF POSSIBLE HUMAN MISSIONS ABOARD COLUMBUS
ALAIN ESTERLE and ANTONIO GUELL (CNES, Paris, France) IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 8 p. refs
(IAF PAPER 88-487)

The challenge to Europe posed by man in space is discussed. His activities in space are divided into the following: sleep, habitability, nutrition and hygiene, leisure, and work. Main medical and physiological constraints related to long-duration flights are outlined. K.K.

A89-19878#
THE SERVICE TEST OF LIFE SUPPORT SYSTEM - DESALTER KIT SERVICE TEST
YOSHINORI MIYAMOTO, ASAO KOBAYASHI, MARI SAKAUCHI, and YOSHIHISA YAMAZAKI Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 28, Dec. 1987, p. 141-154. In Japanese, with abstract in English.

The results of performance tests of the salt-water conversion devices supplied to Japanese military pilots as part of their survival kit are summarized. Drawings and photographs of three desalters, all employing high-salt-rejection membranes, are provided, and the test results are presented in tables and graphs. The concentrations of Cl(-) in the desalted samples range from 260 to 880 ppm. T.K.

A89-19883#
IMPROVEMENT OF COMFORTABILITY OF OXYGEN MASK (MO-15)
HIROKAZU OZAKI, KEN SHIMIZU, and YOSHIHISA YAMAZAKI Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 29, March 1988, p. 43-52. In Japanese, with abstract in English. refs

A redesigned configuration of the MO-15 oxygen mask for Japanese military aircraft is evaluated in terms of wearer comfort and oxygen leakage. The mask design is illustrated with drawings, and the test results are presented in extensive tables and graphs (with captions in English). The extra padding included in the modified MO-15 is found to decrease leakage without increasing the subjectively experienced pressure. T.K.

A89-19942
PEAK POWER DISSIPATION DEPENDENCE OF THE ELECTROMAGNETIC NOISE RADIATED FROM AN ELECTROSTATIC DISCHARGE OF HUMAN BODY
NORIO MURASAKI (Chiba, University, Japan), MITSURU MATSUI, and KOICHI FUJIBAYASHI (Tokyo University of Agriculture and Technology, Koganei, Japan) Institute of Electronics, Information and Communication Engineers, Transactions (ISSN 0913-574X), vol. E71, Sept. 1988, p. 882-886.

Radiative electromagnetic noise generation from the human body is investigated. The intensity of radiative electromagnetic noise depends on the inserted discharging resistance between the earthing electrode touched by the subject's forefinger and the ground. A 50 percent electromagnetic wave (EMW) detection voltage V50 is derived from the EMW detection rate. An empirical formula for V50 vs. inserted discharging resistance between the electrode and the ground is presented. This formula states that a certain fraction of the dissipated power at electrostatic discharge should be radiated as a Poynting vector of radiative electromagnetic noise in order to stimulate the EMW detector. C.D.

A89-20112*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
THE FLIGHT TELEROBOTIC SERVICER PROJECT AND SYSTEMS OVERVIEW
HARRY G. MCCAIN and JAMES F. ANDARY (NASA, Goddard Space Flight Center, Greenbelt, MD) IN: EASCON '88; Proceedings of the Twenty-first Annual Electronics and Aerospace Conference, Arlington, VA, Nov. 9-11, 1988. New York, Institute of Electrical and Electronics Engineers, Inc., 1988, p. 97-102. refs

As part of the Flight Telerobotic Servicer (FTS) project an advanced telerobotic system is being developed to assist in and reduce crew extravehicular activity (EVA) for the U.S. Space Station. The FTS will be used for assembly, maintenance, servicing, and inspection throughout the lifetime of the Space Station. A brief overview of the FTS program is given, and some of the technical and system engineering issues associated with the development of the FTS are explored. A key to the evolutionary capability of the FTS design is the NASREM (NASA Standard Reference Model for telerobot control system) architecture. This architecture provides the framework for future growth and permits a logical blend of teleoperation and autonomous operations as required. I.E.

A89-20113* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GROUND OPERATION OF SPACE-BASED TELEROBOTS WILL ENHANCE PRODUCTIVITY
WAYNE R. SCHOBER (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: EASCON '88; Proceedings of the Twenty-first Annual Electronics and Aerospace Conference, Arlington, VA, Nov. 9-11, 1988. New York, Institute of Electrical and Electronics Engineers, Inc., 1988, p. 103-105. refs

Due to the limited human resources which will be available on the U.S. Space Station, automation and robotics technologies are being developed to enhance the productivity on the Space Station. The need for space telerobots which can be operated from the ground is explored, taking into consideration the resulting time delay, the technology involved, and some currently planned experiments. The proposed experiments include a remote link with the Kennedy Space Center robotics laboratory and the Telerobot Intelligent Interface Flight Experiment (TRIIFEX). It is concluded that there is a need to develop and implement ground-remote telerobotics technology which can effectively operate in the time-delay environment. This capability will enable servicing operations in polar and geosynchronous orbits and assist EVA astronauts on the Space Station. I.E.

A89-20654#
THE SPECIAL PURPOSE DEXTEROUS MANIPULATOR (SPDM) - A CANADIAN FOCUS FOR AUTOMATION AND ROBOTICS ON THE SPACE STATION
RICHARD C. HUGHES and DAVID G. HUNTER (National Research Council of Canada, Ottawa) AIAA and NASA, International Symposium on Space Automation and Robotics, 1st, Arlington, VA, Nov. 29, 30, 1988. 8 p.
(AIAA PAPER 88-5004)

The development of the Special Purpose Dexterous Manipulator (SPDM) as part of the Mobile Servicing System for the Space Station is examined. The SPDM is a robot with two arms, an articulated body, and sophisticated vision, force sensing, and control systems. The robot operates in both teleoperated and semiautonomous modes. The functional requirements for assembly, restoration, consumable replenishment, temporary storage, and transportation support are presented. The program to develop technologies to meet these requirements is discussed. R.B.

A89-20655#
SPACE ROBOTICS IN JAPAN
MASAMI IKEUCHI (National Space Development Agency of Japan, Tokyo) AIAA and NASA, International Symposium on Space Automation and Robotics, 1st, Arlington, VA, Nov. 29, 30, 1988. 7 p.
(AIAA PAPER 88-5005)

The current R & D status of Japanese Space Robotics and related activities is reviewed. The Japanese Experiment Module/Remote Manipulator System is described with attention given to the control mode and ground simulation. Research being conducted by NASDA on an advanced space robot to meet EVA requirements is described. A development scenario of the operational platforms and the servicing vehicles is presented. K.K.

A89-20660*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SPACE TELEROBOTS AND PLANETARY ROVERS
CARL F. RUOFF (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) AIAA and NASA, International Symposium on Space Automation and Robotics, 1st, Arlington, VA, Nov. 29, 30, 1988. 21 p. refs
(AIAA PAPER 88-5011)

Space telerobots and planetary rovers are advanced forms of space automation that are being studied for missions beginning in the 1990s. This paper describes telerobots and planetary rovers, points out that pure autonomy is far beyond the state of the art, and goes on to discuss how useful, realizable telerobots and rovers can be developed in the context of human-machine systems. Telerobot and rover computational and architectural requirements are also briefly examined, and examples of current work, including the development of dedicated analog processing chips based upon neural networks are described. The paper closes with some speculations on the terrestrial implications of space robotics and some general conclusions. Author

A89-20671
THERMAL COMPARISON OF AIRCREW CLOTHING ABOARD OV-10 AIRCRAFT
R. CONSTABLE, R. L. WEBSTER, and S. A. NUNNELEY (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1190-1192. refs

This paper reports on a thermal evaluation of aircrew clothing, with the experiment designed so as to make it possible to distinguish the effects of clothing from the possible effects of heat stress caused by an addition of an oxygen mask, an anti-g suit, or both to the usual clothing worn by pilots of OV-10 aircraft during 20 flights in hot weather. The results on core and skin temperatures showed no measurable differences among the clothing outfits, indicating that the anti-g suit does not present a heat problem. However, the mask and the anti-g suit did contribute to discomfort since their impermeable materials prevented evaporation of sweat and caused 100 percent skin wetting in covered areas. I.S.

A89-20672
VALIDATION OF A MODIFIED ONE-STEP REBREATHING TECHNIQUE FOR MEASURING EXERCISE CARDIAC OUTPUT
PATRICIA C. SZLYK, KARLEYTON C. EVANS, and INGRID V. SILS (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 59, Dec. 1988, p. 1193-1197. refs

This paper describes the configuration of the recirculation circuit for a modified Farhi et al. (1976) one-step rebreathing technique for measuring cardiac output (Q); the method was modified by including a high-flow-rate analyzer instead of a recommended low-flow-rate mass spectrometer. The results of measurements conducted in six physically fit and active subjects, validate this circuit. No statistically significant differences were found between the results obtained with the mass spectrometer and those obtained with the high-flow-rate analyzer. Heart rate and oxygen uptake were highly correlated with cardiac output and agreed well with the literature. I.S.

N89-13886*# Eagle Engineering, Inc., Houston, TX.
CONCEPTUAL DESIGN OF A LUNAR OXYGEN PILOT PLANT LUNAR BASE SYSTEMS STUDY (LBSS) TASK 4.2
1 Jul. 1988 270 p
(Contract NAS9-17878)
(NASA-CR-172082; NAS 1.26:172082; EEI-88-182) Avail: NTIS HC A12/MF A01 CSCL 06K

The primary objective was to develop conceptual designs of two pilot plants to produce oxygen from lunar materials. A lunar pilot plant will be used to generate engineering data necessary to support an optimum design of a larger scale production plant. Lunar oxygen would be of primary value as spacecraft propellant oxidizer. In addition, lunar oxygen would be useful for servicing nonregenerative fuel cell power systems, providing requirements for life support, and to make up oxygen losses from leakage and airlock cycling. Thirteen different lunar oxygen production methods are described. Hydrogen reduction of ilmenite and extraction of solar-wind hydrogen from bulk lunar soil were selected for conceptual design studies. Trades and sensitivity analyses were performed with these models. Author

N89-13887# Navy Clothing and Textile Research Facility, Natick, MA.
MICROCLIMATE COOLING SYSTEMS: A SHIPBOARD EVALUATION OF COMMERCIAL MODELS Final Report, Jan. - Jul. 1987
CARL R. JANIK, BARBARA A. AVELLINI, and NANCY A. PIMENTAL Apr. 1988 44 p
(AD-A196848; NCTRF-163) Avail: NTIS HC A03/MF A01 CSCL 13A

The Navy Clothing and Textile Research Facility (NCTRF), under contract to the Navy Science Assistance Program (NSAP), evaluated the feasibility of using commercial microclimate cooling systems (MCS) in the high heat areas onboard Navy ships by conducting an evaluation aboard the USS LEXINGTON (AVT16) from 30 March to 9 April 1987. The following cooling systems were evaluated: three liquid-cooled MCS - the LSSI Cool Head, the LSSI Portapack, and the ILC Cool Vest; and two air-cooled MCS - the Encon Air System, with and without a vortex tube. Both air systems and the LSSI Portapack MCS were tethered. The remaining two MCS's were portable, battery-operated, backpack systems. A control test with no cooling system was also run. The evaluation consisted of having test subjects wear the MCS during their normal duty and collecting physiological, subjective, and logistical data. During the test period, environmental conditions were relatively mild: the Wet Bulb Globe Temperature (WBGT) did not rise above 34 C, and the average WBGT was 24 C. GRA

N89-13888# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
A METHODOLOGY FOR PREDICTING PILOT WORKLOAD Ph.D. Thesis
THOMAS F. SCHUPPE Aug. 1988 318 p
(AD-A197090; AFIT/CI/NR-88-169) Avail: NTIS HC A14/MF A01 CSCL 01C

This research is limited to the problem of assessing a pilot's workload while flying an aircraft. The intent is to develop and validate a mathematical model which predicts pilot workload. This effort will show the feasibility of such a model and show that the model's predictions relate reasonably well to measured workload levels. This study focuses on pilot workload in a single-seat, fighter aircraft. While the methods employed are generally applicable to other human-machine systems, it is not known if any derived conclusions can also be applied to other systems. This research is unique in that it employs a model significantly different from other existing models. This model combines predictions from discrete-event simulation with subjective predictions, while other models generally rely on a single method. In addition, this model employs the structure of an existing measurement methodology to provide a framework for these predictions. This model may be useful in early aircraft design stages to assess the impact of a particular aircraft configuration on pilot workload. GRA

N89-13889*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
DON/DOFF SUPPORT STAND FOR USE WITH REAR ENTRY SPACE SUITS Patent Application
JOSEPH J. KOSMO, inventor (to NASA), TERRY O. TRI, inventor (to NASA), WILLIAM E. SPENNY, inventor (to NASA), and PHILIP R. WEST, inventor (to NASA) 19 Jul. 1988 22 p
(NASA-CASE-MSC-21364-1; NAS 1.71:MSC-21364-1; US-PATENT-APPL-SN-221472) Avail: NTIS HC A03/MF A01 CSCL 06K

A don/doff support stand for use with rear entry space suits is disclosed. The support stand is designed for use in one-g environments; however, certain features of the stand can be used on future spacecraft, lunar, or planetary bases. The present invention has a retainer which receives a protrucing lug fixed on the torso section of the space suit. When the lug is locked in the retainer, the space suit is held in a generally upright position. In a one-g environment a portable ladder is positioned adjacent to the rear entry of the space suit supported by the stand. The astronaut climbs up the ladder and grasps a hand bar assembly positioned above the rear entry. The astronaut then slips his legs through the open rear entry and down into the abdominal portion of the suite. The astronaut then lowers himself fully into the suit. The portable ladder is then removed and the astronaut can close the rear entry door. The lug is then disengaged from the retainer and the astronaut is free to engage in training exercises in the suit. When suit use is over, the astronaut returns to the stand and inserts the lug into the retainer. A technician repositions the ladder. The astronaut opens the rear entry door, grasps the hand bar assembly and does a chin-up to extricate himself from the suit. The astronaut climbs down the movable ladder while the suit is supported by the stand. NASA

N89-13890# Institute for Defense Analyses, Alexandria, VA.
RELATING FLYING-HOUR ACTIVITY TO THE PERFORMANCE OF AIRCREWS Final Report, Jun. - Dec. 1987
STANLEY A. HOROWITZ, COLIN P. HAMMON, and PAUL R. PALMER Dec. 1987 34 p
(Contract MDA903-84-C-0031)
(AD-A199004; AD-E501011; IDA-P-2085; IDA/HQ-88-33010)
Avail: NTIS HC A03/MF A01 CSCL 05I

This paper assesses the feasibility of developing quantitative relationships between the capability of aviation units to perform their assigned missions and the level of resources available for aircrew training on aircrew performance. The relatively sparse literature that develops statistical links between aircrew performance and flying hours is reviewed. Quantitative evidence of the magnitude of these links is discussed, and a model for relating flying-hour activity to aircrew performance is developed. The model posits that additional flying enhances proficiency in two ways: through the short-run honing of skills and through the long-run development of mastery. Available data on aircrew performance and on training histories are described. The paper finds that statistical analysis of historical information can successfully quantify the effects of training and experience on aircrew proficiency and safety. Additional analyses of the data that exist to support such quantification are proceeding. GRA

N89-13891# South Dakota Univ., Vermillion. Human Factors Lab.
AN AUTOMATED TEST OF FITTS' LAW AND EFFECTS OF TARGET WIDTH AND CONTROL/DISPLAY GAIN USING A DIGITI ZER TABLET Interim Report, Jul. 1985 - Jan. 1986
A. K. PARNG Feb. 1988 81 p
(Contract N66001-85-C-0253; S57-525)
(AD-A198202; NOSC/TD-1214) Avail: NTIS HC A05/MF A01 CSCL 12I

Motor performance in relation to response magnitude and response variability has been one of the most widely studied topics in human factors and experimental psychology. Following Shannon and Weaver's indication (1949) that information theory could be applied to psychological problems, an information-processing model combined with information theory has become a very popular approach to the study of human performance. Fitts was one of the earliest and most influential proponents of this approach. He extended information theory to the human motor system and proposed that the information capacity of the motor system can be interpreted as analogous to Shannon's Theorem 17. GRA

N89-13892# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, OH.
AN ANNOTATED BIBLIOGRAPHY OF UNITED STATES AIR FORCE ENGINEERING ANTHROPOMETRY - 1946 TO 1988
KATHLEEN M. ROBINETTE and JOY FOWLER May 1988 126 p
(AD-A198345; AFAMRL-TR-88-013; AFAMRL-TR-83-045) Avail: NTIS HC A07/MF A01 CSCL 05B

This report contains the titles, authors, publication/source information, and the abstracts of 223 technical reports and articles published by the Harry G. Armstrong Aerospace Medical Research Laboratory from 1946 to 1988. It is a detailed document of the scope of the effort of the Air Force in the field of engineering anthropometry to provide the information on human body size and biomechanical characteristics of Air Force personnel required for the development and evaluation of Air Force systems, personal protective equipment, and clothing. GRA

N89-13893*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, CT.
MODEL DESCRIPTION DOCUMENT FOR A COMPUTER PROGRAM FOR THE EMULATION/SIMULATION OF A SPACE STATION ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM (ESCM)
JAMES L. YANOSY Sep. 1988 68 p
(Contract NAS1-17397)
(NASA-CR-181737; NAS 1.26:181737; SVHSER-9504) Avail: NTIS HC A04/MF A01 CSCL 05H

Emulation/Simulation Computer Model (ESCM) computes the transient performance of a Space Station air revitalization subsystem with carbon dioxide removal provided by a solid amine water desorbed subsystem called SAWD. This manual describes the mathematical modeling and equations used in the ESCM. For the system as a whole and for each individual component, the fundamental physical and chemical laws which govern their operations are presented. Assumptions are stated, and when necessary, data is presented to support empirically developed relationships. Author

N89-13894*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, CT.
UTILITY OF EMULATION AND SIMULATION COMPUTER MODELING OF SPACE STATION ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS
JAMES L. YANOSY Sep. 1988 43 p
(Contract NAS1-17397)
(NASA-CR-181739; NAS 1.26:181739; SVHSER-10640) Avail: NTIS HC A03/MF A01 CSCL 05H

Over the years, computer modeling has been used extensively in many disciplines to solve engineering problems. A set of computer program tools is proposed to assist the engineer in the various phases of the Space Station program from technology selection through flight operations. The development and application of emulation and simulation transient performance modeling tools for life support systems are examined. The results of the development and the demonstration of the utility of three computer models are presented. The first model is a detailed computer model (emulation) of a solid amine water desorbed (SAWD) CO2 removal subsystem combined with much less detailed models (simulations) of a cabin, crew, and heat exchangers. This model was used in parallel with the hardware design and test of this CO2 removal subsystem. The second model is a simulation of an air revitalization system combined with a wastewater processing system to demonstrate the capabilities to study subsystem integration. The third model is that of a Space Station total air revitalization system. The station configuration consists of

a habitat module, a lab module, two crews, and four connecting nodes. Author

N89-13895*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, CT.
APPENDICES TO THE MODEL DESCRIPTION DOCUMENT FOR A COMPUTER PROGRAM FOR THE EMULATION/SIMULATION OF A SPACE STATION ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM
JAMES L. YANOSY Sep. 1988 106 p
(Contract NAS1-17397)
(NASA-CR-181738; NAS 1.26:181738; SVHSER-10638) Avail: NTIS HC A06/MF A01 CSCL 05H

A Model Description Document for the Emulation Simulation Computer Model was already published. The model consisted of a detailed model (emulation) of a SAWD CO2 removal subsystem which operated with much less detailed (simulation) models of a cabin, crew, and condensing and sensible heat exchangers. The purpose was to explore the utility of such an emulation simulation combination in the design, development, and test of a piece of ARS hardware, SAWD. Extensions to this original effort are presented. The first extension is an update of the model to reflect changes in the SAWD control logic which resulted from test. Also, slight changes were also made to the SAWD model to permit restarting and to improve the iteration technique. The second extension is the development of simulation models for more pieces of air and water processing equipment. Models are presented for: EDC, Molecular Sieve, Bosch, Sabatier, a new condensing heat exchanger, SPE, SFWES, Catalytic Oxidizer, and multifiltration. The third extension is to create two system simulations using these models. The first system presented consists of one air and one water processing system. The second consists of a potential air revitalization system. Author

N89-13896*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, CT.
APPENDICES TO THE USER'S MANUAL FOR A COMPUTER PROGRAM FOR THE EMULATION/SIMULATION OF A SPACE STATION ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM
JAMES L. YANOSY Sep. 1988 208 p
(Contract NAS1-17397)
(NASA-CR-181736; NAS 1.26:181736; SVHSER-10639) Avail: NTIS HC A10/MF A01 CSCL 05H

A user's Manual for the Emulation Simulation Computer Model was published previously. The model consisted of a detailed model (emulation) of a SAWD CO2 removal subsystem which operated with much less detailed (simulation) models of a cabin, crew, and condensing and sensible heat exchangers. The purpose was to explore the utility of such an emulation/simulation combination in the design, development, and test of a piece of ARS hardware - SAWD. Extensions to this original effort are presented. The first extension is an update of the model to reflect changes in the SAWD control logic which resulted from the test. In addition, slight changes were also made to the SAWD model to permit restarting and to improve the iteration technique. The second extension is the development of simulation models for more pieces of air and water processing equipment. Models are presented for: EDC, Molecular Sieve, Bosch, Sabatier, a new condensing heat exchanger, SPE, SFWES, Catalytic Oxidizer, and multifiltration. The third extension is to create two system simulations using these models. The first system presented consists of one air and one water processing system, the second a potential Space Station air revitalization system. Author

N89-13897*# Hamilton Standard Div., United Aircraft Corp., Windsor Locks, CT.
USER'S MANUAL FOR A COMPUTER PROGRAM FOR THE EMULATION/SIMULATION OF A SPACE STATION ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM (ESCM)
JAMES L. YANOSY Sep. 1988 216 p
(Contract NAS1-17397)
(NASA-CR-181735; NAS 1.26:181735; SVHSER-9503) Avail: NTIS HC A10/MF A01 CSCL 05H

This manual describes how to use the Emulation Simulation Computer Model (ESCM). Based on G189A, ESCM computes the transient performance of a Space Station atmospheric revitalization subsystem (ARS) with CO2 removal provided by a solid amine water desorbed subsystem called SAWD. Many performance parameters are computed some of which are cabin CO2 partial pressure, relative humidity, temperature, O2 partial pressure, and dew point. The program allows the user to simulate various possible combinations of man loading, metabolic profiles, cabin volumes and certain hypothesized failures that could occur. Author

N89-13898*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
REPORT OF THE 1ST PLANNING WORKSHOP FOR CELSS FLIGHT EXPERIMENTATION
JOHN W. TREMOR and ROBERT D. MACELROY 1988 28 p
Workshop held at Moffett Field, Calif., 23-24 Mar. 1987
(NASA-CP-10020; A-88265; NAS 1.55:10020) Avail: NTIS HC A03/MF A01 CSCL 05H

A workshop held March 23 and 24, 1987 to establish a base upon which a CELSS flight experiment program will be developed, is summarized. The kind of information necessary for productivity assessment was determined. In addition, generic experiments necessary to gather that information were identified and prioritized. General problems of hardware and equipment were defined. The need for the hardware to provide a stress-free environment, not only for productivity, but also to make more readily identifiable disturbing mission factors, was recognized. Author

N89-13899*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Displays and Controls Lab.
HUMAN FACTORS STUDIES OF CONTROL CONFIGURATIONS FOR ADVANCED TRANSPORT AIRCRAFT
HARRY L. SNYDER, ROBERT W. MONTY, and JOE OLD (Research Triangle Inst., Hampton, Va.) 31 Aug. 1985 29 p
(Contract NAG1-491)
(NASA-CR-184608; NAS 1.26:184608) Avail: NTIS HC A03/MF A01 CSCL 05H

This research investigated the threshold levels of display luminance contrast which were required to interpret static, achromatic, integrated displays of primary flight information. A four-factor within-subjects design was used to investigate the influences of type of flight variable information, the level of ambient illumination, the type of control input, and the size of the display symbology on the setting of these interpretability thresholds. A three-alternative forced choice paradigm was used in conjunction with the method of adjustments to obtain a measure of the upper limen of display luminance contrast needed to interpret a complex display of primary flight information. The pattern of results and the absolute magnitudes of the luminance contrast settings were found to be in good agreement with previously reported data from psychophysical investigations of display luminance contrast requirements. Author

N89-14164*# Florida Inst. of Tech., Melbourne. Dept. of Computer Science.
THE DESIGN OF AN INTELLIGENT HUMAN-COMPUTER INTERFACE FOR THE TEST, CONTROL AND MONITOR SYSTEM
WILLIAM D. SHOAFF *In* NASA, John F. Kennedy Space Center, NASA/ASEE Summer Faculty Fellowship Program: 1988 Research Reports p 311-383 Oct. 1988
Avail: NTIS HC A24/MF A01 CSCL 05H

The graphical intelligence and assistance capabilities of a human-computer interface for the Test, Control, and Monitor System at Kennedy Space Center are explored. The report focuses on how a particular commercial off-the-shelf graphical software package, Data Views, can be used to produce tools that build widgets such as menus, text panels, graphs, icons, windows, and ultimately complete interfaces for monitoring data from an

application; controlling an application by providing input data to it; and testing an application by both monitoring and controlling it. A complete set of tools for building interfaces is described in a manual for the TCMS toolkit. Simple tools create primitive widgets such as lines, rectangles and text strings. Intermediate level tools create pictographs from primitive widgets, and connect processes to either text strings or pictographs. Other tools create input objects; Data Views supports output objects directly, thus output objects are not considered. Finally, a set of utilities for executing, monitoring use, editing, and displaying the content of interfaces is included in the toolkit. Author

N89-14684*# National Aeronautics and Space Administration, Washington, DC.
LIVING IN SPACE
SHEILA BRISKIN ANDREWS and AUDREY KIRSCHENBAUM 1988 63 p Original doc. contains color illustrations
(EP-222) Avail: SOD HC $4.75 as 033-000-01000-1 CSCL 06K

Operation Liftoff was designed to encourage pupils in the nation's elementary schools to take a greater interest in mathematics and science. Topics addressed include: food, clothing, health, housing, communication, and working. Each unit consists of background information, a teacher printout (lesson plan), and student liftoff (activities) for levels A, B, and C. B.G.

N89-14685# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.
ARTICULATED TOTAL BODY MODEL ENHANCEMENTS. VOLUME 1: MODIFICATIONS Final Report, Nov. 1983 - Dec. 1987
LOUISE A. OBERGEFELL, JOHN T. FLECK, INTS KALEPS, and THOMAS R. GARDNER (Systems Research Labs., Inc., Dayton, Ohio.) Jan. 1988 87 p
(AD-A198726; AAMRL-TR-88-009) Avail: NTIS HC A05/MF A01 CSCL 20K

The Articulated Total Body (ATB) Model is used at the Armstrong Aerospace Medical Research Laboratory for human body biomechanics in various dynamic environments, especially aircraft ejection with windblast exposure. In order to improve the model's predicted results and capabilities, a number of modifications have been made. These modifications include the capability to have segment contact ellipsoids block the wind from other segments, an option to prescribe velocity dependent wind forces, a correction to prevent angular drift in the joints, improved contact force calculations for segment contact near a plane's edge, the capability to specify as input multi-axis angular displacements to describe the vehicle motion, a slip joint capability and a hyperellipsoid option. Along with these major changes, a number of minor corrections and clarifications have been included to form the ATB-IV version. The results of these modifications have been documented in three volumes of which this is Volume 1, Modifications. It contains a description of the ATB-IV modifications and the theory used to develop them. Volume 2 is an updated user's guide containing the new input description and Volume 3 is an updated programmer's guide containing a listing of all the ATB-IV subroutines. GRA

N89-14686# Carlow Associates, Inc., Fairfax, VA.
HUMAN FACTORS IN THE NAVAL AIR SYSTEMS COMMAND: COMPUTER BASED TRAINING
THOMAS L. SEAMSTER, CATHERINE E. SNYDER, MICHELE TERRANOVA, WILLIAM J. WALKER, and D. TODD JONES (Naval Air Systems Command, Washington, DC.) 1988 6 p Presented at the Human Factors Society Annual Meeting, Anaheim, CA, 24 Oct. 1988
(Contract DE-AC05-84OR-21400)
(DE88-015301; CONF-881058-2) Avail: NTIS HC A02/MF A01

Military standards applied to the private sector contracts have a substantial effect on the quality of Computer Based Training (CBT) systems procured for the Naval Air Systems Command. This study evaluated standards regulating the following areas in CBT development and procurement: interactive training systems, cognitive task analysis, and CBT hardware. The objective was to develop some high-level recommendations for evolving standards that will govern the next generation of CBT systems. One of the key recommendations is that there be an integration of the instructional systems development, the human factors engineering, and the software development standards. Recommendations were also made for task analysis and CBT hardware standards. DOE

N89-14687# Oak Ridge National Lab., TN. Center for Engineering Systems Advanced Research.
MAN-ROBOT SYMBIOSIS: A FRAMEWORK FOR COOPERATIVE INTELLIGENCE AND CONTROL
LYNNE E. PARKER and FRANCOIS G. PIN 1988 11 p Presented at the Advances in Intelligent Robotics Systems, Cambridge, MA, 6 Nov. 1988
(Contract DE-AC05-84OR-21400)
(DE89-000430; CONF-881116-3) Avail: NTIS HC A03/MF A01

The man-robot symbiosis concept has the fundamental objective of bridging the gap between fully human-controlled and fully autonomous systems to achieve true man-robot cooperative control and intelligence. Such a system would allow improved speed, accuracy, and efficiency of task execution, while retaining the man in the loop for innovative reasoning and decision-making. The symbiont would have capabilities for supervised and unsupervised learning, allowing an increase of expertise in a wide task domain. This paper describes a robotic system architecture facilitating the symbiotic integration of teleoperative and automated modes of task execution. The architecture reflects a unique blend of many disciplines of artificial intelligence into a working system, including job or monitoring, and machine learning. These disciplines are embodied in five major components of the symbiotic framework: the Job Planner, the Dynamic Task Allocator, the Presenter/Interpreter, the Automated Monitor, and the Learning System. DOE

N89-14688# Aerospace Medical Research Labs., Wright-Patterson AFB, OH. Biodynamics and Bioengineering Div.
ARTICULATED TOTAL BODY MODEL ENHANCEMENTS. VOLUME 3: PROGRAMMER'S GUIDE Final Report, Nov. 1983 - Dec. 1987
LOUISE A. OBERGEFELL, INTS KALEPS, THOMAS R. GARDNER, and JOHN T. FLECK (J and J Technologies, Inc., Orchard Park, NY.) Feb. 1988 443 p
(AD-A197940; AAMRL-TR-88-007-VOL-3) Avail: NTIS HC A19/MF A01 CSCL 05H

The Articulated Total Body (ATB) model is used at the Armstrong Aerospace Medical Research Lab. to study human body biomechanics in various dynamic environments, especially aircraft ejection with windblast exposure. To improve the model's predicted results and capabilities, a number of modifications have been made, including the capability to have segment contact ellipsoids block the wind from other segments, an option to prescribe velocity dependent wind forces, a correction to prevent angular drift in the joints, improved contact force calculations for segment contact near a plane's edge, the capability to specify as input multi-axis angular displacements to describe the vehicle motion, a sliding joint capability and a hyperellipsoid option. Along with these major changes, a number of minor corrections and clarifications have been included to form the ATB-IV version. Volume 3, contains a complete listing of the ATB-IV program with designation of coding modifications from previous versions. GRA

N89-14689# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
THE EFFECT OF TRANSMISSION DESIGN ON FORCE-CONTROLLED MANIPULATOR PERFORMANCE
WILLIAM TOWSEND Apr. 1988 109 p
(Contract N00014-86-K-0685; N00014-85-K-0124)
(AD-A198131; AI-TR-1054) Avail: NTIS HC A06/MF A01 CSCL 12I

The concept of manipulator force control and a corresponding emphasis on the choice of appropriate servo implementation have been developing for many years. However, the selection of appropriate mechanical hardware may ultimately be the limiting

performance factor in force control. Mechanism properties, such as contact compliance, actuator-to-joint compliance, torque ripple, and highly nonlinear dry friction, affect, and often degrade, manipulator performance in force-controlled systems. This thesis describes a set of requisites for good performance, analyzes the effects of transmission-mechanism properties on force-controlled manipulators, and recommends mechanical-design strategies to improve performance. While much of the analysis applies to a broad class of transmissions, a special control-volume analysis quantifies a limit on the power efficiency of tension-element drives. A single-degree-of-freedom transmission testbed was constructed and used to confirm the predicted effect of Coulomb friction on robustness; design of a cable-driven, four-degree-of-freedom, whole-arm manipulator illustrates the recommended mechanical-design strategies. GRA

N89-14690# California Univ., San Diego, La Jolla. Inst. for Cognitive Science.
COMPUTATION VIA DIRECT MANIPULATION Final Report, 1 Dec. 1984 - 29 Feb. 1988
DONALD A. NORMAN and EDWIN L. HUTCHINS, JR. 1 Aug. 1988 31 p
(Contract N00014-85-C-0133; RR04206)
(AD-A198417) Avail: NTIS HC A03/MF A01 CSCL 12I

Interfaces to complex equipment can often impose severe difficulties for the user. In part, these difficulties are caused by the abstract nature of the interaction that many modern interfaces present to the operator. A new class of interfaces, the direct manipulation interface, appears to offer improvements in ease of use and understandability because the abstraction of the normal interface is replaced with what might be called the model world metaphor, where the user can feel as if the operations are done directly upon the external environment. Research under this contract examined in detail the nature of directness in the use of computer interfaces. The research demonstrates that the concept of directness is a complex one, involving at least four different aspects of the interface, including two gulfs, one for execution and one for evaluation, and two different kinds of mappings: semantic mappings and referential distance. The experimental and theoretical work reported under this contract examines the complexities of the differences among interface styles, demonstrates the importance of visibility and sound in the performance of tasks, and presents a new, detailed analysis of the general attributes of cognitive artifacts, including an important new theoretical construct: the object-symbol. GRA

N89-14691*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
IODINE SORPTION STUDY ON THE PROPOSED USE OF VITON A IN A SHUTTLE GALLEY WATER ACCUMULATOR
RANDALL E. GIBBONS, JOHN R. SCHULTZ (Krug International, Houston, TX.), and RICHARD L. SAUER Oct. 1988 19 p
(Contract NAS9-17720)
(NASA-TM-100467; S-582; NAS 1.15:100467) Avail: NTIS HC A03/MF A01 CSCL 06K

The installation of a Viton A accumulator in the Shuttle galley has been proposed to prevent overpressurization of the hot water supply system. A laboratory study has been conducted to determine if there would be any interaction between the Viton A material and the iodine used to disinfect the water. Coupons of Viton A were exposed for 24 hours to aqueous iodine solutions similar in quality to the Shuttle's potable water. Changes in the iodine residual were monitored to determine the rate of iodine sorption by the coupon. Total organic carbon (TOC) was monitored to determine the rate of desorption of organic materials from the Viton A. The same coupons were then soaked in reagent-grade water for 24 hours, and iodine was monitored to determine the rate of iodine desorption. The coupons were again exposed to iodine solutions for 24 hours and iodine and TOC were monitored. No significant change in the iodine sorption rate was detected between the first and second exposures. A triangle taste test indicated at a 1 percent confidence level that the water exposed to Viton A had a different taste which was less acceptable to the panelists. Author

N89-14692# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afdeling Thermofysiologie.
WORKING IN IMPERMEABLE CLOTHING: CRITERIA FOR MAXIMUM STRESS
F. J. G. VANDELINDE Sep. 1987 37 p In DUTCH; ENGLISH summary
(Contract A81/K/041)
(IZF-1987-24; TD-87-4831; ETN-89-93449) Avail: NTIS HC A03/MF A01

Experiments were performed in order to determine safe working times in impermeable clothing. The protective clothing of the test subject consisted of a butyl rubber decontamination garment, rubber gloves, boots, and respirator. It is found that poorly trained subjects are always limited by heart rate as are trained subjects during very heavy work. The total body heat storage criterion is only relevant for the well trained subjects, for moderately heavy workload. Core temperature criteria are never relevant since the high mean skin temperature causes the heat storage to be exceeded earlier. Dehydration is never a problem, due to the short exposure time. It is concluded that air temperature and work intensity are important variables, whereas there is no direct effect of solar load. It is beneficial to be physically fit (acclimatized, well trained). ESA

N89-14693*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
SPACE SHUTTLE FOOD SYSTEM SUMMARY, 1981-1986
CONNIE R. STADLER, RITA M. RAPP, CHARLES T. BOURLAND, and MICHAEL F. FOHEY (Lockheed Engineering and Management Services Co., Inc., Houston, TX.) Dec. 1988 335 p
(NASA-TM-100469; S-584; NAS 1.15:100469) Avail: NTIS HC A15/MF A01 CSCL 06H

All food in the Space Shuttle food system was precooked and processed so it required no refrigeration and was either ready-to-eat or could be prepared for consumption by simply adding water and/or heating. A gun-type water dispenser and a portable, suitcase-type heater were used to support this food system during the first four missions. On STS-5, new rehydratable packages were introduced along with a needle-injection water dispenser that measured the water as it was dispensed into the packages. A modular galley was developed to facilitate the meal preparation process aboard the Space Shuttle. The galley initially flew on STS-9. A personal hygiene station, a hot or cold water dispenser, a convection oven, and meal assembly areas were included in the galley. Author

N89-14920*# Hampton Inst., VA. Airway Science Program.
EVALUATION OF THE PSEUDO PILOT EFFECT ON BASELINE CONTROLLER STUDY DATA Abstract Only
LINDA C. NEWCOMB *In its* NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program 1988 p 87 Sep. 1988
Avail: NTIS HC A07/MF A01 CSCL 05H

The Baseline Controller Study requires the support of pseudo pilots who input computer commands in response to air data in a simulated environment. Errors committed either by pseudo pilots, or by the computer's failure to accept commands, can result in data that is not representative of controller capabilities. Therefore, it became necessary to evaluate the actions of the pseudo pilots and determine what effect, if any, those actions had upon a given set of baseline data. The Pseudo Pilot Stations (PPS) associated with the Baseline Controller Study are user unfriendly. This fact, coupled with the human factor of the pilots themselves, required exploration of the degree the pseudo pilot's actions affected the subject air traffic controller actions during the collection of baseline data. Examination of the preliminary data collected by the Basline Controller Study subjectively determined that pseudo pilot actions do, indeed, affect the the research data. Further study is needed to quantify that affect and, perhaps, assign a value to the pseudo pilot factor rather than merely decide which simulations are valid and which are not. Author

55

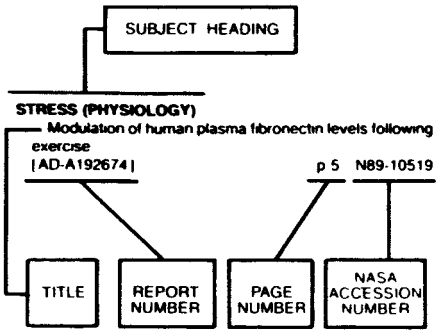
SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

N89-13900*# George Washington Univ., Washington, DC.
PUBLICATIONS OF THE BIOSPHERIC RESEARCH PROGRAM: 1981-1987 Contractor Report, 1981-1987
JANICE S. WALLACE, ed. Washington NASA Dec. 1988 48 p
(Contract NASW-4324)
(NASA-CR-4204; NAS 1.26:4204) Avail: NTIS HC A03/MF A01 CSCL 06B

Presented is a list of publications of investigators supported by the Biospheric Research Program of the Biological Systems Research Branch, Life Sciences Division, and the Office of Space Science and Applications. It includes publications dated as of December 31, 1987 and entered into the Life Sciences Bibliographic Database at the George Washington University. Publications are organized by the year published. Author

Typical Subject Index Listing



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A

B

C

D

E

F

K

L

M

N

O

P

R

S

T

U

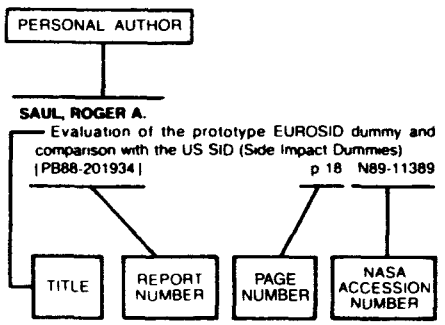
V

W

X

PERSONAL AUTHOR INDEX

Typical Personal Author Index Listing



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A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

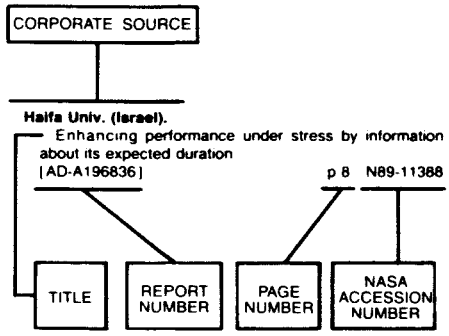
V

W

Y

Z

Typical Corporate Source Index Listing



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

A

Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, OH.
An annotated bibliography of United States Air Force engineering anthropometry - 1946 to 1988
[AD-A198345] p 64 N89-13892

Aerospace Medical Research Labs., Wright-Patterson AFB, OH.
Further investigation of contrast sensitivity and visual acuity in pilot detection of aircraft
[AD-A198434] p 59 N89-14680
Articulated total body model enhancements. Volume 1: Modifications
[AD-A198726] p 66 N89-14685
Articulated total body model enhancements. Volume 3: Programmer's guide
[AD-A197940] p 66 N89-14688

Air Force Inst. of Tech., Wright-Patterson AFB, OH.
A methodology for predicting pilot workload
[AD-A197090] p 63 N89-13888

Army Research Inst. of Environmental Medicine, Natick, MA.
Cognitive performance, mood states, and altitude symptomatology in 13-21 percent oxygen environments
[AD-A198816] p 58 N89-13884
The effects of different run training programs on plasma responses of beta-endorphin, adrenocorticotropin and cortisol to maximal treadmill exercise
[AD-A197472] p 55 N89-14668

B

Battelle Columbus Labs., OH.
The effects of rotary motion on taste and odor ratings: Implications for space travel
[AD-A198241] p 55 N89-13878

Baylor Coll. of Medicine, Houston, TX.
The effect of fluid mechanical stress on cellular arachidonic acid metabolism p 51 A89-19826

Bell Telephone Labs., Inc., Murray Hill, NJ.
Direct access by spatial position in visual memory. Part 3. The roles of uncertainty about position, target, and response in information retrieval
[AD-A198740] p 58 N89-13882

Bionetics Corp., Cocoa Beach, FL.
The effects of different run training programs on plasma responses of beta-endorphin, adrenocorticotropin and cortisol to maximal treadmill exercise
[AD-A197472] p 55 N89-14668

Bolt, Beranek, and Newman, Inc., Cambridge, MA.
Human plausible reasoning
[AD-A197426] p 58 N89-13881

C

California State Univ., Northridge.
Best estimate of luminal cross-sectional area of coronary arteries from angiograms p 52 A89-19844

California Univ., Irvine.
Neurobiology of learning and memory: Modulation and mechanisms
[AD-A198815] p 58 N89-13883

California Univ., Los Angeles.
Influence of spaceflight on rat skeletal muscle
p 45 A89-19400
Ocular torsion in upright and tilted positions during hypo- and hypergravity of parabolic flight p 53 A89-20665

California Univ., San Diego, La Jolla.
Computation via direct manipulation
[AD-A198417] p 67 N89-14690

Calspan Corp., Buffalo, NY.
The effect of pyridostigmine bromine on inflight aircrew performance
[AD-A198828] p 55 N89-14670

Carlow Associates, Inc., Fairfax, VA.
Human factors in the Naval Air Systems Command: Computer based training
[DE88-015301] p 66 N89-14686

Colorado State Univ., Fort Collins.
Circuit behavior in the development of neuronal networks
[AD-A198040] p 56 N89-14672

Connecticut Univ., Storrs.
Human auditory and visual unimodal and biomodal continuous evoked potentials
[AD-A198845] p 54 N89-13875
Hormonal regulation of wheat growth during hydroponic culture p 48 N89-14167
The effects of different run training programs on plasma responses of beta-endorphin, adrenocorticotropin and cortisol to maximal treadmill exercise
[AD-A197472] p 55 N89-14668

E

Eagle Engineering, Inc., Houston, TX.
Conceptual design of a lunar oxygen pilot plant Lunar Base Systems Study (LBSS) task 4.2
[NASA-CR-172082] p 63 N89-13886

F

Florida Inst. of Tech., Melbourne.
The design of an intelligent human-computer interface for the test, control and monitor system
p 65 N89-14164

G

George Washington Univ., Washington, DC.
The 1987-1988 NASA space/gravitational biology accomplishments
[NASA-TM-4079] p 47 N89-13867
Publications of the biospheric research program: 1981-1987
[NASA-CR-4204] p 68 N89-13900

H

Hamilton Standard Div., United Aircraft Corp., Windsor Locks, CT.
Model description document for a computer program for the emulation/simulation of a space station environmental control and life support system (ESCM)
[NASA-CR-181737] p 64 N89-13893
Utility of emulation and simulation computer modeling of space station environmental control and life support systems
[NASA-CR-181739] p 64 N89-13894
Appendices to the model description document for a computer program for the emulation/simulation of a space station environmental control and life support system
[NASA-CR-181738] p 65 N89-13895
Appendices to the user's manual for a computer program for the emulation/simulation of a space station environmental control and life support system
[NASA-CR-181736] p 65 N89-13896
User's manual for a computer program for the emulation/simulation of a space station Environmental Control and Life Support System (ESCM)
[NASA-CR-181735] p 65 N89-13897

Hampton Inst., VA.
Evaluation of the pseudo pilot effect on baseline controller study data p 67 N89-14920

I

Institute for Defense Analyses, Alexandria, VA.
Relating flying-hour activity to the performance of aircrews
[AD-A199004] p 64 N89-13890

Institute for Perception RVO-TNO, Soesterberg (Netherlands).
Improved estimation of body heat distribution during cooling: A first attempt
[IZF-1987-38] p 54 N89-13874
Working in impermeable clothing: Criteria for maximum stress
[IZF-1987-24] p 67 N89-14692

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Jet Propulsion Lab., California Inst. of Tech., Pasadena.
Telerobotics for the efficient utilization of space
[IAF PAPER 88-023] p 60 A89-17636
Best estimate of luminal cross-sectional area of coronary arteries from angiograms p 52 A89-19844
Ground operation of space-based telerobots will enhance productivity p 62 A89-20113
Space telerobots and planetary rovers
[AIAA PAPER 88-5011] p 63 A89-20660

John B. Pierce Foundation of Connecticut, New Haven.
Microwave irradiation and cold exposure
[AD-A198875] p 47 N89-13869

Joint Publications Research Service, Arlington, VA.
JPRS report: Science and technology. USSR: Life sciences
[JPRS-ULS-88-016] p 53 N89-13870
Assessment of paired activity of otolithic apparatus of healthy men by study on parallel swings
p 54 N89-13871
JPRS report: Science and technology. USSR: Life sciences
[JPRS-ULS-87-008] p 48 N89-14658
Effects of calcitonin and retabolil on rat femur in hypokinesia p 48 N89-14659
Holographic recording of deformation waves in muscle tissue p 55 N89-14660
Influence of high temperature on total gas metabolism of animals with limitation of motor activity
p 48 N89-14661
Influence of emotional-pain stress on contractile function of myocardium during long-term hypokinesia
p 48 N89-14662
Correction of acute hypoxia-induced changes in blood coagulation in rabbits p 49 N89-14663

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K

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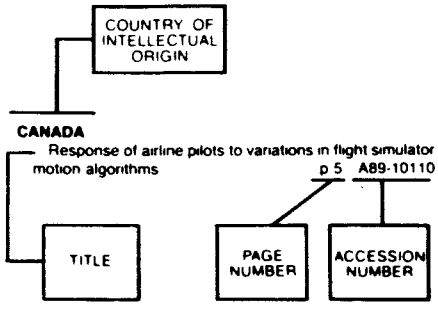

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A

AUSTRALIA
The psychology of flight training p 57 A89-17900
An inquiry into panic and its differentiation from other types of anxiety p 59 N89-14679

B

BULGARIA
Study of cosmonauts' working capacity by means of psycho-physiological methods and instrumentation of special design
[IAF PAPER 88-480] p 50 A89-17834

C

CANADA
The Special Purpose Dexterous Manipulator (SPDM) - A Canadian focus for automation and robotics on the Space Station
[AIAA PAPER 88-5004] p 62 A89-20654

D

DENMARK
Effects of angiotensin blockade on the splanchnic circulation in normotensive man
[IAF PAPER 88-493] p 50 A89-17838

F

FRANCE
Robotics and artificial intelligence in space
[IAF PAPER 88-024] p 60 A89-17637
Radiation protection of astronauts in LEO
[IAF PAPER 88-079] p 60 A89-17666
Decreased cardiac response to isoproterenol infusion in acute and chronic hypoxia p 51 A89-19393
Atrial natriuretic factor attenuates the pulmonary pressor response to hypoxia p 45 A89-19394
Pulmonary gas exchange in Andean natives with excessive polycythemia - Effect of hemodilution p 51 A89-19398
Analysis of human activities during space missions - Outlines of possible human missions aboard Columbus
[IAF PAPER 88-487] p 62 A89-19857
Cardiovascular system and space environment
[ETN-89-93600] p 56 N89-14674

G

GERMANY DEMOCRATIC REPUBLIC
Space travel and improvement of knowledge in medicine
[IAF PAPER 88-501] p 50 A89-17840
GERMANY,FEDERAL REPUBLIC OF
BIOTEX, a project for conducting biotechnological experiments under microgravity
[DGLR PAPER 87-067] p 47 A89-20232

J

JAPAN
Psychological aspects of flight aptitude and adaptation to flying p 57 A89-19877
The service test of life support system - Desalter kit service test p 62 A89-19878
Study on pilot workload - Hormone response to flight stress p 52 A89-19879
The estimation of atherosclerosis in physical examination for flying duty - An examination about serum value of high density lipoprotein and atherogenic index p 52 A89-19880
Effects of chlorpheniramine on the EEG p 52 A89-19881
Psychological study on mood states of fighter pilots before flights p 57 A89-19882
Improvement of comfortability of oxygen mask (MO-15) p 62 A89-19883
Peak power dissipation dependence of the electromagnetic noise radiated from an electrostatic discharge of human body p 62 A89-19942
Space robotics in Japan
[AIAA PAPER 88-5005] p 62 A89-20655

N

NETHERLANDS
Improved estimation of body heat distribution during cooling: A first attempt
[IZF-1987-38] p 54 N89-13874
Spacing effects in learning described by the SAM model. Comparing three versions of the SAM model
[PB88-204060] p 59 N89-14678
Working in impermeable clothing: Criteria for maximum stress
[IZF-1987-24] p 67 N89-14692

S

SWITZERLAND
Atrial natriuretic peptide in acute mountain sickness p 51 A89-19392

U

U.S.S.R.
Thermal visualization of the interhemispheric asymmetry of the brains of animals p 43 A89-18456
An experiemental and theoretical investigation of the dynamics of lymphopoiesis during prolonged exposure to ionizing radiation p 43 A89-18561
Estimating the level and the radiosensitivity of the human haemopoietic stem-cell pool from the number of endocolonies of nondifferentiated cells formed against the background of postirradiational bone-marrow aplasia p 51 A89-18562
Early effects of low-level ionizing radiation in relatively low doses on the neuromediatory systems responsible for the central regulation of the hypothalamic-pituitary-adrenocortical system p 43 A89-18563
Some features of the response of mammalian nerve cells to low-level radiation p 43 A89-18564
Pathomorphological changes in rat brain neurons long after exposures to carbon ions and gamma rays p 43 A89-18565
Radioprotective efficiency, toxicity, and the mechanism of action of bis(beta-dimethyloctyl ammonium ethyl) disulfide p 43 A89-18566
Radioprotective efficiency of complexes of copper, cobalt, and zinc with substituted acylhydrazones p 44 A89-18567
Combined effect of a constant magnetic field and ionizing radiation p 44 A89-18568
Role of cholinergic mechanisms in alterations of rabbit brain functional activity caused by motion sickness p 44 A89-18573
Changes in the sensitivity of alpha(2)-D and beta(1)-adrenoreactive systems during intense cooling in cold-acclimated rats p 44 A89-18574
Conjugated thermoregulatory and hemodynamic effects of centrally administered bombesin p 44 A89-18575
Participation of erythron in the adaptation to muscle loads p 44 A89-18639
Geomagnetic field and the human organism p 51 A89-18640
JPRS report: Science and technology. USSR: Life sciences
[JPRS-ULS-88-016] p 53 N89-13870
Assessment of paired activity of otolithic apparatus of healthy men by study on parallel swings p 54 N89-13871
JPRS report: Science and technology. USSR: Life sciences
[JPRS-ULS-87-008] p 48 N89-14658
Effects of calcitonin and retabolil on rat femur in hypokinesia p 48 N89-14659
Holographic recording of deformation waves in muscle tissue p 55 N89-14660
Influence of high temperature on total gas metabolism of animals with limitation of motor activity p 48 N89-14661
Influence of emotional-pain stress on contractile function of myocardium during long-term hypokinesia p 48 N89-14662
Correction of acute hypoxia-induced changes in blood coagulation in rabbits p 49 N89-14663
Functional significance and mechanisms of variability in baroreceptor reflex p 49 N89-14664
Systemic hemodynamic shifts in hypoxia p 49 N89-14665

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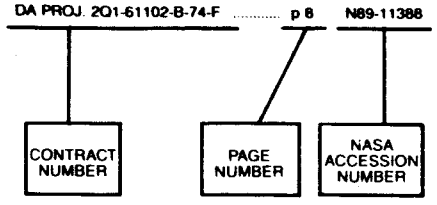

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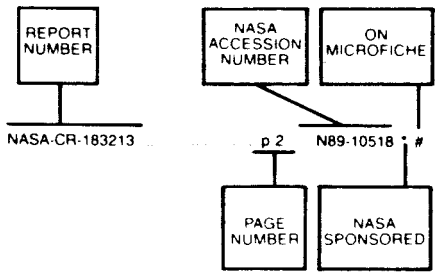

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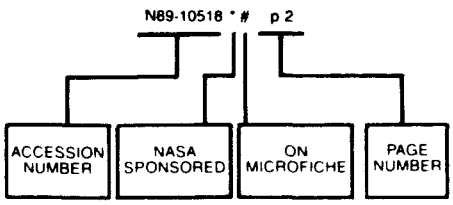

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Springfield, IL 62756
(217) 782-5185

INDIANA

INDIANA STATE LIBRARY
Serials Documents Section
140 North Senate Avenue
Indianapolis, IN 46204
(317) 232-3686

IOWA

UNIV. OF IOWA LIBRARIES
Govt. Documents Department
Iowa City, IA 52242
(319) 353-3318

KANSAS

UNIVERSITY OF KANSAS
Doc. Collect—Spencer Lib.
Lawrence, KS 66045-2800
(913) 864-4662

KENTUCKY

UNIV. OF KENTUCKY LIBRARIES
Govt. Pub. Department
Lexington, KY 40506-0039
(606) 257-3139

LOUISIANA

LOUISIANA STATE UNIVERSITY
Middleton Library
Govt. Docs. Dept.
Baton Rouge, LA 70803
(504) 388-2570

LOUISIANA TECHNICAL UNIV. LIBRARY
Documents Department
Ruston, LA 71272-0046
(318) 257-4962

MAINE

UNIVERSITY OF MAINE
Raymond H. Fogler Library
Tri-State Regional Documents Depository
Orono, ME 04469
(207) 581-1680

MARYLAND

UNIVERSITY OF MARYLAND
McKeldin Lib—Doc. Div.
College Park, MD 20742
(301) 454-3034

MASSACHUSETTS

BOSTON PUBLIC LIBRARY
Government Docs. Dept.
Boston, MA 02117
(617) 536-5400 ext.226

MICHIGAN

DETROIT PUBLIC LIBRARY
Sociology Department
5201 Woodward Avenue
Detroit, MI 48202-4093
(313) 833-1409

MICHIGAN STATE LIBRARY
P.O. Box 30007
Lansing, MI 48909
(517) 373-1593

MINNESOTA

UNIVERSITY OF MINNESOTA
Government Pubs. Division
409 Wilson Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 373-7870

MISSISSIPPI

UNIV. OF MISSISSIPPI LIB.
Documents Department
University, MS 38677
(601) 232-5857

MONTANA

UNIV. OF MONTANA
Mansfield Library
Documents Division
Missoula, MT 59812
(406) 243-6700

NEBRASKA

UNIVERSITY OF NEBRASKA - LINCOLN
Love Library
Documents Department
Lincoln, NE 68588-0410
(402) 472-2562

NEVADA

UNIVERSITY OF NEVADA LIB.
Govt. Pub. Department
Reno, NV 89557-0044
(702) 784-6579

NEW JERSEY

NEWARK PUBLIC LIBRARY
5 Washington Street
Newark, NJ 07101-0630
(201) 733-7812

NEW MEXICO

UNIVERSITY OF NEW MEXICO
Zimmerman Library
Government Pub. Dept.
Albuquerque, NM 87131
(505) 277-5441

NEW MEXICO STATE LIBRARY
Reference Department
325 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827-3826

NEW YORK

NEW YORK STATE LIBRARY
Empire State Plaza
Albany, NY 12230
(518) 474-5563

NORTH CAROLINA

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
Davis Library
BA/SS Documents Division
Chapel Hill, NC 27515
(919) 962-1151

NORTH DAKOTA

UNIVERSITY OF NORTH DAKOTA
Chester Fritz Library
Documents Department
Grand Forks, ND 58202
(701) 777-4629
In cooperation with North Dakota State Univ. Library

OHIO

STATE LIBRARY OF OHIO
Documents Department
65 South Front Street
Columbus, OH 43266-0334
(614) 462-7051

OKLAHOMA

OKLAHOMA DEPT. OF LIB.
Government Documents
200 NE 18th Street
Oklahoma City, OK 73105
(405) 521-2502, ext. 252

OKLAHOMA STATE UNIV. LIB.
Documents Department
Stillwater, OK 74078
(405) 624-6546

OREGON

PORTLAND STATE UNIV. LIB.
Documents Department
P.O. Box 1151
Portland, OR 97207
(503) 229-3673

PENNSYLVANIA

STATE LIBRARY OF PENN.
Government Pub. Section
P.O. Box 1601
Harrisburg, PA 17105
(717) 787-3752

TEXAS

TEXAS STATE LIBRARY
Public Services Department
P.O. Box 12927—Cap. Sta.
Austin, TX 78711
(512) 475-2996

TEXAS TECH. UNIV. LIBRARY
Govt. Documents Department
Lubbock, TX 79409
(806) 742-2268

UTAH

UTAH STATE UNIVERSITY
Merrill Library, U.M.C. 30
Logan, UT 84322
(801) 750-2682

VIRGINIA

UNIVERSITY OF VIRGINIA
Alderman Lib.—Public Doc.
Charlottesville, VA 22903-2498
(804) 924-3133

WASHINGTON

WASHINGTON STATE LIBRARY
Documents Section
Olympia, WA 98504
(206) 753-4027

WEST VIRGINIA

WEST VIRGINIA UNIV. LIB.
Documents Department
Morgantown, WV 26506-6069
(304) 293-3640

WISCONSIN

MILWAUKEE PUBLIC LIBRARY
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 278-3065

ST. HIST LIB. OF WISCONSIN
Government Pub. Section
816 State Street
Madison, WI 53706
(608) 262-4347

WYOMING

WYOMING STATE LIBRARY
Supreme Ct. & Library Bld.
Cheyenne, WY 82002
(307) 777-5919

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