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June 1992

P-69

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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INFORMATION

NASA SP-7011 (363)

June 1992

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES



National Aeronautics and Space Administration
Scientific and Technical Information Program
Washington, DC

1992

INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 179 reports, articles and other documents originally announced in May 1992 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue are:

<i>STAR</i> (N-10000 Series)	N92-18006 — N92-20045
<i>IAA</i> (A-10000 Series)	A92-24399 — A92-28554

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

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

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

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

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

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TYPICAL REPORT CITATION AND ABSTRACT

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ACCESSION NUMBER → **N92-11637***# Vanderbilt Univ., Nashville, TN. Dept. of Electrical Engineering. ← CORPORATE SOURCE

TITLE → **ROBOT GRAPHIC SIMULATION TESTBED Final Report**

AUTHORS → **GEORGE E. COOK, JANOS SZTIPANOVITS, CSABA BIEGL, GABOR KARSAI, and JAMES F. SPRINGFIELD** Aug. 1991 ← PUBLICATION DATE

CONTRACT NUMBER → (Contract NAG8-690) ← AVAILABILITY SOURCE

REPORT NUMBERS → (NASA-CR-188998; NAS 1.26:188998) Avail: NTIS HC/MF A06; ← PRICE CODE
12 functional color pages CSCL 06/11 ← COSATI CODE

The objective of this research was twofold. First, the basic capabilities of ROBOSIM (graphical simulation system) were improved and extended by taking advantage of advanced graphic workstation technology and artificial intelligence programming techniques. Second, the scope of the graphic simulation testbed was extended to include general problems of Space Station automation. Hardware support for 3-D graphics and high processing performance make high resolution solid modeling, collision detection, and simulation of structural dynamics computationally feasible. The Space Station is a complex system with many interacting subsystems. Design and testing of automation concepts demand modeling of the affected processes, their interactions, and that of the proposed control systems. The automation testbed was designed to facilitate studies in Space Station automation concepts.

Author

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT

ACCESSION NUMBER → **A92-10353**

TITLE → **EFFECTS OF HYPOXIA AND COLD ACCLIMATION ON THERMOREGULATION IN THE RAT**

AUTHORS → **H. GAUTIER, M. BONORA, S. B. M'BAREK, and J. D. SINCLAIR** (Paris VI, Universite, France; Auckland, University, New Zealand) ← AUTHORS' AFFILIATION

JOURNAL TITLE → **Journal of Applied Physiology** (ISSN 0161-7567), vol. 71, Oct. 1991, p. 1355-1363. Research supported by Institut National de la Sante et de la Recherche Medicale. refs ← PUBLICATION DATE

Copyright

Results are reported from an experimental study tracing the effects of hypoxia on thermoregulation and on the different sources of thermogenesis in rats before and after periods of 1-4 wk of cold acclimation. Measurements of the metabolic rate (VO₂) and body temperature (T_b) were made at 5-min intervals, and shivering activity was recorded continuously in groups of rats subjected to three protocols. Recordings were made in normoxia and in hypoxia on different days in the same animals. The results show that: (1) in noncold-acclimated (NCA) rats, cold exposure induced increases in VO₂ and shivering that were proportional to the decrease in T_a; (2) in cold-acclimated (CA) rats in normoxia, for a given ambient temperature, VO₂ and T_b were higher than in NCA rats, whereas shivering was generally lower; and (3) in both NCA and CA rats, hypoxia induced a transient decrease in shivering and a sustained decrease in nonshivering thermogenesis associated with a marked decrease in T_b that was about the same in NCA and CA rats. It is concluded that hypoxia acts on T_b control to produce a general inhibition of thermogenesis.

P.D.

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 363)

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LIFE SCIENCES (GENERAL)

A92-25259

THE EFFECT OF VARIOUS TYPES OF ABNORMALITIES OF THE CUPULOENDOLYMPHATIC SYSTEM OF THE VESTIBULAR APPARATUS ON THE SYSTEM'S DYNAMIC CHARACTERISTICS [VLIANIE RAZLICHNYKH VIDOV PATOLOGII KUPULO-ENDOLIMFATICHESKOI SISTEMY VESTIBULIARNOGO APPARATA NA EE DINAMICHESKIE KHARAKTERISTIKI]

V. M. GUSEV and I. V. ORLOV Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 17-20. In Russian. refs

Copyright

Results are presented of calculations designed to show the mechanism of the effect of abnormalities in the semicircular canal on the biophysical characteristics of the vestibular apparatus expressed as shifts of endolymph in the area of the cupular partition. It is shown that various types of abnormalities (such as an obstruction in the canal or the separation of cupula from the wall of the ampulla) lead to different types of distortions of the informational properties of the canal. I.S.

A92-25261

THE EFFECT OF WEIGHTLESSNESS ON THE PROGRESS OF MUSCLE REPAIR IN RATS FLOWN ON THE COSMOS-2044 BIOSATELLITE [VLIANIE NEVESOMOSTI NA TECHENIE REPARATIVNOGO PROTSESSA V MYSHTSAKH KRYSA, EKSPONIROVANNYKH NA BIOSPUTNIKE 'KOSMOS-2044']

E. I. IL'INA-KAKUEVA and T. E. BURKOVSKAYA Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 24-29. In Russian. refs

Copyright

The effect of microgravity on the rate of repair of damaged skeletal musculature was investigated in rats flown for 14 days aboard Cosmos-2044, two days after their soleus and gastrocnemius muscles were crushed by clamp forceps. A comparison of microscopic examinations of flown and ground-control rats showed that the exposure to space flight inhibited the repair process but did not impair its phasic development. As a result, the reparative field was smaller, the myofibers that originated from the ends of injured atrophic fibers were thinner, and some fibers underwent splitting. It is postulated that the muscle-repair inhibition was due to the same mechanism that produces muscle atrophy under microgravity. I.S.

A92-25262

THE EFFECT OF WEIGHTLESSNESS ON HEALING OF BONE FRACTURES IN RATS FLOWN ON THE COSMOS-2044 BIOSATELLITE [VLIANIE NEVESOMOSTI NA ZAZHYVLENIE PERELOMOV KOSTEI U KRYSA, EKSPONIROVANNYKH NA BIOSPUTNIKE 'KOSMOS-2044']

G. N. DURNOVA, T. E. BURKOVSKAYA, E. V. VOROTNIKOVA, A. S. KAPLANSKII, and O. V. ARUSTAMOV Kosmicheskaya Biologiya

i Aviakosmicheskaya Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 29-33. In Russian. refs

Copyright

The effect of microgravity on the healing characteristics of bone tissue was investigated in rats flown aboard Cosmos-2044, two days after the animals underwent an operation in which their fibulae were cut bilaterally. Results of histological and histomorphometrical examinations showed that healing was inhibited; bone callus was underdeveloped and the bone fragment consolidation was inadequate. The newly formed bone tissue exhibited increases in the relative volume of osteoid and a decrease in the number and activity of osteoblasts, signs of mineral disorders. Similar results were observed in rats exposed to tail suspension. I.S.

A92-25265

SOME INDICES OF PROTEIN AND NUCLEIC ACID METABOLISM IN THE LYMPHOID ORGANS OF RATS SUBJECTED TO HYPOKINESIA AND TO VITAMIN-B1 DEFICIENCY [NEKOTORYE POKAZATELI METABOLIZMA BELKOV I NUKLEINOVYKH KISLOT V LIMFOIDNYKH ORGANAKH KRYSA V USLOVIAKH GIPOKINEZII I DEFITSITA VITAMINA B1]

L. N. DVORIANINOVICH and V. V. KLIMOVICH Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 41-43. In Russian. refs

Copyright

The effects of long-term hypokinesia and vitamin B1 deficiency on the amounts of total protein, nucleic acids, alanine aminotransferase, aspartate aminotransferase, and methionine- and cysteine-tRNA synthetases in the thymus and spleen of rats were investigated in animals kept for 15 days in restraining cages. The results suggested that the hypokinesia-induced disorders in protein and nucleic acid metabolisms observed in the two organs are aggravated when rats are made deficient in vitamin B1 by feeding oxythiamine. I.S.

A92-25267

FUNCTIONAL STATE OF THE CNS AT AN EARLY PERIOD OF THE DEVELOPMENT OF RADIATION SICKNESS AFTER IRRADIATION WITH HELIUM IONS [FUNKSIONAL'NOE SOSTOYANIE TSNS V RANNII PERIOD FORMIROVANIYA I RAZVITIYA LUCHEVOGO PORAZHENIYA POSLE OBLUCHENIYA IONAMI GELIYA]

N. IA. SAVCHENKO Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 46-48. In Russian. refs

Copyright

The effect of whole-body irradiation by various doses of accelerated helium ions on the functional activity of the central nervous system (CNS) of rats was investigated by monitoring the behavioral reactions of the animals at different times after irradiation. Results showed that the changes that developed in the CNS after irradiation with He ions were similar to those that develop during early stages of radiation sickness. I.S.

A92-25268

THE EFFECTS OF ISOLATED AND COMBINED EXPOSURES TO A CONSTANT MAGNETIC FIELD AND ANTIORTHOSTATIC HYPOKINESIA ON THE CENTRAL HEMODYNAMICS IN RATS [VLIIANIE IZOLIROVANNOGO I KOMBINIROVANNOGO DEISTVIA POSTOIANNOGO MAGNITNOGO POLIA I ANTIORTOSTATICHESKOI GIPOKINEZII NA TSENTRAL'NUIU GEMODINAMIKU U KRYS]

R. T. KAZAKOVA and A. M. BADAQVA Kosmicheskaja Biologija i Aviakosmicheskaja Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 48, 49. In Russian. refs
Copyright

The effect of exposures to a constant magnetic field (CMF) combined with hypokinesia on the parameters of the central hemodynamics system was investigated in rats subjected to tail suspension for periods of 3 hr, 1 day, and 7 days and/or to 3-hr-long exposures to a CMF of 0.4 T intensity. It was found that 3-h-long exposures to magnetic field did not significantly affect central blood circulation in control rats, which were moving freely. However, the exposures to magnetic field during hypokinesia were found to alleviate the effects of hypokinesia. I.S.

A92-25270

THE EFFECT OF A PULSED ELECTROMAGNETIC FIELD ON THE ACCUMULATION OF CALCIUM IONS BY THE SARCOPLASMIC RETICULUM OF RAT HEART MUSCLE [DEISTVIE IMPUL'SNOGO ELEKTROMAGNITNOGO POLIA NA AKKUMULIATSIIU IONOV KAL'TSIIA SARKOPLAZMATICHESKIM RETIKULUMOM SERDECHNOI MYSHTSY KRYSY]

V. A. LOGINOV, N. V. GORBATENKOVA, and V. IA. KLIMOVITSKII Kosmicheskaja Biologija i Aviakosmicheskaja Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 51-53. In Russian. refs
Copyright

The effect of a single electromagnetic pulse on the amount of calcium ions accumulated by the sarcoplasmic reticulum of rat heart muscle was investigated using an ion-selective electrode for measuring the rate of Ca(2+) accumulation by rat-heart homogenates subjected to monopolar electromagnetic pulses of 1 ms duration, 10-Hz frequency, and from 1 to 10 mT magnetic induction. It was found that 100-min-long exposures led to 70 percent inhibition of Ca(2+) transfer across the sarcoplasmic reticulum. The effect is associated with direct inhibition of Ca(2+)-ATPase. I.S.

A92-25271

INVESTIGATION OF THE CYCLIC KINETICS OF IMMUNITY BY MATHEMATICAL MODELING METHODS [ISSLEDOVANIE TSIKLICHESKOI KINETIKI IMMUNITETA METODAMI MATEMATICHESKOGO MODELIROVANIJA]

O. A. SMIRNOVA Kosmicheskaja Biologija i Aviakosmicheskaja Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 53-56. In Russian. refs
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A mathematical model of the humoral immune response to soluble antigens was developed and used to investigate the mechanisms involved in the dynamics of the immune response. It is shown that, at the zero rate of removal, the concentration of free antigen is a hyperbolic function of the sum of antibody concentrations. This relationship explains variations in the immune reaction, based on the dynamics of antibody accumulation: as the antibody concentration increases, the concentration of free antigen decreases, leading to a decrease in stimulated immunocompetent cells and in antibody synthesis. I.S.

A92-25275

PROPHYLACTIC AND SENSITIZING EFFECTS OF BIOLOGICALLY ACTIVE SUBSTANCES IN THE SIMULATION OF VESTIBULOVEGETATIVE DISORDERS [PROFILAKTICHESKOE I SENSIBILIZIRUIUSHCHEE DEISTVIE BIOLOGICHESKI AKTIVNYKH VESHCHESTV PRI MODELIROVANII VESTIBULOVEGETATIVNYKH RASSTROISTV]

V. S. SHASHKOV, IU. V. DROZD, and V. M. PUKO Kosmicheskaja Biologija i Aviakosmicheskaja Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 61-63. In Russian. refs
Copyright

Mechanisms involved in the development of vestibulovegetative disorders (VVDs) in cats were investigated by analyzing the effects of various biologically active substances on the development of the motion-sickness syndrome in cats exposed to vestibulovegetative stimuli. It was found that inhibitors of the opioid receptors, such as naloxone and ICI 154129, when injected into the cerebral ventriculum, delay the onset of motion sickness, while the inhibitors of other receptors of the chemoreceptor trigger zone, such as pipolfen, scopolamine, haloperidol, and deseril, are not effective. Alpha-endorphin, enkephalins, and AKTG(1-39) showed sensitizing activity. The common property of all protecting polypeptides was the presence of glutamic acid in their amino-acid sequences, while the N-terminals of all sensitizers contained tyrosin. It was also found that vitamin E had a protective effect. I.S.

A92-25276

PROTECTION FROM EFFECTS OF RADIATION AT SUBLETHAL DOSES DURING EXPOSURES TO HYPERGRAVITATION [POPYTKA PROTIVOLUCHEVOI ZASHCHITY PRI SUBLETAL'NOM OBLUCHENII V USLOVIAKH GIPERGRAVITATSII]

M. I. MINKOVA and T. P. PANTEV Kosmicheskaja Biologija i Aviakosmicheskaja Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 63, 64. In Russian. refs
Copyright

The effects of hypergravitation (G) and of two radiation protective substances, eleutherococcus (E) and adeturon (A), on the development and progress of radiation sickness in rats were investigated in animals exposed to centrifugal acceleration to +5 Gx and/or irradiation (I) by Cs-137 (3 Gy), delivered in the following combinations: E + I, E + G + I, and E + G + A + I. Results indicate that acceleration delivered 1 h before irradiation did not change the sensitivity of animals to radiation sickness development, but canceled the beneficial effect of E, while injections of A in the combination E + G + A + I did not alleviate the early symptoms of radiative sickness, but increased the speed of recovery. I.S.

A92-25402

PILEATE MUSHROOMS AND ALGAE - OBJECTS FOR SPACE BIOLOGY [SHLIAPOCHNYE GRIBY I VODOROSLI: OB'EKTY KOSMICHESKOI BIOLOGII]

L. F. GOROVoi, T. B. KASATKINA, A. F. POPOVA, and E. L. KORDIUM Leningrad, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Vol. 69), 1991, 232 p. In Russian. refs
Copyright

Methods are described for investigating the growth and development of pileate mushrooms and blue-green and monocellular green algae under conditions of space flight. Particular attention is given to special installations (Kvadrat and Trapezia) constructed for growing several generations of mushrooms and algae under microgravity or other extreme conditions such as ionizing radiation, UV light, magnetic fields, and for studies of these effects on growth of mushrooms and algae. Results are presented on morphological, cytological, and biochemical effects of microgravity and hypogravity in mushrooms and algae. I.S.

A92-25429* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

THE SOLUBILITY OF THE TETRAGONAL FORM OF HEN EGG WHITE LYSOZYME FROM PH 4.0 TO 5.4

ELIZABETH CACIOPPO and MARC L. PUSEY (NASA, Marshall Space Flight Center, Huntsville, AL) *Journal of Crystal Growth* (ISSN 0022-0248), vol. 114, no. 3, Nov. 1991, p. 286-292. Research supported by Universities Space Research Association. refs Copyright

Hen egg white lysozyme solubilities in the presence of the tetragonal crystal form have been determined. Conditions investigated cover the pH range 4.0 to 5.4, varying from 2.0 to 7.0 percent NaCl concentrations and from 4 to 25 C. In all instances, the solubilities were found to increase with temperature and decrease with increasing salt concentration. The effects of pH were more complex, showing a decreasing solubility with increasing pH at low salt concentration and an increasing solubility with increasing pH at high salt concentration. Author

A92-26012

THE GROOMING AND MOTOR ACTIVITIES OF RATS UNDER CONDITIONS OF HYPERBARIA [GRUMING I DVGATEL'NAIA AKTIVNOST' KRYS V USLOVIAKH GIPERBARII]

A. IU. SLEDKOV *Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina* (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 30-33. In Russian. refs Copyright

The effect of hyperbaric environment on the grooming and motor activities of rats and on their blood content of corticosterone was investigated in animals exposed to hyperbaric atmospheres of O₂-N₂ (at 10 kg/sq cm pressure) and O₂-He (at 10 and 40 kg/sq cm). It was found that hyperbaria caused significant increases in the motor and grooming activities in rats exposed to either O₂-N₂ or O₂-He atmosphere; plasma contents of serum corticosterone also increased (more than twice). The return to normal activity took place faster after exposures to 10 kg/sq cm than after higher pressure. I.S.

A92-26020

A MATHEMATICAL APPROACH TO THE ASSESSMENT OF THE ACCURACY OF PHYSIOLOGICAL PARAMETER MEASUREMENTS PERFORMED BY DIFFERENT METHODS [MATEMATICHESKII PODKHOD K OTSENKE TOCHNOSTI IZMERENII FIZIOLOGICHESKOGO PARAMETRA RAZLICHNYMI METODAMI]

N. V. PRAVETSKII, A. M. NOSOVSKII, and S. F. KHOLIN *Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina* (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 53-55. In Russian. refs Copyright

Mathematical formulas were developed for calculating the relative accuracy of the values of a physiological parameter obtained using different measurement methods. The approach was verified using, as an example, data on the stroke volume and the minute volume in healthy individuals (obtained from a data base compiled by Pravetskii, 1986), when these parameters were measured by two methods: the Fick method and the thermodilution method described by Gaiton (1969). I.S.

A92-26021

BASIC APPROACHES TO SPACECRAFT STUDIES OF THE BIOLOGICAL EFFECT OF HEAVY IONS OF GALACTIC COSMIC RAYS [OSNOVNYE PODKHODY K IZUCHENIIU BIOLOGICHESKOGO DEISTVIA TIAZHELYKH IONOV GALAKTICHESKIKH KOSMICHESKIKH LUCHEI V ISSLEDOVANIIAKH NA KOSMICHESKIKH APPARATAKH]

L. V. NEVZGODINA and E. N. MAKSIMOVA *Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina* (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 55-57. In Russian. refs Copyright

It is argued that the basic approach that should be adopted in investigations of the biological effect of heavy-ion radiation (HIR) from galactic cosmic rays is the analysis of final manifestations of radiobiological reactions, such as cell inactivation and cell death

(rather than merely the rate of mutation or the rate of appearance of aberrant cell structures). The choice of biological objects for studying the effect of HIR should be dictated by the feasibility of studying, in the particular object, the amount of injury and the rate of recovery both on the cellular and the organism levels. It is emphasized that the viability of the metabolic apparatus should be measured not only under optimal conditions of enzyme reactivity but also under conditions of extreme temperatures, overload, vibration, pressure, and humidity. I.S.

A92-26022

ANALYSIS OF THE PROTEIN CONTENT IN BLOOD PLASMA OF RATS AFTER THEIR FLIGHT ABOARD THE BIOSATELLITE COSMOS-1887, USING TWO-DIMENSIONAL ELECTROPHORESIS [ANALIZ BELKOVOGO SOSTAVA PLAZMY KROVI KRYS POSLE POLETA NA BIOSPUTNIKE 'KOSMOS-1887' S ISPOL'ZOVANIEM METODA DVUKHMERNOGO ELEKTROFOREZA]

O. N. LARINA *Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina* (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 57, 58. In Russian. refs Copyright

The effect of a space flight on the total protein content and on individual proteins of rat blood plasma was investigated by analyzing plasma proteins of rats flown for 12.5 days aboard Cosmos-1887, using the Anderson and Anderson method of 2D electrophoresis. A comparison of data obtained before and after flight with data on synchronous controls showed that, while the total protein contents of experimental rats and ground controls were similar, the concentrations of albumin in flown rats decreased and those of globulin increased. Four of the flown rats (of the total group of nine) displayed increases of basic polypeptides analogous in the position to the alpha-chain of human fibrinogen. The same samples showed abnormal distributions of proteins among various molecular weight subfractions. I.S.

A92-26023

STUDIES OF THE BIOLOGICAL ACTIVITY OF A NIDUS VESPAE EXTRACT IN ANIMALS SUBJECTED TO PHYSICAL LOADS [IZUCHENIE BIOLOGICHESKOI AKTIVNOSTI NASTOIKI NIDUS VESPAE V USLOVIAKH FIZICHESKOI NAGRUZKI]

V. N. KOSTIUCHENKOV and N. F. FARASHCHUK *Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina* (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 58, 59. In Russian. refs Copyright

Results are presented on studies of the effect of a nidus vespaee (wasp nest) extract on the biological activity of rats. It is shown that injections of the extract (in amounts from 1 to 3 ml/kg-body-weight) resulted in increased work capacity and in amelioration of the unfavorable stress reactions to maximal physical loads. I.S.

A92-26024

CHARACTERISTICS OF BEHAVIORAL REACTIONS OF RATS EXPOSED TO CONSTANT ELECTRIC FIELDS OF DIFFERENT VOLTAGE [OSOBENNOSTI Povedencheskikh Reaktsii KRYS PRI VOZDEISTVII POSTOIANNYKH ELEKTRICHESKIKH POLEI RAZLICHNOI NAPRIAZHENNOSTI]

N. M. GROMYKO and O. L. KRIVODAEVA (Tsentri Mediko-Biologicheskikh i Ekologicheskikh Issledovani, Jurmala, Latvia) *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), vol. 77, May 1991, p. 1-6. In Russian. refs Copyright

The effect of exposures of rats to constant electric fields (CEFs) on their behavioral reactions was investigated by recording the characteristics of conditioned-reflex responses of the animals to food and pain after 4-hr-long daily exposures for 30 days to CEFs in the 30-160 kV/m voltage range. It was found that increases of voltage cause decelerations of responses, decreases in the levels of locomotor and orientation activities, and an eventual disappearance of the reflex extinction processes. The system that

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was found to be most sensitive to CEFs is the system of negative emotional responses. I.S.

A92-26025

THE ROLE OF SPECIFIC AND NONSPECIFIC AFFERENT SYSTEMS IN THE MECHANISM OF CHANGES IN CORTICAL EVOKED RESPONSES TO VIBRATION [ROL' SPETSIFICHESKIKH I NESPEITSIFICHESKIKH AFFERENTNYKH SISTEM V MEKHANIZME IZMENENII VYZVANNYKH OTVETOV KORY PRI VIBRATSII]

S. M. MINASIAN, O. G. BAKLAVADZHIAN, S. G. SAAKIAN, and TS. I. ADAMIAN (Erevanskii Gosudarstvennyi Universitet, Yerevan, Armenia) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 77, May 1991, p. 18-25. In Russian. refs
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A92-26332 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

THE EFFECT OF HEAD-DOWN TILT AND WATER IMMERSION ON INTRACRANIAL PRESSURE IN NONHUMAN PRIMATES

LANNY C. KEIL (NASA, Ames Research Center, Moffett Field, CA), KENNETH H. MCKEEVER (Ohio State University, Columbus), MICHAEL G. SKIDMORE, JOHN HINES (NASA, Ames Research Center, Moffett Field, CA), and WALTER B. SEVERS (Pennsylvania State University, Hershey) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, March 1992, p. 181-185. refs

(Contract NCC2-127)

Copyright

Intracranial pressure (ICP) is investigated in primates during and after -6-deg head-down tilt (HDT) and immersion in water to examine the effects of the headward fluid shift related to spaceflight. Following the HDT the primates are subjected to head-out thermonutral water immersion, and the ICP is subsequently measured. ICP is found to increase from 3.8 +/- 1.1 to 5.3 +/- 1.3 mm Hg during the horizontal control period. ICP stabilizes at -6.3 +/- 1.3 mm Hg and then increases to -2.2 +/- 1.9 mm Hg during partial immersion, and ICP subsequently returns to preimmersion levels after immersion. These data indicate that exposure to HDT or water immersion lead to an early sharp increase in ICP, and water immersion alone leads to higher ICP levels. A significant conclusion of the work is that the ICP did not approach pathological levels, and this finding is relevant to human spaceflight research. C.C.S.

A92-26334 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

INFLUENCES OF CHEMICAL SYMPATHECTOMY, DEMEDULLATION, AND HINDLIMB SUSPENSION ON THE V(O₂)MAX OF RATS

CHRISTOPHER R. WOODMAN, CRAIG S. STUMP, LISA A. SEBASTIAN, and CHARLES M. TIPTON (Arizona, University, Tucson) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, March 1992, p. 193-199. refs
(Contract NAG2-392; NGT-50493)

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The contributions of catecholamines from the adrenal medulla to the reduction in maximal oxygen consumption is investigated in chemically sympathectomized rats. The rats are injected with saline and chemically sympathectomized, and approximately half of the rats are surgically demedullated. The subjects undergo head-down suspension for two weeks and are examined in terms of submaximal mechanical efficiency, treadmill run time, and maximal oxygen consumption. Rats with adrenal medullas and injected with saline demonstrate reduced levels of maximal O consumption, whereas chemically sympathectomized rats with adrenal medullas showed no significant reduction. Reduced levels of maximal O consumption is also noted in the sympathectomized demedullated rats. The paper concludes that circulating epinephrine enhances the attenuation of the decrease in the maximal O consumption caused by chemical sympathectomy. C.C.S.

A92-26548 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

INTERMITTENT ACCELERATION AS A COUNTERMEASURE TO SOLEUS MUSCLE ATROPHY

DOMINICK S. D'AUNNO, RONALD R. ROBINSON, GREGORY S. SMITH, DONALD B. THOMASON, and FRANK W. BOOTH (Texas, University, Houston) Journal of Applied Physiology (ISSN 8750-7587), vol. 72, Feb. 1992, p. 428-433. refs
(Contract NAG2-239; NAGW-70)

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The effectiveness of using intermittent acceleration as a countermeasure to muscle atrophy was investigated in rats subjected to 7 days of hindlimb suspension interrupted by daily periods of 1.2 g acceleration, for 15-min periods evenly spaced over 12-hr interval. It was found that this regimen, when repeated for 7 days, failed to completely maintain the mass of soleus muscle, which was 84 percent of control. I.S.

A92-26549 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

EFFECTS OF A SIMULATED MICROGRAVITY MODEL ON CELL STRUCTURE AND FUNCTION IN RAT TESTIS AND EPIDIDYMIS

JILL A. HADLEY, JOSEPH C. HALL, AMI O'BRIEN, and RICHARD BALL (Pennsylvania State University, University Park) Journal of Applied Physiology (ISSN 8750-7587), vol. 72, Feb. 1992, p. 748-759. Research supported by NSF. refs
(Contract NCC2-370; NAS9-17416)

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The effect of simulated microgravity on the structure and function of the testis and epididymis cells was investigated in rats subjected to 7 days of tail suspension. Results of a histological examination revealed presence of disorganized seminiferous tubules and accumulation of large multinucleated cells and spermatids in the lumen of the epididymis. In addition, decreases in the content of testis protein and in testosterone levels in the testis, the interstitial fluid, and the epididymis were observed. I.S.

A92-27494

TYROSINE HYDROXYLASE ACTIVITY IN DROSOPHILA VIRILIS UNDER NORMAL CONDITIONS AND HEAT STRESS [AKTIVNOST' TIROZINGIDROKSILAZY U DROSOPHILA VIRILIS V NORME I PRI TEPLOVOM STRESSE]

I. IU. RAUSHENBAKH, N. A. CHENTSOVA, L. V. SHUMNAIA, T. M. KHEBODAROVA, and L. I. SEROVA (AN SSSR, Institut Tsitologii i Genetiki, Novosibirsk, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 321, no. 3, 1991, p. 612-615. In Russian. refs

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Data are presented which demonstrate the activity of tyrosine hydroxylase in *Drosophila virilis* under normal conditions and changes in the ferment activity under heat stress and hybridization of RNA of the *Drosophila virilis* imago with the coding sequence of tyrosine hydroxylase in rats. The results obtained agree with those reported by Neckameyer et al. (1986). Details of the experiments are presented. V.L.

A92-27600

DYNAMICS OF KIDNEY TISSUE AND VESSEL CHANGES IN WHITE RATS DUE TO ACUTE COLD STRESS [DINAMIKA SOSUDISTO-TKANEVYKH IZMENENII V POCHKAKH BELYKH KRYV PRI OSTROM KHOLODOVOM STRESSE]

O. T. DEVONAEV, F. KH. SHARIPOV, and L. E. ETINGEN (Tadzhikskii Gosudarstvennyi Meditsinskii Institut, Dushanbe, Tajikistan) Akademiia Nauk Tadzhikskoi SSR, Doklady (ISSN 0002-3469), vol. 33, no. 12, 1990, p. 843-846. In Russian. refs
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The effect of acute cold stress on the structure of the kidney tissues and vessels of mammals was investigated in rats that were exposed for 7 hrs to a temperature of -16 C, while the control group remained at room temperature. Results of histological examinations performed on the 1st, 3rd, 7th, 14th, 21st, 28th,

45th, and 90th day after the cold exposure showed that the changes (including hemorrhages, vascular plethora, and suppression of mitosis) caused by acute exposure to cold involved mainly the epithelial membranes of the convoluted tubules and the kidney venules. I.S.

A92-27635

THE CHARACTERISTICS OF STRUCTURAL CHANGES IN MEMBRANES OF THE RECTUM OF ANIMALS IN THE PROCESS OF ADAPTATION TO HIGH ALTITUDE [K OSOBNOSTI STRUKTURNYKH IZMENENII V OBOLOCHKAKH PRIAMOGO OTDELA TOLSTOGO KISHECHNIKA EKSPERIMENTAL'NYKH ZHIVOTNYKH V PERIOD ADAPTATSII K USLOVIAM VYSOKOGOR'IA]

SH. IU. IUSUPOVA and F. KH. SHARIPOV (Tadzhikskii Gosudarstvennyi Meditsinskii Institut, Dushanbe, Tajikistan) Akademiia Nauk Tadzhikskoi SSR, Doklady (ISSN 0002-3469), vol. 34, no. 2, 1991, p. 127-129. In Russian. refs

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The effect of relocation to high altitude on the microstructure of rectal membrane tissues was investigated in rabbits relocated to a region 3375 m above sea level and maintained there for up to 30 days in roofed corrals, while the control rabbits were maintained in a valley, at an altitude of 820 m. Results of histological examinations of the mucous membranes of the rectum of animals sacrificed 1 week after relocation disclosed multiple point-size hemorrhages in the anal area of the rectum, indicating changes in vessel permeability. After 2 weeks, all rectal membranes in experimental animals exhibited signs of capillary widening, accompanied by perivascular edema. After 30 days, the tissue changes caused by relocation to high altitude began to disappear. I.S.

A92-28236

NOVEL MAJOR ARCHAEBACTERIAL GROUP FROM MARINE PLANKTON

JED A. FUHRMAN, KIRK MCCALLUM, and ALISON A. DAVIS (Southern California, University, Los Angeles, CA) Nature (ISSN 0028-0836), vol. 356, March 12, 1992, p. 148, 149. Research supported by NSF. refs

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16S rRNA sequences obtained from Pacific Ocean bacterioplankton samples collected from depths of 100 and 500 m are reported. Sequences are found among these which are only distantly related to those of any organisms previously characterized by 16S rRNA sequences, with similarities in the nearest such relatives (extreme thermophiles) approximately the same as those between animals and plants. It is suggested that these sequences are from a previously undescribed archaeobacterial group that may have diverged from the ancestors of characterized organisms very early in evolution. C.D.

A92-28370

CONTENT AND COMPOSITION OF FREE FATTY ACIDS IN THE SARCOPLASMIC RETICULUM MEMBRANES AFTER EXPOSURE TO IONIZING RADIATION [VMIST I SKLAD VIL'NIKH ZHIRNIKH KISLOT U MEMBRANAKH SARKOPLAZMATICHNOGO RETIKULUMU PISLIA DII IONIZIUCHOI RADIATSII]

IU. V. STEPANOV, V. M. VOITSITS'KII, V. S. SABKO, L. N. BOGATS'KA, and M. E. KUCHERENKO (Kiiivskii Derzhavnii Universitet, Kiev, Ukraine) Akademiia Nauk Ukrain'skoi RSR, Dopovidi, Matematika, Prirodovnavstvo, Tekhnichni Nauki (ISSN 0868-8052), May 1991, p. 142-145. In Ukrainian. refs

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A92-28384

ULTRASTRUCTURAL ORGANIZATION OF CHLORELLA CELLS CULTIVATED ON A SOLID MEDIUM IN MICROGRAVITY [UL'TRASTRUKTURNA ORGANIZATSIIA KLITIN KHLORELI, VIROSHCHENIKH NA TVERDOMU POZHIVNOMU SEREDOVISHCHI V UMOVAKH MIKROGRAVITATSII]

A. F. POPOVA, K. M. SITNIK, E. L. KORDIUM, G. S. NECHITAILO, and O. L. MASHINS'KII (AN URSR, Institut Botaniki, Kiev, Ukrainian SSR) Akademiia Nauk Ukrain'skoi RSR, Dopovidi, Matematika, Prirodovnavstvo, Tekhnichni Nauki (ISSN 0868-8052), Aug. 1991, p. 154-157. In Ukrainian. refs

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Chlorella cells grown for 30 days on board the Mir space station are found to differ from the control cells in their ultrastructure and relative volumes of the organelles and cell inclusions. Some of these changes are observed only in the chlorella cells cultivated on a solid medium. The observed changes in the submicroscopic organization of the chlorella cells grown on a solid medium in microgravity must be taken into account in developing techniques for plant growth in space. V.L.

N92-18113# Rensselaer Polytechnic Inst., Troy, NY.

PHYLOGENETIC RELATIONSHIPS AMONG SUBSURFACE MICROORGANISMS

S. A. NIERZWICKI-BAUER 1991 10 p

(Contract DE-FG02-90ER-60989)

(DE92-004421; DOE/ER-60989/2) Avail: NTIS HC/MF A02

This project involves the development of group specific 16S ribosomal RNA-targeted oligonucleotide hybridization probes for the rapid detection of specific types of subsurface organisms (e.g., groups of microbes that share certain physiological traits). Major accomplishments for the period of 6/91 to 12/1/91 are described. Nine new probes have been synthesized on the basis of published 16S rRNA sequence data from the Ribosomal Database Project. We have initiated rapid screening of many of the subsurface microbial isolates obtained from the P24 borehole at the Savannah River Site. To date, we have screened approximately 50 percent of the isolates from P24. We have optimized our hybridization technique, and have developed a cell blot hybridization technique to screen 96 samples on a single blot. This is much faster than reading 96 individual slides. Preliminary experiments have been carried out which indicate specific nutrients can be used to amplify rRNA only in those organisms capable of metabolizing those nutrients. DOE

N92-18132# International Centre for Theoretical Physics, Trieste (Italy).

ON THE TRANSITION PERIOD FROM CHEMICAL TO BIOLOGICAL EVOLUTION

J. CHELA-FLORES Jun. 1991 11 p

(DE92-609049; IC-91/127) Avail: NTIS HC/MF A03

We discuss the consequences of the hypothesis that biological evolution was contemporary with an important event in chemical evolution, namely, the induction of a small chiral bias by the electroweak neutral interaction, amplified by the Salam enhancement factor, which we discuss in terms of familiar crystallographic terms. DOE

N92-18257# University of Southern Illinois, Springfield. School of Medicine.

THE EFFECTS OF EXERCISE ON PHARMACOKINETICS AND PHARMACODYNAMICS OF PHYSOSTIGMINE IN RATS Final Report, 16 Nov. 1987 - 15 Aug. 1990

S. M. SOMANI, P. BUCKENMEYER, M. DASILVA, S. N. DUBE,

and L. FITZPATRICK 15 Feb. 1991 148 p

(Contract DAMA17-88-C-8024)

(AD-A241867) Avail: NTIS HC/MF A07 CSCL 06/5

This report deals with the effect of acute and trained exercise on pharmacodynamics (cholinesterase activity), pharmacokinetics and biochemical parameters in the rat after physostigmine (Phy) administration. Dose-response studies of Phy and ChE inhibition *in vivo* indicated that a dose of 70 micrograms/kg of Phy inhibited about 30 percent of ChE activity in RBC. This dose was used throughout these exercise studies in consultation with USAMRDC. The oxygen consumption, respiratory exchange ratio (RER) and heat production showed a positive linear relationship in young and adult rats at different levels of exercise. However, significant differences were found in oxygen consumption and caloric

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expenditure in young vs. adult rats. Different levels of acute exercise affect the ChE activity in RBC and heart and alter the Phy-induced ChE activity in RBC and the brain. GRA

N92-18757# International Centre for Theoretical Physics, Trieste (Italy).

GLOBAL MODELS FOR THE BIOMECHANICS OF GREEN PLANTS, PART 2

A. R. BESTMAN Dec. 1990 8 p
(DE92-603590; IC-90/474-PT-2) Avail: NTIS HC/MF A02

This paper examines the situation when the flow is not fully developed while the aspect ratio may not be small. Even for the low Reynolds situation, the problem is now nonlinear. Analytical solutions for the problem are found by asymptotic approximation. The method makes use of finite Fourier cosine and sine transforms. These solutions are discussed quantitatively. DOE

N92-18758# International Centre for Theoretical Physics, Trieste (Italy).

GLOBAL MODELS FOR THE BIOMECHANICS OF GREEN PLANTS, PART 3

A. R. BESTMAN Dec. 1990 9 p
(DE92-603591; IC-90/475-PT-3) Avail: NTIS HC/MF A02

As a result of dehydration, there are daily changes in the stem diameter of green plants. This transient phenomenon is addressed in this paper. It is assumed that a small time perturbation is superimposed on an otherwise constant radius. By employing the Laplace transforms, analytical solutions are developed for this peculiar phenomenon. These results are discussed quantitatively. DOE

N92-18887# California Univ., Berkeley.

MECHANISMS OF ACTION OF HEAVY METALS AND ASBESTOS ON CULTURED ANIMAL CELLS: ADAPTATION, TRANSFORMATION AND PROGRESSION

H. RUBIN 1991 131 p

(Contract DE-AS03-79EV-10277)

(DE92-004101; DOE/EV-10277/T2) Avail: NTIS HC/MF A07

Living organisms are exposed to and affected by a variety of physical and chemical environmental factors. Among these are a number of chemical agents which seriously modify the normal functioning and growth of biological systems. The general purpose of this project was to determine some of the effects of several important chemicals on living cells and to investigate the molecular mechanisms whereby these external agents affected cellular structure, physiology, metabolism, and growth. Our focus was on several environmental constituents, including asbestos and the heavy metals cadmium, mercury, lead, and nickel, which gave both short-term and long-term effects on various organisms and consequently are of serious public health concern. DOE

N92-18974# Toronto Univ. (Ontario). Dept. of Mechanical Engineering.

BUBBLE NUCLEATION THRESHOLD IN DECOMPLEMENTED PLASMA

C. A. WARD, D. YEE, D. MCCULLOUGH, and W. D. FRASER (Defence and Civil Inst. of Environmental Medicine, North York, Ontario) *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 4 p Oct. 1991 Sponsored in part by Defence and Civil Inst. of Environmental Medicine, North York, Ontario

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Previous work has indicated that rabbits that are more susceptible to decompression sickness (DCS) are also more sensitive to complement activation by air bubbles, and that rabbits can be protected from DCS if they are pharmacologically decomplemented before they are subjected to the pressure profile. We have investigated a possible means by which decomplementing a rabbit could protect it from DCS. Since DCS is thought to be produced by bubbles that are formed in the tissues of an animal because of its tissues becoming oversaturated with dissolved gas as the animal undergoes a pressure profile, we have investigated

the possibility that decomplementing an animal protects it from DCS by making it more difficult to form bubbles in one of the tissues of primary concern, blood plasma. This investigation was performed with three test liquids: (1) water; (2) native rabbit plasma; and (3) decomplemented plasma. We find that the threshold for bubble nucleation in water is greater than that in either plasma or decomplemented plasma, but we do not find any difference between the nucleation threshold of the two types of plasma. Thus, the indications are that the protection from DCS that results from decomplementing a rabbit does not appear to develop because of a change in the nucleation threshold of the decomplemented plasma. Author

N92-18982# Air Force Systems Command, Brooks AFB, TX. Crew Technology Div.

HEMODYNAMIC RESPONSES TO PRESSURE BREATHING DURING +GZ (PBG) IN SWINE

J. W. BURNS, J. W. FANTON, and J. L. DESMOND *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 5 p Oct. 1991

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Twelve chronically instrumented, unanesthetized, miniature swine were used to investigate the hemodynamic interrelationships of positive pressure breathing at G (PBG), the anti-G straining maneuver (AGSM), and the G-suit, during gradual onset rate (GOR) and simulated aerial combat maneuver (SACM) +Gz profiles. Maximum left ventricular pressure (LVP) and aortic pressure (AP) of over 300 mmHg, and left ventricular end-diastolic pressure (LVEDP) and right ventricular end-diastolic pressure (RVEDP) of over 160 mmHg and 100 mmHg, respectively, were common during the GOR and SACM exposures at 9 +Gz using an extended coverage G-suit (ECGS). A concurrent, substantial increase in intrathoracic pressure attenuated transmural vascular pressures within the thorax. The performance of the ECGS was significantly better than the abdominal bladder G-suit (ABGS), with or without PBG. A PBG effect could not be demonstrated while using the ECGS, during either the GOR or SACM profiles. Author

N92-19636# Missouri Univ., Columbia.

EFFECTS OF LIQUID DESICCANTS ON AIRBORNE MICROORGANISMS: LABORATORY SET UP, PROCEDURE DEVELOPMENT, AND PRELIMINARY MEASUREMENTS Ph.D. Thesis

K. A. ROBERTSON-DEMERS Aug. 1991 100 p

(Contract DE-AC05-76OR-00033)

(DE92-004749; DOE/OR-00033/T454) Avail: NTIS HC/MF A05

Airborne microorganisms are present in all indoor environments including homes, office, schools, and hospitals. These organisms have been found to be responsible for many acute diseases, infections, and allergies. The direct consequences of illnesses and human discomfort is loss of productivity and increased medical costs. Therefore, the removal of these organisms from indoor environments is of great interest. One method that has great potential for removing airborne microorganisms is a liquid desiccant based air conditioning system for removing airborne microorganisms. Various liquid desiccants including lithium chloride, calcium chloride, and triethylene glycol have been reported to have several advantages such as air disinfectant properties, capability to control humidity and temperature, and removal of cell fragments as well as living cells. However, very few systematic studies are available in the literature. Therefore, this research had four objectives: (1) to carry out an extensive literature survey regarding sources of microorganisms, sampling methods, and present methods of removal; (2) to set up a microbiology laboratory and to develop an in vitro exposure procedure for the purpose of systematically studying effects of desiccants on airborne microorganisms; (3) to perform in vitro studies to assess desiccant effectiveness; and (4) to determine relative efficiencies of two airborne sampling devices. DOE

N92-19911# Corvallis Environmental Research Lab., OR.
TWO DIFFERENT APPROACHES FOR CONTROL AND MEASUREMENT OF PLANT FUNCTIONS IN CLOSED ENVIRONMENTAL CHAMBERS

C. MCFARLANE, T. PFLEEGER, H. D. PAYER, W. SCHMOLKE, and D. STRUBE (Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Munich, Germany, F.R.) 1991 21 p Submitted for publication (PB92-108067; EPA/600/D-91/231) Copyright Avail: NTIS HC/MF A03 CSCL 06/2

Two approaches are described for the control and measurement of plant functions in environmental chambers; one approach was developed at the US EPA Research Lab., and the other developed at the GSF (Research Center for Environment and Health) in Munich, Germany. Both labs needed experimental studies performed under a variety of physical and chemical conditions that can only be faithfully reproduced in the absence of environmental disturbances, typical of field and greenhouse studies. The different goals of each facility determined the different approaches to control and measurement. Both labs have many ideas that can be useful to researchers studying the interactions associated with plants (botany) and pollutants. Author

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AEROSPACE MEDICINE

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

A92-25251
PHYSIOLOGICAL-HYGIENIC ASPECTS OF INCREASING THE HEAT RESISTANCE IN HUMANS (REVIEW OF THE LITERATURE) [FIZIOLOGO-GIGIENICHESKIE ASPEKTY POVYSHENIIA TEPLOVOI USTOICHIVOSTI CHELOVEKA /OBZOR LITERATURY/]

V. P. KOVALENKO and V. V. SKORNIKOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Nov. 1991, p. 39-41. In Russian. refs Copyright

The paper reviews results of investigations of the effects of age, sex, the health condition and constitutional parameters, physical training, water consumption, and the degree of thermal adaptation of an individual on the ability of the human organism to maintain stable body temperature and work capacity. Special attention is given to the characteristics of age, physical condition, and health that should be taken into account when military personnel is selected for transfer into hot climate zones and to the measures designed to increase the heat resistance of these individuals. I.S.

A92-25252
FUNCTIONAL STATE OF THE CARDIOVASCULAR SYSTEM IN FIGHTER PILOTS WITH MITRAL VALVE PROLAPSE [FUNKTSIONAL'NOE SOSTOIANIE SERDECHNO-SOSUDISTOI SISTEMY PRI PROLAPSE MITRAL'NOGO Klapana U LETCHIKOV ISTREBITEL'NOI AVIATSII]

V. P. ZAKHAROV and A. V. KONDAKOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Nov. 1991, p. 44-47. In Russian. Copyright

The effect of mitral valve prolapse (MVP) on the functional state of the cardiovascular system in fighter and bomber pilots and on their capacity to fly at high Gz was investigated in 250 subjects with different sensitivities to gravitational centrifugal load. It was found that, out of 37 pilots with lowered tolerance to centrifugal load, 15 had MVP and that the frequency and the severity of arrhythmias in these subjects caused by +Gz overload depended on the number of prolapsed valves and the degree of prolapse. It is suggested that the absence of arrhythmia at rest and during submaximal physical exercise, and a satisfactory work capacity in pilots with MVP should not be used as indices of

good tolerance to +Gz above 6 Gz. It was found that the 2D echocardiogram represents the most effective method for diagnosing mild MVP without expressed mitral regurgitation. I.S.

A92-25253
TOLERANCE TO CHEST-TO-BACK (+GX) AND HEAD-TO-FEET (+GZ) OVERLOADS DURING DRUG-INDUCED HYPOHYDRATION [PERENOSIMOST' POPERECHNYKH /+GX/ I PRODOL'NYKH /+GZ/ PEREGRUZOK PRI FARMAKOLOGICHESKOI GIPOGIDRATATSII]

V. B. NOSKOV, V. IU. LUK'IANIUK, T. V. SOKOLOVA, and A. R. KOTOVSKAIA Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 4-6. In Russian. refs Copyright

The effect of hypohydration induced by intake of 40 mg furosemide on the tolerance to chest-to-back (+Gx) and head-to-feet (+Gz) acceleration was investigated in healthy humans subjected to rotation in a 7.5-m-arm centrifuge. The results of ECG examinations, ear pulsograms, measurements of pressure in the arm and the ear-lobe vessels, and pneumograms performed during the centrifugation period showed that, after the intake of diuretic, the (+Gx) tolerance remained essentially unchanged, while the (+Gz) tolerance was good but required greater efforts. I.S.

A92-25254
RESPONSES OF THE REGIONAL VESSEL TONUS TO THE EFFECTS OF ORTHOSTATIC AND GRAVITATIONAL LOADS [REAKTSII REGIONARNOGO SOSUDISTOGO TONUSA PRI DEISTVII ORTOSTATICHESKOI I GRAVITATSIONNOI NAGRUZOK]

R. A. VARTBARONOV and E. V. BARANOVA Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 6-8. In Russian. refs Copyright

The effects of active orthostasis and +Gz acceleration (to 5, 7, and 9 G for 30 sec at an onset rate of 1.0 G/sec in the horizontal and vertical position) on the tonus of the middle-finger vessels were investigated in six human subjects. The arterial pulse and the degree of the venous blood filling of the finger vessels were measured by photoplethysmography, when the sensor was at three different points, adjusted by raising or lowering the arm: at the level of the right atrium, and at 41 cm above and below this level. It was found that increases of the intravascular hydrostatic pressure caused decreases of the arterial pulse (i.e., increases of arterial tonus) and increases in the degree of the venous blood filling, particularly, in the horizontal position. I.S.

A92-25255
SOME CHARACTERISTICS OF HUMORAL IMMUNITY AND NONSPECIFIC RESISTANCE IN PILOTS [NEKOTORYE OSOBNOSTI GUMORAL'NOGO IMMUNITETA I NESPETSIFICHESKOI REZISTENTNOSTI Y LETCHIKOV]

A. A. BOCHENKOV, V. S. SMIRNOV, and V. V. GORANCHUK Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 8-10. In Russian. refs Copyright

The responses of the human immune system to adverse effects of an air flight (such as emotional stress, hypoxia, noise, and vibration) were investigated in 134 pilots between the ages of 22 and 42. Compared with healthy control subjects, the pilots were found to exhibit a significant decline in the levels of IgA, IgM, IgG, C3, alpha-antitrypsin, and R-proteins. Correlation analysis of over 100 anthropometric, psychophysiological, and immune parameters, together with data from a questionnaire, were used to develop mathematical models to analyze the relationship between the personality features and humoral immunity of pilots. It is shown that, as the emotional strain increases, the emotional stability decreases and the levels of immunoglobulins decline. I.S.

A92-25256

GLYCEMIA AS A RISK FACTOR OF REDUCED TOLERANCE TO HYPOXIC HYPOXIA IN FLIGHT PERSONNEL [GLIKEMIIA KAK FAKTOR RISKА PONIZHENNOI PERENOSIMOSTI GIPOKSICHESKOI GIPOKSII U LETNOGO SOSTAVA]

A. P. IVANCHIKOV, V. N. DENISOV, V. M. MERKULOV, and T. L. KURAEVA Kosmicheskaiа Biologiа i Aviakosmicheskaiа Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 10-12. In Russian. refs

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The effect of increased levels of glycemia in pilots on the level of tolerance to hypoxia in flight (at the altitude of 5000-m simulated in a pressure chamber) was investigated in 61 human subjects 22-50 years of age. Results showed that all subjects could be grouped according to their response to hypoxia among three types: (1) no change (15.79 percent), (2) hypoglycemia (49.12 percent), and (3) hyperglycemia (35.09 percent). The subjects with low glycemic levels typically exhibited a low resistance to hypoxia. It is suggested that these three types of glycemic responses to hypoxia reflect three major pathways of biochemical adaptation of the body. I.S.

A92-25257

CHANGES IN THE ERYTHROCYTE MEMBRANES AND OF NA(+), K(+)-ATPASE IN PARTICIPANTS OF THE CANADIAN-SOVIET TRANS-ARCTIC SKI TREK [IZMENENIE STRUKTURNY MEMBRAN ERITROTSITOV I AKTIVNOSTI NA+/+, K/+/-ATFAZY U UCHASTNIKOV SOVETSKO-KANADSKOGO TRANSARKTICHESKOGO LYZHNOGO PEREKHODA]

L. E. PANIN, V. G. KUNITSYN, and M. F. NEKRASOVA Kosmicheskaiа Biologiа i Aviakosmicheskaiа Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 12-15. In Russian. refs

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The effect of the extreme conditions of a long-distance trans-Arctic ski trek on the characteristics of the erythrocyte membranes and the activity of Na(+), K(+)-ATPase was investigated in the 13 participants of the 1988 Canadian-USSR ski passage that started at Dikson village (USSR) and ended in Ottawa (Canada) via the North Pole. The results of examinations revealed changes in the rheological properties of the erythrocyte membranes and their electric conductivity as a function of temperature. During the progress of the ski trek, the activity of Na(+), K(+)-ATPase of the erythrocyte membranes decreased, with the decrease correlating with structural changes observed in the membranes. I.S.

A92-25258

FUNCTIONAL PROPERTIES OF BLOOD PROTEINS IN HIGHLY TRAINED ATHLETES [K VOPROSU O FUNKTSIONAL'NYKH SVOISTVAKH BELKOV KROVI U VYSOKOTRENIROVANNYKH SPORTSMENOV]

N. V. TOLKACHEVA, S. V. KONOSHENKO, M. M. LEVACHEV, F. A. MEDVEDEV, V. L. LUPINOVICH, and O. V. NIKOLENKO Kosmicheskaiа Biologiа i Aviakosmicheskaiа Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 15-17. In Russian. refs

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The effect of intense physical exercise on the binding capacity of lipids and oxidized lipids of the human blood albumin was investigated by analyzing the constituents of albumin preparations from the blood serum of trained athletes (three bicycle racers) and of healthy control subjects. Results indicate that the adaptation to regular strenuous exercise leads to increases in the metabolism of omega-3 fatty acids and in the content of albumin-bound products of lipid oxidation. In addition, the hemoglobin affinity for molecular oxygen decreases and the ATP concentration in red blood cells increases. I.S.

A92-25260

ROLE OF EXTERNAL RESPIRATION IN THE FORMATION OF THE AUTONOMIC COMPONENT OF MOTION SICKNESS [O ROLI VNESHNEGO DYKHANIIA V FORMIROVANII VEGETATIVNOGO KOMPONENTA BOLEZNI DVIZHENIIA]

V. M. BARANOV, M. A. TIKHONOV, E. I. MATSNEV, M. IU. VOLKOV, A. S. MARKIN, and K. S. KHAIDAKOV Kosmicheskaiа Biologiа i Aviakosmicheskaiа Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 20-24. In Russian. refs

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Changes in the respiration pattern and in the parameters of gas exchange, gas content, and acid-base equilibrium due to the development of motion sickness were measured in 22 human subjects with different motion-sickness susceptibilities, who were placed into head-down position (-8 deg) and rocked in parallel swings for 120 min. It was found that subjects susceptible to motion sickness developed signs of hyperventilation concomitant with alveolar-arterial hypocapnia and respiratory alkalosis. It was also found that the use of a hypercapnic atmosphere (4 percent CO₂, 96 percent air) eliminated these changes in gas-composition and acid-base equilibrium in the blood and, in 70 percent subjects, alleviated vestibular symptoms of motion sickness and increased the time before the onset of motion sickness. I.S.

A92-25263

VARIATIONS IN THE PROSTAGLANDIN CONTENT AND IN SOME PARAMETERS OF LIPID METABOLISM IN HUMANS UNDER CONDITIONS OF PROLONGED HYPOKINESIA [DINAMIKA SODERZHANIIA PROSTAGLANDINOV I NEKOTORYKH POKAZATELEI LIPIDNOGO OBMENA U CHELOVEKA V USLOVIAKH DLITEL'NOI GIPOKINEZII]

V. P. NAIDINA, I. P. LARINA, E. E. ZHARKOVSKAIA, and IU. V. SUKHANOV Kosmicheskaiа Biologiа i Aviakosmicheskaiа Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 33-36. In Russian. refs

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The effectiveness of periodic exercise to counteract the effects of long-term hypokinesia (370-day-long bed rest with -5 deg head-down tilt) on the contents of prostaglandins PGE and PGE(2a) and of fatty acids in serum and erythrocyte membranes was investigated in subjects of two groups. Group A subjects exercised from the beginning of the bed-rest period, while Group B subjects began exercising only on the 120th day. Results show that, by the end of the 50th day, subjects of both groups exhibited decreased contents of lipids in the blood and the erythrocyte membranes, mainly due to decreases in polyunsaturated fatty acids. However, the fatty acid levels returned to normal or above. The levels of prostaglandins measured at day 50 were somewhat above the control level but by day 170 the prostaglandin levels decreased drastically and remained low, indicating serious changes in the lipid metabolism at a cellular level. I.S.

A92-25264

EMERGENCY DEPOSITION OF CALCIUM BY PLASMA AND NONPLASMA BUFFER SYSTEMS - THE EFFECT OF LONG-TERM HYPOKINESIA [REAKTSIIA SROCHNOGO DEPONIROVANIIA KAL'TSIIA PLAZMENNYMI I VNEPLAZMENNYMI BUFERNYMI SISTEMAMI - VLIANIE USLOVII DLITEL'NOI GIPOKINEZII]

I. M. LARINA, T. M. SMIRNOVA, and IU. V. SUKHANOV Kosmicheskaiа Biologiа i Aviakosmicheskaiа Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 36-41. In Russian. refs

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The effect of 100-day-long bed rest with -6-deg head-down tilt on the parameters of Ca-binding and -mobilizing systems in humans was investigated by monitoring mineral compositions of urine and blood and by measuring blood concentrations of protein, Ca(2+), parathyroid hormone, and calcitonin in subjects who were injected with solutions of calcium gluconate. Results showed that long-term hypokinesia caused decreases of the calcium-binding capacity of the nonplasma pool, changes in the kinetic characteristics of the Ca-binding reaction, and increases in the responses of mineralotrophic hormones to induced hypercalcemia. I.S.

A92-25266

THE INFORMATION CONTENT OF SOME HORMONAL INDICES AND CYCLIC NUCLEOTIDES IN THE ESTIMATION AND PREDICTION OF RESISTANCE TO THE EFFECT OF ACUTE HYPOXIA IN OPERATORS [INFORMATIVNOST' NEKOTORYKH GORMONAL'NYKH POKAZATELEI I TSIKLICHESKIKH NUKLEOTIDOV V OTSENKE I PROGNOZE USTOICHIVOSTI K VOZDEISTVIU OSTROI GIPOKSII PRI OPERATORSKOI DEIATEL'NOSTI]

I. P. BOBROVNITSKII, T. V. PETROVA, I. P. IAKOVLEVA, and S. V. KALINKIN *Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina* (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 43-46. In Russian. refs

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Results are presented from a study in which 16 healthy human subjects 25 to 40 years of age were asked to perform physical exercise under conditions of acute hypoxia (9-12 percent O₂), and the levels of insulin, cortisol, and cyclic nucleotides in these subjects were measured in order to determine the value of these quantities for estimating tolerance to acute hypoxia. Results show that acute hypoxia caused increases of cortisol, insulin, somatotropin, epinephrine, norepinephrine, and cAMP in the urine, as well as increases of cAMP in lymphocytes and blood plasma. It was found that subjects with higher levels of plasma insulin and urine catecholamines exhibited better tolerance to hypoxia. The ability to better tolerate acute hypoxia was combined with a higher activity of the sympathoadrenal system, and increases of cortisol and cAMP in lymphocytes. I.S.

A92-25274

NIGHT-SLEEP PATTERN AND THE SUSCEPTIBILITY TO MOTION SICKNESS [STRUKTURA NOCHNOGO SNA I PREDRASPOLOZHENNOST' K BOLEZNI DVIZHENIIA]

S. N. LIPOVENKO *Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina* (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 61. In Russian. refs

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The relation between motion-sickness susceptibility and the pattern of the night sleep in healthy humans was investigated by comparing polygraphic data of night sleep obtained (together with EEGs, electromyograms, electrooculograms, heart rate measurements, and records of cutaneous galvanic reflex) on three groups of subjects with different motion-sickness susceptibilities, before and after exposures to vestibular stimuli. It is shown that subjects with the lowest motion-sickness susceptibility (i.e., the most stable vestibulovegetative system) exhibited the highest stability of the somnogenic mechanisms. I.S.

A92-25401

HYPERVENTILATION [GIPERVENTILIATSIIA]

VIKTOR B. MALKIN and ELENA P. GORA *Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Vol. 70), 1990, 184 p. In Russian. refs*

(ISBN 5-02-005854-8) Copyright

The book reviews work on the effect of hyperventilation on the physiological functions of the human organism. Results are presented on the use of voluntary hyperventilation of various intensities for studies of the effects of age, sex, and individual characteristics on the responses to hyperventilation of the cardiorespiratory, cardiovascular, and central nervous systems. Special attention is given to the occurrence of involuntary hyperventilation as a means of adaptation to hypoxia and to the use of controlled voluntary hyperventilation to counteract the effects of altitude hypoxia. I.S.

A92-25956

USE OF AIR TRANSPORT IN DELIVERING MEDICAL HELP TO VICTIMS IN THE AREA OF AN EARTHQUAKE EPICENTER [ISPOL'ZOVANIE AVIATSIONNOGO TRANSPORTA PRI OKAZANII MEDITSINSKOI POMOSHCHI POSTRAZDAVSHIM V OCHAGE ZEMLETRIASENIIA]

S. A. BUGROV, V. V. LITOVCHENKO, and V. N. GOLOVCHITS

Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Sept. 1991, p. 54-57. In Russian.

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The paper presents a report on the activity of military aviation (large military transport aircraft and helicopters) in the aftermath of the December 1988 earthquake in Armenia. The efficiency of aircraft-related operations in delivering first aid and evacuating wounded victims is demonstrated and causes of the deficiencies that occurred in the course of these activities are analyzed. These activities encompassed three stages: (1) the determination of the degree of destruction and on-the-spot first aid and evacuation (Dec. 7-8); (2) planned evacuation of victims (Dec. 9-12); and (3) activities directed toward ameliorating the consequences of the earthquake (Dec. 13-20). I.S.

A92-25957

BIORHYTHMICITY IN DECOMPRESSION SICKNESS [BIORITMOLOGICHESKIE ASPEKTY ZABOLEVAEMOSTI DEKOMPRESSIONNOI BOLEZNIU]

I. A. POGORELOV, E. G. SHIMANOVICH, A. I. CHERNENKO, and A. N. ANTROPOV *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), Sept. 1991, p. 57-59. In Russian. refs

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The circadian and seasonal rhythms in the rate of occurrence of decompression sickness (DS) were investigated using data collected in the course of 17 years on young (19-23 yr old) divers operating in the Barents Sea at depths between 40 and 180 m. Results are presented showing that the rate of DS occurrence was higher in the period between midnight and noon than in the following 12 hours, reflecting the generally unfavorable effect of work during night hours on the physiological condition of the human body. The greatest numbers of DS cases occurred during the months of seasonal weather changes (March and September-November), when the human organism is adapting to new conditions. It is suggested that divers working at the most unfavorable periods should be afforded longer periods of decompression and with an increased content of atmospheric oxygen and should undergo stricter health-control procedures than at other times. I.S.

A92-26004

EXTERNAL RESPIRATION AND GAS EXCHANGE DURING SPACE FLIGHTS [VNESHNEE DYKHANIE I GAZOZHMEN V KOSMICHESKIKH POLETAKH]

V. M. BARANOV, M. A. TIKHONOV, N. M. ASIAMOLOVA, M. I. VOLKOV, A. N. KOTOV, G. E. SAVCHENKO, and K. S. KHAIDAKOV *Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina* (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 4-8. In Russian. refs

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Using results obtained in earlier space flights and simulated flight studies, the effects of microgravity, acceleration, and changes in the composition and pressure of the spacecraft-cabin and the space suit atmospheres on the parameters of the respiratory function of humans are examined. It is shown that the effects include changes in the respiration biomechanics, the gas-diffusion and ventilation-perfusion ratios in lungs, the regulation of respiration and of respiratory muscles, the degrees of the hydration and blood filling of lungs, and the acid-base equilibrium and blood gases. In addition, a combination of these effects may cause functional and morphological changes in the lung tissue. I.S.

A92-26006

HEMATOLOGIC INDICES IN COSMONAUTS DURING A SPACE FLIGHT [GEMATOLOGICHESKIE POKAZATELI U KOSMONAVTOV V USLOVIAKH KOSMICHESKOGO POLETA]

M. P. KALANDAROVA, V. V. POLIAKOV, I. B. GONCHAROV, and L. I. TIKHONOVA *Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina* (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 11-14. In Russian. refs

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The effect of space flight on hematologic indices of the space crew was investigated in crew members of the third and the fourth

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prime crew flights (EO-3 and EO-4). It was found that hematological parameters in the subjects were not affected by the space flight, indicating the intactness of the blood regeneration system during these periods. However, some changes were recorded in the numbers of neutrophils, myelocytes, and lymphocytes; also observed were erythrocytic hypochromia and anisocytosis. A comparison of the results of preflight and postflight bone-marrow examinations revealed slight increases in lymphocytosis, monocytosis, and plasma-cell counts as a result of space flight.

I.S.

A92-26009

EXTERNAL RESPIRATION AND GAS EXCHANGE IN HUMANS UNDERGOING SIMULATED DIVING AT 350 M [VNESHNEE DYKHANIE I GAZOOBMEN CHELOVEKA PRI IMITIROVANNYKH POGRUZHENIYAKH NA 350 M]

A. V. SUVOROV, A. E. MIKHENKO, and V. V. ISAENKO
Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 21-23. In Russian. refs
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The effect of deep-sea diving on the external respiration and gas exchange of humans was investigated in subjects staying for up to 21 days in a barochamber at about 3.5 MPa. The external respiration and gas exchange characteristics were measured under conditions of rest and maximum physical load. It was found that, at rest, the basic respiratory parameters remained unchanged but the respiratory reserves decreased under the effect of increased gas density. Exposures to maximum work load led to the retention of CO₂ and, consequently, to the inability to continue physical work. The exposure to 3.5 MPa caused significant respiratory changes in the first three days, followed by considerable normalization and constancy during the rest of the exposure.

I.S.

A92-26010

THE DEVELOPMENT OF DECOMPRESSION REGIMENS FOR EXCURSION DIVES USING DATA FROM PROLONGED EXPOSURES TO 21 ATA [RAZRABOTKA REZHIMOV DEKOMPRESSII DLIYA EKSKURSIONNYKH SPUSKOV IZ USLOVII DLITEL'NOGO PREBYVANIYA POD DAVLENIEM DO 21 ATA]

S. V. RODCHENKOV, I. P. POLESHCHUK, V. K. SKUDIN, and A. I. DMITRUK
Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 23-27. In Russian. refs
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A92-26011

METABOLIC CHANGES DURING HYPERBARIC OXYGENATION [IZMENENIE OBMENA VESHCHESTV PRI GIPERBARICHESKOI OKSIGENATSII]

L. G. MEDVEDEV, V. I. KULESHOV, and S. B. SHEVCHENKO
Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 27-30. In Russian. refs
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The effect of high partial O₂ pressure on human metabolism was investigated in 12 subjects exposed to compressed-oxygen atmosphere (pO₂ = 0.25 MPa) for up to 90 min, by measuring the activity of enzymes of carbohydrate and protein metabolism and the levels of electrolytes in subjects' blood before and after the exposure. The results obtained were interpreted as demonstrations of a toxic effect of oxygen on the metabolism. It was also found that the optimal exposure times were different for different individuals.

I.S.

A92-26013

FUNCTIONAL CHANGES IN THE CARDIOVASCULAR SYSTEM AND THEIR PHARMACOLOGICAL CORRECTION DURING IMMERSION IN A DIVING SUIT [FUNKTSIONAL'NIE IZMENENIYA SERDECHNO-SOSUDISTOI SISTEMY I IKH FARMAKOLOGICHESKAYA KORREKTSIYA V USLOVIIYAKH KOSTIUMNOI IMMERSII]

V. S. SHASHKOV, N. G. LAKOTA, A. I. U. MODIN, and S. L.

IL'INA
Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 33-36. In Russian. refs

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The effect of prolonged immersion in water of human subjects wearing a diving suit on the parameters of the cardiovascular system was investigated in 39 men subjected to immersion for periods from 3 hrs to 3 days. Data were obtained on circulation responses to the upright and supine body positions during immersion as well as on the exercise tolerance after immersion. Results of clinical observations and instrumented measurements showed that the cardiovascular effects of immersion were similar to those caused by hypogravity. No difference was found between the vertical and horizontal variants. It is suggested that immersion is a better model for simulating hypogravity than some currently used procedures. It was found that the administration of sydnocarb, sydnogluton, sydstrigluton, and estrigluton preparations were all effective in promoting cardiovascular correction.

I.S.

A92-26014

SOME CHARACTERISTICS OF THE MOTOR FUNCTION OF DIGESTIVE ORGANS IN HUMANS WITH DIFFERENT SUSCEPTIBILITIES TO MOTION SICKNESS [NEKOTORYE OSOBENOSTI MOTORNOI FUNKTSII ORGANOV PISHCHEVARENIIA U LITS S RAZLICHNOI STEPEN'IU REZISTENTNOSTI K BOLEZNI DVIZHENIYA]

B. V. AFONIN, V. A. ROGOV, L. G. RUVINOVA, B. I. POLIAKOV, and S. L. INOZEMTSEV
Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 36-39. In Russian. refs
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The effect of three exposures to Coriolis acceleration on the frequency and amplitude of contractions by the fasting stomach was investigated in 22 subjects, six of whom were resistant to motion-sickness while 16 were susceptible. All subjects underwent gastroduodenoscopy after tests and four subjects in each group were also subjected to echography to measure the gall bladder contractility in response to glucose-milk loads. It was found that, in resistant subjects, the motor activity of the stomach increased slightly, while in the susceptible group the motor activity was inhibited. Ultrasonic gall bladder examinations showed that susceptible subjects developed a faster and stronger gall bladder contraction than did the resistant subjects, indicating a more prolonged duration of the gall excretion phase in susceptible subjects.

I.S.

A92-26015

NUCLEASE ACTIVITY OF MICROORGANISMS AND THE PROBLEM OF MONITORING THE STATE OF AUTOMICROFLORA IN OPERATORS IN HERMETICALLY SEALED ENVIRONMENTS [NUKLEAZNAIA AKTIVNOST' MIKROORGANIZMOV I PROBLEMA KONTROLIA ZA SOSTOIANIEM AUTOMIKROFLORY OPERATOROV GERMETICHNO ZAMKNUTYKH OB'EKTOV]

N. A. POLIKARPOV, A. N. VIKTOROV, and A. F. KHALANGOT
Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 39-42. In Russian. refs
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The safety, with respect to microbial infections, of operators working in hermetically sealed environments such as space vehicles and underwater chambers was considered by investigating the DNA and/or RNA activities of microbial pathogens (Shigella, Salmonella, and Staphylococcus aureus) and potential microbial pathogens in three groups of subjects: (1) clinically healthy subjects with normal microflora, (2) somatic patients with intestinal dysbacteriosis, and (3) patients with acute intestinal diseases. Results of microscopic examinations and of nuclease assays of samples from these subjects showed that the critical size of depolymerization zones of nucleic acids in the gel media were significantly different for normal and for potentially pathogenic intestinal microorganisms.

I.S.

A92-26017

THE CHARACTERISTICS OF PROLACTIN SECRETION IN RESPONSE TO DIFFERENT DEGREES OF VESTIBULAR-ANALYZER LESIONS [OSOBENOSTI SEKRETSII PROLAKTINA PRI RAZLICHNYKH UROVNIAMH PORAZHENIYA VESTIBULIATORNOGO ANALIZATORA]

N. V. BOIKO, T. S. KOLMAKOVA, E. N. NESTERENKO, and F. IA. GROISBERG *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina* (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 46-48. In Russian. refs

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Changes in the prolactin secretion in response to lesions in the vestibular analyzer were measured in patients that were in the middle of a vestibular-dysfunction crisis or during the period of compensation, and the results were compared with clinical symptoms and the levels of the vestibular problem. It was found that patients with acute vestibular disorders and with central vestibular-analyzer lesions exhibited above-normal levels of blood prolactin, which were significantly higher than in patients with peripheral vestibular syndrome at the compensation stage. It is suggested that hyperprolactinemia during central vestibular dysfunction is a manifestation of a dopamine deficiency in the tuberoinfundibular region. I.S.

A92-26018

ASSESSMENT OF THE HEALTH STATUS AND THE CHARACTERISTICS OF METABOLISM IN COSMONAUTS DURING A PROLONGED SPACE FLIGHT [OTSENKA SOSTOYANIYA ZDOROV'YA I OSOBENOSTEI OBMENA VESHCHESTV U KOSMONAVTOV V USLOVIYAKH DLITEL'NOGO KOSMICHESKOGO POLETA]

A. I. GRIGOR'EV, V. V. POLIAKOV, V. B. NOSKOV, and V. I. KOZHARINOV *Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina* (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 48, 49. In Russian. refs

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The effect of a long-term (up to 200 days) space flight on the biochemical indices of cosmonauts' blood was investigated using minute quantities of blood drawn from the finger tip of the subjects and analysis by means of special diagnostic strips and an instrumental system (Reflotron) that was adopted to the conditions of space flight. The results of microanalyses were correlated and were used to assess the conditions of metabolism and to make diagnoses of metabolic abnormalities in the myocardium, liver, pancreas, and other organs. I.S.

A92-26329

PHASIC SKIN CONDUCTANCE ACTIVITY AND MOTION SICKNESS

JOHN F. GOLDING (RAF, Institute of Aviation Medicine, Farnborough, England) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 63, March 1992, p. 165-171. refs

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The relationship between sweating and motion sickness is investigated with attention given to the differences associated with two measuring sites and two methods of signal analysis. Subjects undergo either cross-coupled motion challenge, vertical/horizontal sinusoidal linear motion, or simple head movements. The two recording sites tested are the palmar finger and the forehead; the signal-analysis techniques include the tonic skin-conductance level (SCL) and the phasic skin-conductance responses (SCRs). Additionally three subjects are examined in terms of sweating responses by means of mass spectrometry for skin water vapor with the N₂ gas-flow method. The results indicate that phasic SCRs measured at the forehead correlate better with the motion sickness onset and recovery than SCRs relating to palmar finger data and better than any tonic SCL methods. C.C.S.

A92-26331

G-ENDURANCE DURING HEAT STRESS AND BALANCED PRESSURE BREATHING

U. I. BALLDIN and J. SIEGBORN (National Defence Research

Establishment, Div. of Aviation Medicine, Linkoping, Sweden) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 63, March 1992, p. 177-180. refs

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The effect of heat stress and balanced pressure breathing during G (PGB) on G-endurance was investigated. Ten fighter pilots wearing anti-G-suits with increased bladder coverage were warmed to 38.2 C and exposed to 15-s periods at 4.5 and 7 G in a heated human centrifuge gondola until exhaustion during PGB and normal breathing (NB). During both NB and PGB, the rectal temperature rose to a mean of 38.3 C, and the dehydration was about 1.2 kg. With NB the endurance was a mean of 254 s, while it was 300 s with PGB (n.s.). Oxygen saturation and ratings of perceived exertion were mainly unchanged, while the maximum heart rate decreased by a mean of 13 bpm during PGB. In conclusion, the G-endurance was not deteriorated with PGB, in comparison with NB, during heat stress. In conjunction with experiences from other studies, however, it emphasizes the importance of avoiding heat stress and dehydration during G-loads, even with PGB. Author

A92-26335

DECOMPRESSION SICKNESS - AN INCREASING RISK FOR THE PRIVATE PILOT

WILLIAM R. BLACK and ROY L. DEHART (Oklahoma, University, Oklahoma City) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 63, March 1992, p. 200-202. refs

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Decompression sickness is not an appreciated hazard among the private pilot community. This is of growing concern with the increasing number of nonpressurized aircraft capable of flying to altitudes in excess of 5468 m (18,000 ft). A case report is presented of a 42-year-old pilot who apparently experienced decompression sickness at flight level 250 which went unrecognized until several months after the incident. Author

A92-26336

ALTITUDE-INDUCED ARTERIAL GAS EMBOLISM - A CASE REPORT

FREDERICK W. RUDGE (USAF, School of Aerospace Medicine, Brooks AFB, TX) *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), vol. 63, March 1992, p. 203-205. refs

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Following a rapid decompression in an altitude chamber for routine training purposes, a 38-year-old altitude chamber technician developed rapid onset of mental dullness, right arm weakness, and sensory deficits. Immediate treatment with compression therapy in a hyperbaric chamber resulted in complete resolution. Ambient pressure changes great enough to result in arterial air embolism due to an explosive or rapid decompression have been described as a potential hazard in aviation, although no actual cases of such a phenomenon have been previously reported. The aeromedical considerations of this complication are discussed. Author

A92-26700

CLINICAL AVIATION MEDICINE (2ND REVISED AND ENLARGED EDITION)

RUSSELL B. RAYMAN (Lockheed Engineering and Sciences Co., Washington, DC) Philadelphia, PA, Lea & Febiger, 1990, 208 p. refs

(ISBN 0-8121-1248-2) Copyright

The book focuses on the application of clinical medicine in the field of aviation medicine. The diseases commonly encountered by a flight surgeon are discussed with special attention given to the conditions and their treatments which are of particular significance to a pilot. Topics discussed include internal medicine, orthopedics, neurology, ophthalmology, otolaryngology, cardiology, genitourinary diseases, dermatology, psychiatry, and oncology. The signs, the symptoms, the modes of treatment, and the prognoses of the diseases encountered in these fields are described, and their special significance for the flying ability of the pilot is

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emphasized. Particular consideration is given to the side effects of commonly prescribed medications, particularly with respect to effects on the flying ability. I.S.

A92-27498

ESTIMATING THE ORGANISM'S NONSPECIFIC RESISTANCE FROM INDIVIDUAL REACTION TO HYPOXIC TESTING [OTSENKA NESPETSIFICHESKOI REZISTENTNOSTI ORGANIZMA PO INDIVIDUAL'NOI REAKTSII NA TESTIRUIUSHCHEE GIPOKSICHESKOE VOZDEISTVIE]

IU. V. BUSHOV, A. P. PISANKO, F. V. OS'MININ, K. T. PROTASOV, and A. F. ERSHOV (NII Biologii i Biofiziki, Tomsk, Russia) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, Nov.-Dec. 1991, p. 59-65. In Russian. refs
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The individual differences in the nonspecific reactions of humans to hypoxic tests were investigated in experiments where subjects were mountain climbers and healthy controls subjected to hypoxic tests (HTs) that included simulated ascents to 3.5 km in combination with physical exercise and orthostatic and breathing tests. The results revealed three types of individual reactions to HTs and, in particular, the existence of a sthenic type of organism, characterized by insignificant decreases of work capacity due to moderate hypoxia. A quick method is proposed for estimating nonspecific resistance of humans from individual reactions to HTs. I.S.

A92-27499

THE EFFECT OF THE METABOLIC PREPARATION RIKAVIT ON THE PROCESS OF HUMAN ADAPTATION TO HIGH ALTITUDES [VLIANIE METABOLICHESKOGO PREPARATA RIKAVITA NA PROTSESS ADAPTATSII CHELOVEKA K GORNOI MESTNOSTI]

T. V. SEREBROVSKAIA, A. A. IVASHKEVICH, M. M. SEREDENKO, P. V. BELOSHITSKII, I. I. SAKHARCHUK, G. T. DENISENKO, and A. N. PISHCHALENKO (AN Ukrainy, Institut Fiziologii, Kiev, Ukraine) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, Nov.-Dec. 1991, p. 73-80. In Russian. refs
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The effect of Rikavit (which contains 0.1 g riboxine, 0.05 g KCl, 0.1 g glutamic acid, 0.02 g ascorbic acid, 0.01 g nicotinamide, 0.002 g riboflavin, and 0.002 g pyridoxine) on the adaptation of humans to altitude hypoxia was investigated in mountain skiers lodging at a 2100 m altitude for 10 days and skiing at an altitude of 4200 m. It was found that oral administration of Rikavit resulted in increases of oxygen supply to body tissues, in improved efficiencies of the respiratory and cardiovascular systems, and in higher efficiency of oxidation in body tissues. The extents and the type of the observed changes varied depending on the metabolism of individual subjects. I.S.

A92-27500

DYNAMICS OF COMPETING INTERACTION BETWEEN VERBAL AND MANUAL ACTIVITIES DURING ADAPTATION AND READAPTATION AFTER TRANSMERIDIONAL FLIGHT [DINAMIKA KONKURENTNOGO VZAIMODEISTVIA VERBAL'NOI I MANUAL'NOI DEIATEL'NOSTI PRI ADAPTATSII I READAPTATSII POSLE TRANSMERIDIONAL'NOGO PERELETA]

N. V. VOL'F (AMN SSSR, Institut Fiziologii, Novosibirsk, USSR) Fiziologiya Cheloveka (ISSN 0131-1646), vol. 17, Nov.-Dec. 1991, p. 142-146. In Russian. refs
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The effects of adaptation and readaptation to quick transmeridional relocations on the characteristics of mutual interference during concurrent verbal and manual activities were investigated in right-handed male subjects flown from Novosibirsk to the East Coast (Reineke Island) and, after 20 days on the coast, back to Novosibirsk. To test for changes in concurrent verbal and manual activities, subjects were tested using a concurrent verbal-manual test (Ianson and Keng, 1983) in the beginning of the experiment, 2-5 days and 20 days following the first flight, and 2-5 days after the return to Novosibirsk. Results

show that the first periods of adaptation and readaptation were characterized by lowered asymmetry of the interference effect of the verbal load on the speed of tapping by the right and the left hands. After the flight in the eastern direction, subjects displayed a weaker interference of the left cerebral hemisphere in the morning hours and stronger interference in the right hemisphere in the evening. I.S.

A92-27504

ANALYSIS OF THE STAGES OF THE NIGHT SLEEP OF HUMAN SUBJECTS FROM THE STANDPOINT OF THE FUNCTIONAL QUANTIZATION OF THE VITAL ACTIVITY [ANALIZ ORGANIZATSII NOCHNOGO SNA CHELOVEKA S POZITSII FUNKTSIONAL'NOGO KVANTOVANIIA ZHIZNEDEIATEL'NOSTI]

IU. E. VAGIN and S. I. POSOKHOV (Moskovskaia Meditsinskaia Akademiia, Moscow, Russia) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 321, no. 5, 1991, p. 1115-1120. In Russian. refs
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The hierarchical structure of the night sleep of human subjects is examined in the light of the hypothesis of the system quantization of the physiological functions of the human organism. It is suggested, in particular, that sleep can be treated as a continuum of Delta and R sleep quanta whose function is to satisfy the information and psychic needs of the human brain. A mathematical analysis of the sleep stages in these terms indicates that the need for the Delta and R stages is satisfied alternatively and fractionally. V.L.

A92-27629

THE PRIMARY-REACTION SYNDROME CAUSED BY A RADIATION EXPOSURE (REVIEW OF THE LITERATURE) [SINDROM PERVICHNOI REAKTSII NA OBLUCHENIE /OBZOR LITERATURY/]

V. I. LEGEZA Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Oct. 1991, p. 20-22. In Russian. refs
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Recent data are presented that support the modern concepts of the pathophysiological and neurochemical mechanisms of the primary reactions to irradiation at the level of a nuclear explosion. Special attention is given to a review of research conducted on the search for pharmacological means for preventing and/or alleviating the primary-reaction syndrome. I.S.

A92-27630

THE CHARACTERISTICS OF PHYSIOLOGICAL REACTIONS OF AN ORGANISM DURING THE GENERATION OF MUSCULAR EFFORT NEEDED TO OPERATE CONTROL PEDALS [OSOBENNOSTI FIZIOLGICHESKIKH REAKTSII ORGANIZMA PRI SOZDANII MYSHECHNYKH USILII NA PEDALIAKH UPRAVLENIIA]

V. V. BELIKOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Oct. 1991, p. 50, 51. In Russian. refs
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The capacity of a fighter pilot for maintaining, during high-G loads, a certain level of muscular effort needed to operate control pedals is investigated, with special attention given to the physiological reactions caused by the effort. In experiments, subjects were tied to the back of aircraft seats and were asked to maintain 50 to 100 kilogauss pressure on the control pedals for as long as it was physically possible, while their muscular stress and cardiovascular parameters were recorded continuously. Results of data analysis showed that the physiological reactions to pressure reached their maximal values right before the moment when the muscle strain had to be released due to physical incapability to maintain it any longer. I.S.

A92-27642

**PSYCHOPHYSIOLOGICAL TRAINING OF
MULTISEAT-AIRCRAFT FLIGHT PERSONNEL FOR
COORDINATING ACTIVITIES DURING EMERGENCY
SITUATIONS [PSIKHOFIZIOLOGICHESKAIA PODGOTOVKA
CHLENOV EKIPAZHEI MNOGOMESTNYKH LETATEL'NYKH
APPARATOV K VZAIMODEISTVIU V AVARIINNYKH
SITUATSIIAKH]**

A. N. RAZUMOV, O. A. KOSOLAPOV, and A. A. PIKALOV
Voенно-Meditsinskii Zhurnal (ISSN 0026-9050), Dec. 1991, p.
45-48. In Russian. refs

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It has been shown that nearly one half of flight accidents caused by a breakdown in flight of aircraft equipment could have been prevented if the crew had been trained to optimize the coordination of their individual activities in these situations. This paper describes a training method, consisting of a specially developed set of training control cards, for training crew members to coordinate their activity in various actual situations, such as the breakdown of an engine during the takeoff, horizontal flight, and touchdown on the gliding path, or the breakdown of a navigation instrument during these stages of flight. I.S.

N92-18025# Oakland Univ., Rochester, MI.

MECHANISMS FOR RADIATION DAMAGE IN DNA

M. D. SEVILLA Dec. 1991 27 p

(Contract DE-FG02-86ER-60455)

(DE91-019080; DOE/ER-60455/6) Avail: NTIS HC/MF A03

Recent work in our laboratory has been instrumental in the reformulation of the current model for radiation damage in DNA. We have found that radical ion distribution is a function of strandedness of the DNA. A new model for ion transport through DNA is proposed. We completed an extensive ab initio molecular orbital study of the ion radicals species involved in DNA radiation damage. In this effort, the ionization energies (IE), electron affinities (EA), relative energies, fully optimized structural parameters, and spin densities were determined. Joint work with Steven Swarts and Ken Wheeler of Wake Forest on yields of products on irradiation of DNA has also yielded new insights to radiation damage to DNA - specifically, the division between the direct and indirect effect. Perhaps our most important work during this period has been in the area of the interaction of thiol radicals and oxygen as well as (DNA) peroxy radicals with thiols. The sulfinyl radical, RSO*, was not previously known to be a product of thiol- or carbon-based peroxy reaction with RSH. The structure of the thiol peroxy radical, RSOO, was uncertain. The conversion of RSOO to the sulfonyl radical, RSO2, and the subsequent reaction with oxygen to form the sulfonyl peroxy radical, RSO2OO, had never been suggested in the literature. We have investigated the reactions of thiols with primary ion radicals in gamma-irradiated DNA and observed electron transfer from the thiol to the guanine cation radical. This is believed to be the major protective effect of thiols from the direct effect of radiation. Our work with peroxy radicals has also established that the ESR measured O-17 hyperfine couplings give a good estimate of the relative reactivity of the peroxy group and shows that the thiol peroxy radical cannot be a effective hydrogen abstracting agent. DOE

N92-18076# Army Biomedical Research and Development Lab., Fort Detrick, MD.

**TECHNOLOGY ASSESSMENT AND STRATEGY FOR
DEVELOPMENT OF A RAPID FIELD WATER MICROBIOLOGY
TEST KIT**

DAVID R. PRESTON and STEPHEN A. SCHAUB Sep. 1991
54 p

(AD-A243413; USABRDL-TR-9106) Avail: NTIS HC/MF A04
CSCL 06/6

A literature and market search of existing technology for the detection, identification, and quantification of microorganisms in water was conducted. Based upon the availability of technologies and their configurations, an assessment of the appropriate strategies to pursue for the near and long term development plans in development of the Rapid Field Bacteriology Test Kit was

performed. Near term technologies to improve the Army's capability to detect microorganisms would appear to be essentially improvements in versatility and measurement of coliform indicator organisms. New chromogenic and fluorogenic indicator substances associated with new substrates appear to be best suited for test kit development either for quantitative membrane filter tests or presence/absence and multiple fermentation tests. Test times, incubator requirements, and operator involvement appear to be similar to older technologies. Long term development would appear to favor such technologies as genetic probes with amplification of the hydrodized nucleic acid materials of positive samples, and some immunological based systems such as enzyme linked, immuno-sorbent assays. In both cases, the major problems would appear to be sample preparation and development of signal strengths from the reactions which would allow the user to see results in 1 hour. GRA

N92-18102# Michigan Univ., Ann Arbor.

**RADIOPHARMACEUTICALS FOR DIAGNOSIS AND
TREATMENT**

D. E. KUHL 1991 5 p

(Contract DE-FG02-88ER-60639)

(DE92-004065; DOE/ER-60639/4) Avail: NTIS HC/MF A01

In this grant period, we have continued our efforts in the areas of PE basic radiochemistry, radiopharmaceutical synthesis, and preclinical radiopharmaceutical evaluation. A new synthetic sequence, consisting of no-carrier-added fluorine-18 labeling of substituted benzaldehydes followed by reductive decarbonylation, has been developed. This new methodology can be applied to the fluorine-18 labeling of a wide variety of drugs not previously accessible through existing fluorine-18 labeling methods. Following up on a literature report that the ability to radiolabel aromatic rings can be predicted by C-13 NMR chemical shifts, we have examined the generality of this correlation in aromatic rings bearing a variety of substituents. Although the original correlation holds for nitro substituted anisaldehydes, it cannot be extended to other rings substitution patterns. We have examined the relationship of in vivo localization of various fluorine-18 labeled dopamine uptake inhibitors to their in vitro binding affinities and lipophilicities. We have found that remarkably small decreases in binding affinity result in dramatic losses of in vivo binding to the desired high affinity binding sites. In order to probe the effects of endogenous neurotransmitter on the in vivo binding of radiolabeled dopamine uptake inhibitors, we have examined the in vivo regional localization of (F-18)GBR 13119 after acute and chronic drug treatments which alter the endogenous levels of dopamine. We have found that acute changes in dopamine levels do not affect the binding of this radioligand, but chronic depletion of neurotransmitter results in down-regulation of the in vivo binding sites. DOE

N92-18296# California Univ., San Diego, La Jolla.

**THE MOLECULAR BASIS FOR UV RESPONSE OF CULTURED
HUMAN CELLS**

M. KARIN 1991 4 p

(Contract DE-FG03-86ER-60429)

(DE92-003766; DOE/ER-60429/T1) Avail: NTIS HC/MF A01

During the past year we have analyzed the mechanism by which UV and H2O2 increase the activity of AP-1 in HeLa cells. AP-1 is a dimeric protein complex composed of the fos and jun gene products. After UV irradiation of HeLa cells (or exposure to H2O2), expression of the c-jun gene rapidly increases at least 50-fold. This induction occurs through the previously identified AP-1 site in the c-jun promoter. This positive autoregulation is mediated by AP-1 complexes that are composed mostly of cJun. cJun is a phosphoprotein that undergoes complex changes in its phosphorylation state following exposure to phorbol esters, growth factors or transforming oncogenes. We show that UV irradiation causes increases in the phosphorylation of cJun. We have been trying to determine the common signal by which DNA damaging agents lead to activation of the UV response. We present evidence that oxidative stress may serve as a signal for AP-1 induction during the UV response. We are also trying to purify and characterize UVIC, a factor secreted from UV damaged cells which

protects non-irradiated cells from damage. We have identified UVIC as a 17 kDa polypeptide that retains radioprotective activity after SDS-PAGE and renaturation. We are currently scaling up the isolation and purification process. DOE

N92-18339# Oxford Univ. (England). Medical Engineering Unit.
PULSE OXIMETRY: THEORETICAL AND EXPERIMENTAL MODELS

J. P. DEKOCK and L. TARASSENKO 26 Jun. 1991 41 p
(OU-EL-1885/91; ETN-92-90909) Avail: NTIS HC/MF A03

A model for understanding and quantifying the phenomena underlying pulse oximetry using an approach which combines both theoretical and empirical modeling is developed. The optical properties of whole blood were measured as a function of pathlength by transmission spectrophotometry using Red (R) (660 nm) and Infrared (IR) (950 nm) light emitting diodes as light sources. Readings were taken from a number of cuvettes of differing depths using diffusers to scatter the light before and after it interacts with the blood film. Twersky's theoretical model for the optical properties of whole blood gives the best fit to the experimental data. A simple theoretical model which takes into account the nonlinear relationship between optical density and pathlength in order to obtain an expression for the R/IR ratio, which relates the measurement of transmission at the two wavelengths, is also used. The R/IR ratio is found to be more or less independent of pathlength. Twersky's theoretical model, together with the simple model for obtaining an expression for the R/IR ratio, is concluded to provide a valid approach to the understanding of the phenomena undergoing pulse oximetry, as shown in the good correlation between the results predicted by the model and earlier, entirely experimental, *in vitro* experiments. ESA

N92-18419# Oakland Univ., Rochester, MI.
MECHANISMS FOR RADIATION DAMAGE IN DNA

M. D. SEVILLA Dec. 1991 17 p
(Contract DE-FG02-86ER-60455)
(DE91-019079; DOE/ER-60455/5) Avail: NTIS HC/MF A03

In this project we have proposed several mechanisms for radiation damage and recently radiation protection to DNA and its constituents, and have detailed a series of experiments utilizing electron spin resonance spectroscopy, HPLC and GC-mass spectroscopy to test the proposed mechanisms. In this years' work we have continued the investigation of the localization of the initial charges on DNA after irradiation through experiment and through the use of *ab initio* molecular orbital theory. The experimental results and MO calculations are in agreement that cytosine, not thymine, is likely the principal locus for excess charge; whereas guanine is confirmed as the initial site for the cationic charge. The mechanism for the anion localization on cytosine is clarified by MO calculations of DNA base pair and stacked base pair (GC/AT) ion radicals. In addition predictions made from a new model of ion transfer in DNA are tested and confirmed by an ESR investigation of irradiated single stranded DNA. In this years' effort in joint work with Wake Forest University we have also made excellent progress in the study of products produced from the direct effect of radiation on DNA. The release of unaltered bases and DNA base damage products are shown to be a function of hydration layer and evidence for a demarcation between the direct and indirect effect of radiation is presented. DNA base products from irradiations at ambient temperatures are shown to be those that would be predicted from ESR studies at low temperatures. In addition initial studies of radiation effects on DNA-protein complexes and certain sensitive amino acids have been initiated to shed light on the role of histones on DNA radiation damage. DOE

N92-18598# Michigan Univ., Ann Arbor. School of Public Health.

DEVELOPMENT OF A REVISED MATHEMATICAL MODEL OF THE GASTROINTESTINAL TRACT Ph.D. Thesis

A. BARKER Jan. 1991 181 p
(Contract DE-AC05-76OR-00033)
(DE92-004748; DOE/OR-00033/T453) Avail: NTIS HC/MF A09

The objectives of this research are as follows. First, to incorporate new biological data into a revised mathematical adult gastrointestinal tract model that includes: ingestion in both liquid and solid forms; consideration of absorption in the stomach, small intestine, ascending colon, transverse colon or not at all; gender and age of the adult; and whether the adult is a smoker or not. Next, to create a computer program in basic language for calculating residence times in each anatomical section of the GI tract for commonly used radionuclides. Also, to compare and contrast the new model with the ICRP 30 GI tract model in terms of physiological concepts, mathematical concepts, and revised residence times for several commonly used radionuclides. Finally, to determine whether the new model is sufficiently better than the current model to warrant its use as a replacement for the Eve model. DOE

N92-18799# Westinghouse Hanford Co., Richland, WA.
BENEFICIAL USES OF RADIATION

M. R. FOX Oct. 1991 13 p
(Contract DE-AC06-87RL-10930)
(DE92-003024; WHC-SA-1273) Avail: NTIS HC/MF A03

An overall decline in technical literacy within the American public has come at a time when technological advances are accelerating in the United States and around the world. This has led to a large communication gulf between the general public and the technologists. Nowhere is this more evident than with the topic of radiation. Regrettably, too few people know about the pervasiveness, amounts, and variabilities of sources of radiation. Nor do many people know that radiation has been used in beneficial ways for decades around the world. While the general public does not know of the scientific applications in which radiation has been employed, it has benefitted from these efforts. Thanks to the well know properties of radiation, scientific ingenuity has found many uses of radiation in chemical and agricultural research, biomedical research, in the diagnoses and treatment of hundreds of types of diseases, in industrial applications, food irradiation, and many other areas. This paper provides a sample of the types of applications in which radiation has been used to advance humankind. DOE

N92-18859# Central Inst. for the Deaf, Saint Louis, MO.
BINAURAL MASKING: AN ANALYSIS OF MODELS Final

Technical Report, 1 Apr. 1989 - 31 Jan. 1991
ROBERT H. GILKEY 21 Nov. 1991 29 p
(Contract AF-AFOSR-0302-89; AF PROJ. 2313)
(AD-A244392; AFOSR-91-1022TR) Avail: NTIS HC/MF A03
CSCL 06/3

The goal of this program of research has been to specify auditory processing in the presence of noisy backgrounds. A variety of experimental and modeling approaches have been employed to examine this processing. Overall the results suggest the importance of spectral and temporal comparisons in signal detection and suggest that similar processing underlies monaural and binaural detection. The introduction of masker energy in temporal intervals that did not overlap with the signal could be shown to either enhance or degrade detection performance, depending on the interaural parameters of the stimuli. Experiments on remote masking and suppression showed excitatory and inhibitory effects that extended across more than an octave. These results are being used to evaluate a nonlinear model of cochlear processing. The responses of subjects to individual stimuli (reproducible noise samples) were highly correlated between monaural and binaural conditions that had seemed dramatically different when the ensemble performance was considered (i.e., data averaged across noise samples). GRA

N92-18972# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.

HIGH ALTITUDE AND HIGH ACCELERATION PROTECTION FOR MILITARY AIRCREW

Oct. 1991 264 p In ENGLISH and FRENCH Symposium held in Pensacola, FL, 29-30 Apr. 1991

(AGARD-CP-516; ISBN-92-835-0638-3) Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

These proceedings include the technical evaluation report, the keynote address, and the 28 papers of the symposium. The papers addressed a variety of topics including (1) decompression sickness and ebullism at high altitude; (2) effects of high acceleration in terms of G-induced loss of consciousness (GLOC), positive pressure breathing (PBG), the anti-G straining maneuver (AGSM), and neck injury protection; (3) modeling effects of high acceleration on the cardiovascular system; (4) very high altitude protection; and (5) integrative protection equipment to high altitude, high acceleration, and other harmful stressors.

N92-18973# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

DECOMPRESSION SICKNESS AND EBULLISM AT HIGH ALTITUDES

ANDREW A. PILMANIS and BARBARA J. STEGMANN (Krug Life Sciences, Inc., San Antonio, TX.) *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 11 p Oct. 1991

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The use of high altitude air space for military activities exposes flight crews to the hazards of near vacuum ambient pressures. Both the U.S. Advanced Tactical Fighter and the National Aerospace Plane will travel at heights where unprotected exposure to the environment leads to severe physiological consequences, including decompression sickness (DCS) and ebullism. Information about DCS occurring at or above altitudes of 40,000 feet is minimal. Theoretically, bubble growth will be rapid and latency of symptoms short. The ultimate DCS consequences of such high exposures, even very short ones, may be influenced by the pre- and post-events of a rapid decompression (RD), including prebreathing, and post-exposure medical intervention. Ebullism, or the vaporization of body fluids, poses additional physiological risks to flight above 63,000 feet. Medical treatment protocols for ebullism in the event of accidental manned exposures to extreme altitudes do not exist. As research, training, and operational flights of new measures and treatment protocols becomes essential. Author

N92-18975# Air Force Systems Command, Brooks AFB, TX. High Altitude Protection Function.

THE 1990 HYPOBARIC DECOMPRESSION SICKNESS WORKSHOP: SUMMARY AND CONCLUSIONS

ANDREW A. PILMANIS, ed. *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 4 p Oct. 1991 Workshop held at Brooks AFB, TX, Oct. 1990

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Decompression sickness resulting from exposure to the hypobaric environment was reviewed and discussed at a three-day workshop hosted by the U.S. Air Force in Oct. 1990. This milestone meeting updated the current understanding of this condition. Gaps in this understanding were identified based on input from both research and operational participants. The results of this workshop are summarized. Author

N92-18976# Krug Life Sciences, Inc., San Antonio, TX.

PREBREATHING AS A MEANS TO DECREASE THE INCIDENCE OF DECOMPRESSION SICKNESS AT ALTITUDE

BARBARA J. STEGMANN and ANDREW A. PILMANIS (Air Force Systems Command, Brooks AFB, TX.) *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 8 p Oct. 1991

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Prebreathing with 100 percent oxygen for protection against serious decompression sickness (DCS) is standard practice in the U.S. Air Force (USAF). Before prebreathing became routine, there were 18 reported deaths directly related to altitude DCS. Since prebreathing has become instituted, only one death has been

reported. However, DCS cases still occur and are primarily associated with training in altitude chambers. At the Armstrong Laboratory (AL), Brooks Air Force Base, Texas, research on the use of prebreathing to enhance denitrogenation is directed at optimizing schedules for current operational requirements in both aviation and space. Concurrently, development of a decompression/denitrogenation computer is also underway. This analytical model is based on both laboratory and operational data bases, and will have both real-time and predictive capability. However, the accuracy of these data bases is in question. DCE reporting problems, inconsistencies in medical diagnosis, arbitrary classification of symptoms, historical variation in symptom definition, and the subjectiveness of intravascular bubble detection techniques must be taken into account before reasonable reliability can be applied to this model. Author

N92-18977# Air Force Systems Command, Brooks AFB, TX. Armstrong Lab.

G-INDUCED LOSS OF CONSCIOUSNESS ACCIDENTS: USAF EXPERIENCE 1982-1990

TERENCE J. LYONS, RICHARD HARDING, JAMES FREEMAN, and CAROLYN OAKLEY *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 9 p Oct. 1991 Previously announced in IAA as A92-20719 Prepared in cooperation with Air Force Inspection and Safety Center, Norton AFB, CA

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A review of the 18 accidents attributable to loss of consciousness induced by high-G flight (G-LOC) is conducted to discuss potential acceleration-protection measures. The data show that all accidents are found to have significantly higher systolic blood pressure and fewer aircraft-specific flying hours than other pilots. The pilots seem to represent a typical cross section of the pilot pool in terms of personal variables. It is suggested that the most important variables contributing to the accidents are G duration, G magnitude, the use of G trousers, and experience with the aircraft in question. Author

N92-18978# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

PULMONARY EFFECTS OF HIGH-G AND POSITIVE PRESSURE BREATHING

DAVID H. GLAISTER *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 4 p Oct. 1991

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Since positive pressure breathing (PPB) can provoke syncope even at low gravity, its use to support the circulation and prevent G-induced loss of consciousness (G-LOC) appears somewhat of a paradox. Furthermore, when right heart pressures are normally only a few mm Hg, an alveolar pressure of 65 mmHg produced by PPB appears alarming, and concern has been expressed as to the advisability of enhancing G protection. The effects of acceleration and pressure breathing on the circulation, particularly within the lungs, are examined, and it is concluded that when one considers pressure differentials across the walls of the major vessels and heart chambers, these concerns are largely unjustified. Author

N92-18979# Defence and Civil Inst. of Environmental Medicine, North York (Ontario).

MAXIMUM INTRA-THORACIC PRESSURE WITH PBG AND AGSM

F. BUICK, J. HARTLEY, and M. PECARIC *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 9 p Oct. 1991

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Positive pressure breathing during +Gz (PBG) and anti-G straining maneuvers (AGSM) each improve +Gz tolerance by increasing blood pressure through increases in intra-thoracic

pressure, but the maximal intra-thoracic pressure from their combined effect is not known. Six subjects performed: (1) maximal AGSM at +1Gz; (2) assisted PBG (constant 60 mm Hg) at +Gz; (3) submaximal AGSM at +Gz (enough to maintain peripheral vision); (4) maximal AGSM at +Gz; and (5) combined PBG and maximal AGSM at +Gz. They wore: Tactical Life Support System (TLSS) mask/helmet ensemble, CSU-15/P G-suit, and TLSS-style jerkin. Intra-thoracic pressure (Pes) was measured with a catheter tip pressure transducer in the esophagus. Gastric pressure (Pga) was also measured. For both Pes and Pga, there were no significant differences among experimental conditions (1), (4) and (5). Group mean Pes and Pga in these 3 conditions were 139 and 197 mm Hg, respectively. The similar results between maximal AGSM, and maximal AGSM and PBG are explained by: (1) limited support from the thoracic counter-pressure garment, and (2) the characteristics of the respiratory system. Author

N92-18980# Air Force Systems Command, Brooks AFB, TX. Crew Systems Directorate.

THE INFLUENCE OF HIGH, SUSTAINED ACCELERATION STRESS ON ELECTROMYOGRAPHIC ACTIVITY OF THE TRUNK AND LEG MUSCLES

LARRY P. KROCK and MARK W. CORNWALL *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 4 p Oct. 1991 Prepared in cooperation with Arizona State Univ., Flagstaff

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This study investigated the level and pattern of trunk and lower extremity muscle activity in aircrew performing the anti-G straining maneuver (AGSM) at high, sustained +Gz. Ten male, trained centrifuge riders experienced rapid onset profiles (4G/s) to +6 Gz, and sustained this level on the Armstrong Laboratory's Human Centrifuge until greyout. Surface electromyography (EMG) was recorded from the erector spinae, lateral abdominal, biceps femoris, vastus lateralis, and lateral gastrocnemius muscles of the subject's dominant side. The normalized root mean square (RMS) and mean power frequency (MPF) were calculated for each muscle at 1-second intervals throughout the exposure. The RMS amplitude for the muscles of the lower extremity showed a marked decrease (-61.45 percent) while muscles of the trunk exhibited a slight increase (+3.45 percent). The MPF of the EMG signal did not demonstrate a significant change during the exposure. Motor unit recruitment decreased in the lower extremity muscles during exposure. None of the studied muscles demonstrated a shift in the MPF suggesting evidence of fatigue. The results of the present study suggest the importance of maintaining a high level of muscle activity in the legs throughout exposure to sustained high levels of acceleration stress that require use of the AGSM. Author

N92-18981# Royal Netherlands Air Force, Soesterberg. Dept. of Aviation Medicine.

THE VALSALVA MANEUVER AND ITS LIMITED VALUE IN PREDICTING +GZ-TOLERANCE

E. J. VANLIESHOUT, J. J. VANLIESHOUT, J. KROL, M. SIMONS, and J. M. KAREMAKER (Amsterdam Univ., Netherlands) *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 4 p Oct. 1991

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The aim of the present study was to investigate, in healthy subjects, if responses to a cardiovascular reflex test, the Valsalva maneuver (VM), might be predictive for +Gz-tolerance. The main finding is a significant correlation between blood pressure recovery during VM and peripheral light loss (relaxed, before executing the M1/L1-maneuver) ($r = 0.63$, p less than 0.05). All other parameters, including baroreflex sensitivity, did not significantly correlate with +Gz-tolerance. Furthermore intact baroreflex pathways were determined in all subjects. These results indicate that the parameters derived from the cardiovascular responses to VM may only confirm baroreflex integrity. Therefore VM might be used in the diagnostic process for fighter pilots with repeated +Gz-loss

of consciousness inflight who are suspected of an orthostatic disorder. However in a healthy subject VM has limited value in predicting +Gz-tolerance. Author

N92-18983# Air Force Systems Command, Brooks AFB, TX. Human Systems Div.

SUBJECTIVE REPORTS CONCERNING ASSISTED POSITIVE PRESSURE BREATHING UNDER HIGH SUSTAINED ACCELERATION

KATHY MCCLOSKEY, LLOYD D. TRIPP, DANIEL W. REPPERGER, and STEPHEN E. POPPER *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 6 p Oct. 1991 Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

Assisted positive pressure breathing, as found in the Combined Advanced Technology Enhanced Design G Ensemble (COMBAT EDGE) system, was shown to have distinct advantages and disadvantages concerning the subjective opinion of the system under sustained acceleration. Advantages include subjects' perceptions of the system as an advancement in G-protection technology, personal projections of increased tolerance to G-forces, decreases in fatigue due to a lessening of straining maneuver effort, and an increase in breathing ease during acceleration, at least for subjects with COMBAT EDGE experience. Disadvantages include an increased incidence of arm pain, breathing difficulties for subjects new to the system, and a tendency to rely too much on the system in lieu of traditional straining maneuvers. It is recommended that a training regimen be established to address these issues before the COMBAT EDGE system is deployed operationally. Author

N92-18984# Centre d'Etudes et de Recherches de Medecine Aeronautique, Bretigny sur Orge (France). Div. de Biomecanique.

G-LOC. GZ AND BRAIN HYPOXIA. GZ/S AND INTRACRANIAL HYPERTENSION

P. QUANDIEU, D. GAFFIE, PH. LIEBAERT, M. BRIANE, J. C. SARRON (Direction des Recherches, Etudes et Techniques, Paris, France), A. GUILLAUME, D. TRAN, and J. PH. HAYMANN *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 15 p Oct. 1991 Sponsored in part by DRET G9 Copyright Avail: NTIS HC/MF A12; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The tilt of aircraft during a slow steep turn subjects the pilot to an acceleration which is colinear to the longitudinal axis of the body and can reach several times the acceleration of earth gravity. The purpose of this study is to propose a strictly biomechanic explanation of sudden inflight Loss Of Consciousness (LOC), i.e., brain nerve structures subject to Rapid Onset Rate (ROR) +Gz become functionally inefficient, not because of a shortage of oxygen, but because a sudden rise in brain mechanical stresses causes sudden intracranial hypertension. A simple model is proposed to analyze the following parameters: pressure distribution in the Cerebro-Spinal Fluid (CSF); distribution of stresses and deformations throughout the brain; and changes in blood flow pulsed into the skull. Calculations show the influence of a sudden change in flow rate causing collapses and supercritical flows sometimes followed by intravascular shocks. The first results of this modeling study indicate that ROR +Gz acceleration could augment mechanical stresses inside nerve tissues, and therefore result in sudden intracranial hypertension. Author

N92-18985# Laboratoire de Medecine Aeronautique, Bretigny-sur-Orge (France). Centre d'Essais en Vol.

ASSISTED POSITIVE PRESSURE BREATHING: EFFECTS ON +GZ HUMAN TOLERANCE IN CENTRIFUGE

J. M. CLERE and J. W. BURNS (Air Force Systems Command, Brooks AFB, TX.) *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 8 p Oct. 1991 *In* FRENCH and ENGLISH

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The goal of this paper is to present an experiment on the effect of Assisted Positive Pressure Breathing (APPB) as a method

of increasing G-time tolerance and improving very rapid onset rate (VROR) tolerance using APPB equipment. Six male volunteers were tested on a USAF centrifuge. The equipment used was a helmet with an occipital bladder for automatic mask tightening, mask, jerkin and G-suit, breathing regulator, and high flow G-valve. A standard ejection seat was used, positioned at 30 deg. Acceleration profiles were 9 +Gz for 10 sec at 1 G s(exp -1) or 4 G s(exp -1) and a 5-9 +Gz Simulated Aerial Combat Manoeuvre (SACM) profile at 4 G s(exp -1), with and without APPB. The anti-G straining maneuver (AGSM) was used as necessary to maintain adequate vision. APPB was a maximum of 9 kPa (68 mmHg) at 9 +Gz. Heart rate was calculated and heart rhythm anomalies were detected by an EKG. APPB had no significant effect on VROR tolerance or heart rate. APPB statistically increased G-time tolerance (167.9 +/- 38.4 s with APPB and 88.4 +/- 23.1 s without APPB (p less than 0.001)). Author

N92-18986# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

THE OPTIMISATION OF A POSITIVE PRESSURE BREATHING SYSTEM FOR ENHANCED G PROTECTION

A. R. J. PRIOR *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 11 p Oct. 1991

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An electronic, computer controlled system was developed that allows full control of mask pressure and anti-G trouser inflation pressure in a pressure breathing anti-G system (PBG) installed on a human centrifuge. The apparatus was used to study the effect of different mask and trouser inflation pressures upon G protection in four subjects exposed to +Gz acceleration in the range 3 to 7 G while wearing full coverage anti-G trousers and a chest counter pressure waistcoat. Eye level arterial blood pressure was used as an objective measurement of G protection while subjective assessment of peripheral vision, anti-G trouser inflation pressure, mask pressure, and arm discomfort was measured using a ten centimeter line technique. The results show that eye level arterial blood pressure is better maintained as both mask and trouser inflation pressure are increased, however, peripheral vision was degraded to only 34 pct. of normal under any of the experimental circumstances. Subjectively, the preferred schedule of inflation for the anti-G trousers was 1.3 psi/G with a cut-in of about 2 Gz; for the PBG mask pressure it was 14 mmHg/G with a 3 Gz cut-in point. Arm pain occurred in all subjects and may be related to venous pressure. Author

N92-18987# Air Force Systems Command, Brooks AFB, TX, Crew Technology Div.

EFFECTS ON GZ ENDURANCE/TOLERANCE OF REDUCED PRESSURE SCHEDULES USING THE ADVANCED TECHNOLOGY ANTI-G SUITE (ATAGS)

L. J. MEEKER *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 4 p Oct. 1991

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An advanced lower body full coverage anti-G suit was developed and is called the Advanced Technology Anti-G Suit (ATAGS). Previous centrifuge studies using standard pressurization schedules, flight tests, and theoretical considerations suggest that the ATAGS might provide equivalent G protection using reduced pressures. This study was conducted to determine the G protection afforded by ATAGS using a lower pressure schedule. Six test subjects were exposed to three separate G profiles during three test sessions. The profiles were: a gradual onset with the subject relaxed; a rapid onset to 9 G for 10 seconds with the subject performing an anti-G straining maneuver (AGSM); and a rapid onset 5 to 9 G Simulated Aerial Combat Maneuver (SACM) with 10 sec at each level, repeated to exhaustion. A different anti-G suit pressurization schedule was used at each test session. Data were analyzed by making statistical comparisons of performance between different pressure profiles, both for tolerance and endurance. Results suggest that the present standard of 10 to 8

psig at 9 G without reducing G protection, but that a pressure schedule resulting in 6 psig at 9 G is insufficient. Author

N92-18989# Drexel Univ., Philadelphia, PA.

A CARDIOVASCULAR MODEL OF G-STRESS EFFECTS: PRELIMINARY STUDIES WITH POSITIVE PRESSURE BREATHING

DOV JARON, THOMAS W. MOORE, and PIERRE VIEYRES *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 7 p Oct. 1991

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To study possible means of ameliorating the effects of gravitational acceleration on the cardiovascular system, a nonlinear digital computer model was developed. It combines a variable compliance model of the left ventricle, multielement models of the aorta and the systemic and venous systems, and lumped models of peripheral vascular beds. The vascular elements are obtained from the solution of the Navier-Stokes equations, combined with a set of simplifying assumptions. This closed loop system includes heart rate control and venous tone control, and the effects of acceleration forces. The model also can simulate the effect of several modes of G protection, including the anti-G suit, straining maneuvers, positive pressure breathing (PPB), and seat back angle. In this study, this model was used to gain an understanding of the effects of positive pressure breathing on G tolerance and to compare these effects to other protection methods. Author

N92-18990# Biodynamics International, Halifax (Nova Scotia).

ASSESSMENT OF PHYSIOLOGICAL REQUIREMENTS FOR PROTECTION OF THE HUMAN CARDIOVASCULAR SYSTEM AGAINST HIGH SUSTAINED GRAVITATIONAL STRESSES

RICHARD COLLINS and EMILIA MATEEVA *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 12 p Oct. 1991

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Satisfactory performance of combat pilots exposed to rapid onset of high sustained gravitational stress (+G) is compromised by caudalward fluid shifts which provoke 'compensatory' responses from the central nervous system. Such neural, metabolic, and humoral responses can lead to dramatic alterations in the heart rate, stroke volume, cardiac output, myocardial contractility, and vascular tonus, with the clear danger of loss of vision, loss of consciousness, and myocardial fibrillation and ischemia. A simple but complete model of the coronary circulation is proposed as a framework for organizing a systematic research program for the passive and active control of this circulation under conditions of extreme g-stress. Within such a framework, preliminary conclusions can be drawn concerning the study of effective countermeasures designed to enhance pilot tolerance in air-combat maneuvers. Author

N92-18991# Office National d'Etudes et de Recherches Aérospatiales, Paris (France). Direction de l'Energetique.

CIRCULATORY BIOMECHANICS EFFECTS OF ACCELERATIONS

D. GAFFIE, P. QUANDIEU, PH. LIEBAERT, D. COHEN-ZARDY, T. DAUMAS, and A. GUILLAUME (Centre d'Etudes et de Recherches de Medecine Aérospatiale, Bretigny sur Orge, France) *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 15 p Oct. 1991 Original language document was announced in IAA as A91-45645 Sponsored in part by DRET

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A general physical model of blood flow behavior in vessels is proposed, to have a better understanding of mechanisms which cause inflight loss of consciousness (LOC) in fighter pilots. The problem in the situation when heart work and external disturbances induced by aircraft motions are concomitant. Disturbances are both volume and surface changes. Calculations show that under certain

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conditions blood flow is limited to a change in flow rate. It can then be hypothesized that under the effect of a sudden load, LOC could be caused by a factor other than brain hypoxia resulting from blood pooling in the pilot's lower limbs. Author

N92-18992# Victoria Univ. (British Columbia). Dept. of Mechanical Engineering.

FINITE ELEMENT MODELING OF SUSTAINED +GZ ACCELERATION INDUCED STRESSES IN THE HUMAN VENTRICLE MYOCARDIUM

J. MOORE, B. TABARROK, and W. FRASER (Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario) In AGARD, High Altitude and High Acceleration Protection for Military Aircrew 7 p Oct. 1991

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Due to reports of endocardial hemorrhaging and myofibrillar degradation in swines undergoing high sustained +Gz accelerations, questions arise as to the possibility of cardiac tissue damage in humans subjected to similar Gz forces. Noninvasive cardiological techniques used during experiments seem too insensitive to provide data to determine the presence of any localized cardiac damage. In addition, these tests involve some risk to the subject. Hence, there exists the need for a model to predict possible tissue damage under high sustained +Gz accelerations. The development is presented of such a model for the analysis of +Gz induced stresses in the human ventricle myocardium. The model is based on the finite element method where the effects of finite displacements, large strains and nonlinear nearly incompressible materials behavior are accounted for. When experiments cannot be justified, the computational model can provide valuable quantitative (gross distortions and predicted stresses) data on the effects of +Gz induced stresses in humans. Ultimately, the goal is to provide some form of cardiac risk assessment for pilots of high performance aircraft. Author

N92-19031# City Univ. of New York, NY.

THERMAL RESPONSES DURING EXTENDED WATER IMMERSION: COMPARISONS OF REST AND EXERCISE, AND LEVELS OF IMMERSION Final Report

MICHAEL M. TONER and WILLIAM D. MCARDLE 10 Nov. 1991 47 p

(Contract DAMD17-88-C-8013; DA PROJ. 3E1-62787-A-879) (AD-A244305) Avail: NTIS HC/MF A03 CSCL 06/4

Phase 1 exposed 14 subjects to the neck in 3 water temperatures during both rest (R) and exercise (E) conditions for up to 3 h; whereas 8 subjects in Phase 2 were exposed to the knee (KN), hip (HI), and chest (CH) in water at 15 and 25 C during R and E. In Phase 1 the pct. Body Fat was 9.5 for the low-fat (L, N=5), 14.8 for the moderate-fat (A, N=5), and 19.6 for the high-fat (H, N=4); subjects were immersed on four occasions (two temperatures X two activities) for durations up to 3 h. During R at equivalent thermal strain, rectal and esophageal temperatures declined similarly in all groups over 3 h. GRA

N92-19087# Maryland Univ., Baltimore. Dept. of Pharmacology and Toxicology.

REGULATION OF BRAIN MUSCARINIC RECEPTORS BY PROTEIN KINASE C Final Report, May 1988 - Jun. 1991

ESAM E. EL-FAKAHANY 21 Jun. 1991 9 p

(Contract DAAL03-88-K-0078) (AD-A244419; ARO-25468.1-LS) Avail: NTIS HC/MF A02 CSCL 06/5

We investigated the pharmacological classification of the subtypes of muscarinic receptors which are coupled to increased hydrolysis of phosphoinositides in rat cerebral cortex. Our results indicated that both M1 and M3 receptors mediate such a response. This response to muscarinic receptor stimulation is partially blocked by tetrodotoxin or by protein kinase C activators. The component of the response that is sensitive to blockade by such agents does not correspond to a certain receptor subtype. We investigated the role of protein kinase C in desensitization of muscarinic receptor function in a neuronal clone. While this kinase was clearly involved

in the effects of phorbol esters, it did not play a role in agonist-induced receptor desensitization. We also studied some of the molecular events which accompany muscarinic receptor desensitization and down-regulation. These studies indicated that prolonged in vivo treatment of rats with an irreversible acetylcholinesterase decreased the concentration of the mRNA encoding the M2 muscarinic receptor. GRA

N92-19255# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).

MEASUREMENT OF SIGHT DIRECTION IN A CENTRIFUGE. PART 2: EYE MOVEMENT (MESURE DE LA DIRECTION DU REGARD EN CENTRIFUGEUSE. DEUXIEME PARTIE: MOUVEMENT DE L'OEIL)

C. A. LEGER, G. DEBENQUE, C. DESGRANGES, L. GIRARDEAU, and L. DIZARNY-GARGAS Dec. 1990 77 p In FRENCH (Contract DRET-88-1035)

(REPT-1169/CEV/SE/LAMAS; ETN-92-90864) Avail: NTIS HC/MF A05

A helmet mounted system is used to measure eye movements and other visual ergonomic factors during centrifuge tests. The purpose of the system is to determine the resolution, reproducibility, and precision possible with such a system, and identify possible sources of error in such a system. Technical difficulties involved in developing the helmet mounted system were initially underestimated. A more universal solution to the problem of ocular illumination is suggested. The drawbacks of existing software for real time analysis are summarized. ESA

N92-19273# Executive Office of the President, Washington, DC. Committee on Interagency Radiation Research and Policy Coordination.

IONIZING RADIATION RISK ASSESSMENT, BEIR 4

Oct. 1991 31 p

(Contract DE-AC05-76OR-00033)

(DE92-004014; ORAU-91/J-20; CIRRPC-8) Avail: NTIS HC/MF A03

This report of the Subpanel discusses the potential impact on Federal agencies and indicates individual risk factors that could be used by them in risk assessment. The approach used in this CIRRPC report was to consider the risk factors presented in BEIR IV for each radionuclide (or group radioelements) and to make some judgments regarding their validity and/or the uncertainties involved. The coverage of Radon-222 and its progeny dominated the BEIR IV report and this Subpanel felt it was proper to devote more attention to this radionuclide family. This risk factor presented in BEIR IV for radon is 350 cancer deaths per million person-working level months (WLM) of exposure for a lifetime. There is a range of opinions on the conversion from WLM to absorbed dose. As discussed in the text, the use of the WLM concept makes it difficult or infeasible to compare the risk factor for radon with that of other radionuclides which are based on organ dose. This report also includes a discussion of certain fundamental scientific and operational issues that may have decisive effect upon risk factor selection. These adjunct items are dealt with under separate headings and include discussions of threshold dose considerations, extrapolation to low doses, and age at exposure. DOE

N92-19333# Defence Research Establishment, Ottawa (Ontario).

INVESTIGATION OF THE EFFECT OF COOLING THE FEET AS A MEANS OF REDUCING THERMAL STRESS

SYDNEY D. LIVINGSTONE and RICHARD W. NOLAN Aug. 1991 14 p

(AD-A244264; DREO-TN-91-15) Avail: NTIS HC/MF A03 CSCL 06/4

The purpose of this investigation was to determine if cooling the feet is as effective as cooling the hands in the alleviation of heat stress. Each of six volunteers dressed in chemical warfare (CW) protective clothing, sat for 120 min in an environment of 35 C and then immersed his feet in a water calorimeter for 20 min. Heat lost to the calorimeter was measured at water temperatures of 10, 15, 20, 25 and 30 C. The use of water-cooled socks was

also examined under these environmental conditions. It was found that heat loss from the feet was comparable to that from the hands indicating that the two methods are equally efficient. Preliminary results indicate that the use of water-cooled socks may also be practical. GRA

N92-19347# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).

MEASUREMENT OF SIGHT DIRECTION IN A CENTRIFUGE. PART 1: HEAD MOVEMENT [MESURE DE LA DIRECTION DU REGARD EN CENTRIFUGEUSE. PREMIERE PARTIE: MOUVEMENT DE LA TETE]

G. DEBENQUE, C. DESGRANGES, L. GIRARDEAU, and A. LEGER Dec. 1990 40 p In FRENCH (Contract DRET-88-1035) (REPT-1168/CEV/SE/LAMAS; ETN-92-90865) Avail: NTIS HC/MF A03

The precision of global measurements obtained using an electro-optic helmet mounted aiming system is evaluated. Possible sources of error are determined. The influence of various factors on these sources is outlined. The precision of measurements is evaluated in terms of the efficiency of parallel error correction, reproducibility, and global precision of corrected measurements. Errors of less than one-half of a degree are found in most cases. The global precision, measured by means of one sensor, is better than 0.8 degrees for 95 percent of the measurements carried out. ESA

N92-19689# Veterans Administration Hospital, White River Junction, VT. National Center for Post-Traumatic Stress Disorder.

PILOTS: USER'S GUIDE

FRED LERNER Oct. 1991 71 p (PB92-100262) Avail: NTIS HC/MF A04 CSCL 06/16

The User's Guide is designed to assist librarians and other experienced database searchers in using the Published International Literature on Traumatic Stress (PILOTS) database and its online equivalent, the Post Traumatic Stress Disorder (PTSD) subfile of the Combined Health Information Database (CHID). It includes a field-by-field guide to searching the database on BRS or using Pro-Cite, as well as the PILOTS Thesaurus. GRA

N92-19702# Health Effects Research Lab., Research Triangle Park, NC.

EVALUATING THE HUMAN HEALTH EFFECTS OF HAZARDOUS WASTES: REPRODUCTION AND DEVELOPMENT, NEUROTOXICITY, GENETIC TOXICITY, AND CANCER

ROBERT S. DYER, VIRGINIA S. HOUK, and LAWRENCE W. REITER 1991 20 p (PB92-110352; EPA/600/D-91/236) Avail: NTIS HC/MF A03 CSCL 06/16

Several approaches are available for characterizing potential toxicity of wastes. The paper describes biological tests which are appropriate for identifying waste as neurotoxic, genotoxic, or likely to produce developmental or reproductive effects. The tests recommended are as follows: for neurotoxicity a functional observational battery, coupled with a measure of motor (bodily movement) activity; for genetic toxicity, the 'Ames' test of mutagenicity in Salmonella and a test of clastogenicity (DNA damage); and for developmental and reproductive toxicity, the Chernoff-Kavlock assay and a multi-generational reproductive assay. In addition, the paper identifies several generic factors which must be considered in performing any evaluations of hazardous wastes. GRA

N92-19761*# Pennsylvania Univ., Philadelphia. Inst. for Environmental Medicine.

PATHOPHYSIOLOGY OF SPONTANEOUS VENOUS GAS EMBOLISM Final Report

C. J. LAMBERTSEN, K. H. ALBERTINE, J. B. PISARELLO, and N. D. FLORES 10 Nov. 1991 90 p

(Contract NAG9-154)

(NASA-CR-189915; NAS 1.26:189915) Avail: NTIS HC/MF A05 CSCL 06/16

The use of controllable degrees and durations of continuous isobaric counterdiffusion venous gas embolism to investigate effects of venous gas embolism upon blood, cardiovascular, and respiratory gas exchange function, as well as pathological effects upon the lung and its microcirculation is discussed. Use of N₂O/He counterdiffusion permitted performance of the pathophysiological and pulmonary microstructural effects at one ATA without hyperbaric or hypobaric exposures. Author

N92-19877# Pennsylvania Univ., Philadelphia. Dept. of Radiology.

EFFECT OF INCREASED AXIAL FIELD OF VIEW ON THE EFFECT OF A VOLUME PET SCANNER

JOEL S. KARP, PAUL E. KINAHAN, GERD MUEHLEHNER, and PETER COUNTRYMAN 1991 9 p Presented at the IEEE Nuclear Science Symposium, Santa Fe, NM, 5-9 Nov. 1991 (Contract DE-FG02-88ER-60642) (DE92-004424; CONF-911106-34) Avail: NTIS HC/MF A02

The performance of the PENN-PET 240H scanner from UGM Medical Systems is tested and compared to the prototype PENN-PET scanner built at the University of Pennsylvania. The UGM PENN-PET scanner consists of six continuous position-sensitive NaI(Tl) detectors, which results in a 50-cm transverse field-of-view and a 12.8-cm axial field-of-view. The fine spatial sampling in the axial direction allows the data to be sorted into as many as 64 transverse planes, each 2-mm thick. A large axial acceptance angle, without interplane septa, results in a high sensitivity, with a low scatter and random fraction, due to the use of a narrow photopeak energy window. This paper emphasizes those performance measurements that illustrate the special characteristics of a volume imaging scanner and how they change as the axial length is increased. DOE

N92-19952# Pennsylvania State Univ., University Park. Dept. of Chemical Engineering.

NONINVASIVE DETERMINATION OF RESPIRATORY OZONE ABSORPTION: DEVELOPMENT OF A FAST-RESPONDING OZONE ANALYZER Research Report, Jun. 1988 - Apr. 1990

J. S. ULTMAN and A. BEN-JEBRIA 1991 35 p Sponsored in part by Health Effects Inst., Cambridge, MA (PB91-243220; HEI/RR-91/39) Copyright Avail: NTIS HC/MF A03 CSCL 06/16

An ozone analyzer and an ozone bolus generator were developed and tested for future use in noninvasive measurements of ozone absorption along human respiratory tract using the bolus-response technique. The analyzer, based on the chemiluminescent reaction of ozone with 2-methyl-2-butene, is sufficiently rapid and sensitive to measure changes in ozone concentration during a 4 second breathing period at quiet respiratory flow rates of 300 mL/sec in humans. Its performance characteristics include a 90 pct. step response time of 110 msec, a linear calibration from 0.03 to 10 ppm ozone, a signal to noise ratio of 30 at 0.5 ppm ozone, and a minimum detection limit of 0.017 ppm ozone. The ozone bolus generator can produce single boluses containing as little as 0.35 micro g ozone in a volume of 19 mL, with a peak ozone fraction of up to 4 ppm. The analyzer and bolus generator were tested in bolus-response experiments at steady air flow rates of 50 to 200 mL/sec in excised pig and sheep tracheas. Twenty-five to 50 pct. of the ozone introduced into the trachea was absorbed. Analysis of the mathematical moments of the bolus input and response curves and comparison to predictions of a diffusion theory indicate that ozone absorption is limited by diffusion processes in the airway lumen. Author

N92-19954# State Univ. of New York, Buffalo. Dept. of Mechanical and Aerospace Engineering.

RETENTION MODELING OF DIESEL EXHAUST PARTICLES IN RATS AND HUMANS Research Report, Apr. 1987 - Apr. 1990

C. P. YU and K. J. YOON 1991 41 p Sponsored in part by

Health Effects Inst., Cambridge, MA
(PB91-243238; HEI/RR-91/40) Copyright Avail: NTIS HC/MF
A03 CSCL 06/16

To study lung clearance, a compartmental model was used consisting of the nasopharyngeal, tracheobronchial, alveolar, and lung associated lymph node compartment. A particle model was assumed made up of material components according to the characteristics of clearance: (1) a carbonaceous core or soot (80 pct. of particle mass); (2) slowly cleared organics (10 pct. pm); and (3) fast cleared organics (10 pct. pm). Kinetic equations of the retention model were first developed for rats. The lung burden calculations showed that although the organics were cleared at nearly constant rates, the alveolar clearance rate of soot decreased with increasing lung burden. At low lung burdens, the alveolar clearance rate was controlled by macrophage migration to the mucociliary escalator, whereas at high lung burdens, the clearance rate was determined by transport to the lymphatics. The retention model for rats was extrapolated to humans of different ages. The reduction in the mechanical clearance in adult humans caused by exposure to high concentrations of diesel exhaust was much less than that observed in rats. The reduction in children was greater than in adults. Author

N92-19956# North Carolina Univ., Chapel Hill.
**EFFECTS OF 4 PERCENT AND 6 PERCENT
CARBOXYHEMOGLOBIN ON ARRHYTHMIA PRODUCTION IN
PATIENTS WITH CORONARY ARTERY DISEASE Research
Report, Nov. 1985 - Nov. 1989**

D. S. SHEPS, M. C. HERBST, A. L. HINDERLITER, K. F. ADAMS,
and L. G. EKELUND 1990 66 p Prepared in cooperation
with Environmental Protection Agency, Research Triangle Park,
NC Sponsored in part by Health Effects Inst., Cambridge, MA
(PB91-243246; HEI/RR-91/41) Copyright Avail: NTIS HC/MF
A04 CSCL 06/16

The effects were assessed of exposure to carbon monoxide (CO) resulting in 4 or 6 pct. carboxyhemoglobin (COHb) on ventricular arrhythmias in 41 subjects (nonsmokers) with documented coronary artery disease. Subjects were exposed to room air, 100 ppm CO (target, 4 pct. blood COHb), or 200 ppm CO (target, 6 pct. blood COHb), and then did a supine bicycle exercise test. Radionuclide ventriculography was performed at rest and during exercise. Ambulatory electrocardiogram recordings were made to determine the frequency of premature ventricular contractions (PVCs). The frequency of single and multiple PVCs per hour during exercise was significantly greater on the 6 pct. COHb day than on the room air day (for single PVCs, 167.72 + or - 37.99 for 6 pct. COHb compared with 127.32 + or - 28.22 for room air, $p = 0.03$; for multiple PVCs, 9.59 + or - 3.70 for 6 pct. COHb day compared with 3.18 + or - 1.67 for the room air day, $p = 0.02$). Patients who developed increased arrhythmias were significantly older than those who had a higher peak workload during. No effects of CO exposure was seen on the 6 pct. COHb day for subjects at rest, or on the 4 pct. COHb day. Author

N92-19957# Midwest Research Inst., Golden, CO. Life Sciences Dept.

**EFFECTS OF METHANOL VAPOR ON HUMAN
NEUROBEHAVIORAL MEASURES Research Report, Jul. 1988
- Oct. 1990**

M. R. COOK, F. J. BERGMAN, H. D. COHEN, M. M. GERKOVICH,
and C. GRAHAM 1991 65 p Sponsored in part by Health
Effects Inst., Cambridge, MA
(PB91-243253; HEI/RR-91/42) Copyright Avail: NTIS HC/MF
A04 CSCL 06/16

Methanol may become an important alternative fuel for vehicles in the near future. The objective of the preliminary study was to determine if inhalation exposure to methanol, near the maximum concentration allowed for an eight hour average exposure in the workplace (200 ppm), would have adverse effects on human neurobehavioral functions. Twelve healthy young men were exposed twice to filtered air and twice to 192 ppm methanol vapors for 75 minutes on different days under double blind conditions. Twenty two neurobehavioral and neurophysiological tests were

administered before, during, and after exposure to measure visual, behavioral, reasoning, and hearing functions. Exposure to methanol produced significant increases in blood and urine methanol concentration at the end of the exposure period. As expected, no changes in plasma formate were observed. Methanol exposure had no effect on the subjects' performance on most of the tests. However, some methanol exposed subjects reported more fatigue and lack of concentration. Performance was also slightly impaired on the Sternberg memory task. These effects were small and did not exceed the range of results measured in filtered air exposed subjects. Author

N92-19977*# National Aeronautics and Space Administration.
Ames Research Center, Moffett Field, CA.

**CREW FACTORS IN FLIGHT OPERATIONS. 8: FACTORS
INFLUENCING SLEEP TIMING AND SUBJECTIVE SLEEP
QUALITY IN COMMERCIAL LONG-HAUL FLIGHT CREWS
PHILIPPA H. GANDER, R. CURTIS GRAEBER, LINDA J.
CONNELL, and KEVIN B. GREGORY (Sterling Software, Palo Alto,
CA.) Dec. 1991 41 p
(NASA-TM-103852; A-91106; NAS 1.15:103852) Avail: NTIS
HC/MF A03 CSCL 06/16**

How flight crews organize their sleep during layovers on long-haul trips is documented. Additionally, environmental and physiological constraints on sleep are examined. In the trips studied, physical periods averaging 10.3 hr alternated with layovers averaging 24.8 hr, which typically included two subject-defined sleep episodes. The circadian system had a greater influence on the timing and duration of first-sleeps than second-sleeps. There was also a preference for sleeping during the local night. The time of falling asleep for second-sleeps was related primarily to the amount of sleep already obtained in the layover, and their duration depended on the amount of time remaining in the layover. For both first- and second-sleeps, sleep durations were longer when subjects fell asleep earlier with respect to the minimum of the circadian temperature cycle. Naps reported during layovers and on the flight deck may be a useful strategy for reducing cumulative sleep loss. The circadian system was not able to synchronize with the rapid series of time-zone shifts. The sleep/wake cycle was forced to adopt a period different from that of the circadian system. Flight and duty time regulations are a means of ensuring that reasonable minimum rest periods are provided. This study clearly documents that there are physiologically and environmentally determined preferred sleep times within a layover. The actual time available for sleep is thus less than the scheduled rest period. Author

N92-20020# National Inst. for Occupational Safety and Health,
Cincinnati, OH.

**DEVELOPMENT OF A LUNG-CELL MODEL FOR STUDYING
WORKPLACE GENOTOXICANTS Final Report**

W. Z. WHONG 1991 25 p
(PB92-114644) Avail: NTIS HC/MF A03 CSCL 06/16

The objectives were to establish in-vivo and/or in-vitro multiple genetic endpoint assay systems using lung cells of the rat, to compare the sensitivity of rat lung cells to genotoxicants between in-vivo and in-vitro assay systems, and to evaluate the suitability of the multiple genetic endpoint/lung cell assay system for detecting genotoxicity. Male CD-rats were used. Results indicated that the best enzymatic separation of rat lung cells was a combined treatment of lung with trypsin and collagenase or a cold digestion with protease. Two micrograms cytochalasin-B/mm for two days incubation was the optimal protocol for cytokinesis block in lung cells during micronucleus formation (MN) assay. Primary lung cells can be used for in-vivo and in-vitro sister chromatid exchange and MN analyses. A minimal 16 hour cell incubation in the presence of tritium labeled thymidine was required for visualization of optimal DNA repair in the lung cells/unscheduled DNA synthesis (UDS) assay system. Both alveolar macrophages and primary lung cells could be used for in-vivo and in-vitro UDS assays. Author

BEHAVIORAL SCIENCES

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

A92-26005

INVESTIGATION OF MENTAL WORK CAPACITY OF COSMONAUTS ABOARD THE MIR ORBITAL COMPLEX [ISSLEDOVANIE PSIKHICHESKOI RABOTOSPOSOBNOSTI KOSMONAVTOV NA ORBITAL'NOM KOMPLEKSE 'MIR']

K. K. IOSELIANI, A. L. NARINSKAIA, SH. R. KHISAMBEEV, and G. RADKOVSKI Kosmicheskaia Biologiia i Aviakosmicheskaia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 8-11. In Russian. refs
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In the framework of the Prognoz experiment, changes in the mental performance occurring after 3 to 5 days of stay aboard Mir and 190 days after the mission, were evaluated in four cosmonauts visiting the station, using a computer-based psychodiagnostic unit Pleven-87. Mental performance was estimated from the ability of the subject to quickly solve the following problems: continuous counting in optimal, prescribed, or self-regulated rhythm; a complex sensorimotor reaction having psychological feedback; a conditional motor reaction to several combinations of color stimuli; and a reaction to a moving object. Results demonstrated the ability of the Pleven-87 system to provide reliable predictions concerning the mental work capacity of cosmonauts. All subjects demonstrated high mental stability during and after the flight. I.S.

A92-26330

THE EFFECT OF SLEEP DEPRIVATION AND SUSTAINED MILITARY OPERATIONS ON NEAR VISUAL PERFORMANCE

JULIE R. QUANT (Hong Kong Polytechnic, Kowloon) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 63, March 1992, p. 172-176. Research supported by Ministry of Defence of England. refs
Copyright

A group of military servicemen were deprived of sleep for 65 h while they carried out a simulated military mission with a high visual workload. Their performance in a series of near vision tests was monitored. In general, the visual system was found to be resilient to the stress of sleep loss, the subjects experiencing mild symptoms of asthenopia (eyestrain). However, after 48 h without sleep there was a reduction in amplitude of convergent fusional reserves and a decrease in contrast sensitivity to a spatial frequency of 6 cycles/deg. A disruption in diurnal rhythms for these parameters was suggested. The results are considered in terms of the maintenance of visual efficiency and comfort with loss of sleep, and have implications for both the military and civilians involved in shift work and long work schedules. Author

N92-18245# North Carolina Univ., Chapel Hill. Dept. of Computer Science.

AUTOMATED PROTOCOL ANALYSIS: TOOLS AND METHODOLOGY

JOHN B. SMITH, DANA K. SMITH, and EILEEN KUPSTAS Aug. 1991 28 p
(Contract N00014-86-K-0680; NSF IRI-85-19517; NSF IRI-88-17305)
(AD-A242040; TR91-034) Avail: NTIS HC/MF A03 CSCL 23/2

The TextLab Research Group, over the past seven years, has developed a collection of tools and techniques for recording users' interactions with computer systems in machine-readable form and for automatically analyzing and displaying those data. This report catalogs those tools and discusses their methodological context and implications. Tools discussed include the following: tracking users behaviors and producing a machine recorded protocol at the level of action - data an order of magnitude larger

than keystrokes; replaying users' sessions from protocol data; modeling users' strategies using formal cognitive grammars; analyzing user sessions by parsing them with the grammars; and displaying results in visual form, both static and animated, to facilitate interpretation and understanding by researchers. These tools are placed in a methodological context by reviewing issues associated with concurrent think-aloud, keystroke, and video protocols; and other computer systems are reviewed that support these forms of protocol data. The discussion concludes by noting the increased importance of data management required by automated methods and our thoughts for a comprehensive environment, built around a protocol management facility, that would integrate the tools discussed and support development of new ones. GRA

N92-19064# Health Research, Inc., Albany, NY.

ACTIVITY-DRIVEN CNS CHANGES IN LEARNING AND DEVELOPMENT Final Report, 15 Apr. 1990 - 14 Apr. 1991

JONATHAN R. WOLPAW 14 Apr. 1991 413 p
(Contract AF-AFOSR-0238-90; AF PROJ. 2312)
(AD-A243790; AFOSR-91-0937TR) Avail: NTIS HC/MF A18 CSCL 05/8

The conference that formed the basis for the present volume took place in May, 1990 at the Rensselaerville Institute in Rensselaerville, New York near Albany. This last meeting reflected the increased pace and breadth of recent research. Most important, it added a new theme to the two stressed before: Its central goal was to discuss, in a connected fashion, the entire sequence of events underlying learning and development. Such a comprehensive and logical format has only become possible in the last few years. Before that, knowledge was too fragmentary to permit meaningful adherence to this framework. At the same time, recent advances have made it imperative to encourage interactions between scientists working at each level in this sequence, if understanding of learning and development is not to remain disjointed and compartmentalized. To emphasize this theme, the meeting's organization paralleled the progression from neuronal activity to altered behavior. Thus, the first session described receptor-mediated triggers of plasticity, the second discussed accompanying molecular events, the next two evaluated synaptic modifications resulting from these events, and the last two evaluated expression of these synaptic modifications as altered behavior of neural networks and whole animals. GRA

N92-19069# New York Univ., New York. Neuromagnetism Lab.
ATTENTION, IMAGERY AND MEMORY: A NEUROMAGNETIC INVESTIGATION Final Report, 1 Mar. 1988 - 30 Sep. 1991

LLOYD KAUFMAN and SAMUEL J. WILLIAMSON 14 Oct. 1991 123 p
(Contract F49620-88-K-0004)
(AD-A243859; AFOSR-91-0970TR) Avail: NTIS HC/MF A06 CSCL 05/8

The techniques of magnetic source imaging (MSI) have been applied to studies of three important aspects of human cognition: (1) An investigation of the effects of selective spatial attention on information processing within the human visual cortex for stimuli of constant luminance have revealed that early response components from 120 to 180 ms latency provide evidence for such effects, but amplitude enhancements for later components are probably related to pattern recognition and task-relevant stimulus discrimination; (2) A study of the relationship between the performance of a cognitive task such as visual imagery, or silent rhyming, and the suppression of spontaneous cortical rhythms reveals that the location, onset time, and duration of suppression are task specific and correlate with measures of performance; and (3) The characterization of the functional attributes of neuronal activity in human auditory association cortex provides evidence that cortical activation traces in primary and association areas can be accurately characterized by distinct lifetimes, which typically amount to several seconds, and that these sensor memories characterize specific physical attributes of sound. GRA

N92-19083# Wisconsin Univ., Madison. Dept. of Computer Sciences.

BEHAVIOR AND LEARNING IN NETWORKS WITH DIFFERING AMOUNTS OF STRUCTURE Final Report, 1 Dec. 1988 - 30 Nov. 1990

LEONARD UHR 9 Sep. 1991 28 p
(Contract AF-AFOSR-0178-89; AF PROJ. 2305)
(AD-A244080; UW-144-AS50; AFOSR-91-0939TR) Avail: NTIS HC/MF A03 CSCL 05/8

This research is investigating how well large networks that are built from neuron-like elements can be made to perform and learn to perform by giving them different types and amounts of built in structure and the ability to learn by generating new nodes in additions to changing weights. Substantial improvements in both learning speed and performance have been achieved on both pattern recognition problems and a range of problems typically used to demonstrate the power of connectionist networks. In addition, a number of new microcircuits and subnetworks have been specified with which more powerful and more flexible networks can be built. These include: back-cycling nets that handle learning (along with many useful functions), rather than having learning handled by the system that executes the net; nets that handle symbols as well as numbers; and microcircuits for productions and perceptual transforms. GRA

N92-19364# Mei Associates, Inc., San Antonio, TX.
CHARACTERIZATION OF AIR FORCE TRAINING AND COMPUTER-BASED TRAINING SYSTEMS Final Report, Mar. 1990 - Jul. 1991

WILLIAM J. WALSH, PATRICIA J. YEE, and STEVEN A. YOUNG
Dec. 1991 237 p
(Contract F33615-88-C-0003)
(AD-A243781; AL-TP-1991-0048) Avail: NTIS HC/MF A11 CSCL 06/5

This paper documents the approach used in the development of guidelines designed to aid novice training managers in the computer-based training (CBT) system planning, selection and implementation process. Phase 1 developed a list of critical factors that characterized Air Force training organizations and CBT technologies. These factors were developed at a level simple enough so misinterpretation by novice managers was minimized. Next, decision processes were merged with identified factors forming guidelines that followed an input-process-output model. These preliminary guidelines were field-tested during Phase 2 at four Air Force training organizations. Concurrent with field-testing, the guidelines were validated by convening a panel of Air Force CBT 'experts' to critique the guidelines and compare their CBT development processes with those of the guidelines. Following these efforts, the guidelines were revised and refined. GRA

N92-19365# Case Western Reserve Univ., Cleveland, OH. Dept. of Psychology.

RESPONSE DEVICES AND COGNITIVE TASKS Annual Report, 16 Jun. 1990 - 30 Oct. 1991

DOUGLAS K. DETTERMAN 30 Oct. 1991 6 p
(Contract AF-AFOSR-0084-90; AF PROJ. 2313)
(AD-A243903; AFOSR-91-0984TR) Avail: NTIS HC/MF A02 CSCL 05/8

The aims of the research are to study the effects of response mode, response complexity, instructions and practice on basic cognitive tasks, and to use the information obtained to develop more elaborated models of cognitive functioning which take these factors into account. To accomplish these aims, subjects will be tested on a set of computer-administered cognitive tasks, using keyboard and touch screen response modes, and under varying sets of verbal and nonverbal instructions. GRA

N92-19410# Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Hamburg (Germany, F.R.). Abt. Luft- und Raumfahrtpsychologie.

THE CONSTRUCTION OF PERSONALITY QUESTIONNAIRES FOR SELECTION OF AVIATION PERSONNEL

KLAUS-MARTIN GOETERS and BERND TIMMERMANN Mar.

1991 42 p

(DLR-FB-91-18; ISSN-0939-2963; ETN-92-90735) Avail: NTIS HC/MF A03; DLR, Wissenschaftliches Berichtswesen, VB-PL-DO, Postfach 90 60 58, 5000 Cologne, Fed. Republic of Germany, HC 16 DM

The Personality Research Form (PRF), a questionnaire for voluntary self description, was administered to a group of 300 applicants for pilot training at a major European airline. Standard psychometric statistics were computed for the PRF subscales. The comparison with information given in the test manual shows that the reliabilities of all PRF subscales decline in personnel selection. Strong ceiling effects which were caused by response sets (mainly social desirability) are identified as the reason for this phenomenon. Besides the PRF the Temperament Structure Scales (TSS) were presented to the same group. The TSS is a questionnaire which is constructed for selection conditions. The computed factor analytic results indicate that its factor structure is very similar to that of the PRF. No detrimental downward trend could be revealed for the scale reliabilities of the TSS. Thus, it seems possible to construct questionnaires which are robust with respect to selection conditions. ESA

N92-19799# Wake Forest Univ., Winston-Salem, NC. Dept. of Physiology and Pharmacology.

RECEPTOR SUBTYPE ALTERATIONS: BASES OF NEURONAL PLASTICITY AND LEARNING Final Technical Report

BRENT A. VOGT 3 Dec. 1991 12 p
(Contract AF-AFOSR-0372-90; AF PROJ. 2312)
(AD-A244406; AFOSR-91-1028TR) Avail: NTIS HC/MF A03 CSCL 05/8

The following findings were reported: (1) oxotremorine-m binding in rabbit thalamus and cingulate cortex increased during discriminative avoidance conditioning (DAC); (2) excitatory and discriminative neuronal activity was documented throughout DAC and there were relationships between training-induced neuronal activity and changes in binding; (3) turnover of noradrenaline was significantly elevated during DAC suggesting a role for this transmitter in long-term memory; (4) anterior cingulate cortex lesions uncover discriminative neuronal activity in the striatum and amplify activity in thalamus; (5) the structure connections and spontaneous activity of the lateral magnocellular nucleus in thalamus were described; and (6) a review was written of the structure and function of cortical layer I and its role in learning and memory analyzed. These are the first studies to document physiological regulation of receptors and transmitters that occur during avoidance learning and provide the basis for a comprehensive analysis of the molecular bases for learning and memory. GRA

N92-20037# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.

HUMAN PERFORMANCE ASSESSMENT METHODS

May 1989 73 p
(AGARD-AG-308; ISBN-92-835-0510-7) Copyright Avail: NTIS HC/MF A04; Non-NATO Nationals requests available only from AGARD/Scientific Publications Executive

The goal was to develop the 'Standardized Tests for Research on Environmental Stressors' or 'STRES' Battery, satisfying conventional psychometric criteria such as reliability, validity, and sensitivity for which an extensive data base may now be compiled among the NATO nations. The protocol for the 7 selected tests is presented. Author

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

A92-25269

AN EXPERIMENTAL STUDY OF THE EFFECT OF HIGH PRESSURE ON THE ADSORPTION PROPERTIES OF SILOCHROME C-120 [EKSPERIMENTAL'NOE IZUCHENIE VLIIANIIA POVYSHENNOGO DAVLENIIA NA ADSORBTSIONNYE SVOISTVA SILOKHROMA C-120]

O. A. SUKHORUKOV, M. V. AZAROVA, and V. P. BOROVIKOVA
Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 50, 51. In Russian. refs
Copyright

The effect of atmospheric pressure on the adsorption capacity of silochrome C-120 with respect to various toxic gases (including heptane, octane, nonane, benzene, toluene, and m-xylene vapors) was investigated in a helium atmosphere from 7 to 77 gage atm. It was found that the adsorption capacity of C-120 decreased with pressure for all the substances investigated (except toluene which showed a small and transient increase in adsorption at 10 gage atm, followed by a sharp fall at 18.5 gage atm). I.S.

A92-25273

A METHOD FOR DETERMINING LEVELS OF CALCIUM IN THE HAND USING ACTIVATED NEUTRONS FROM (PU-238)-BE SOURCES [SPOSOB OPREDELENIIA UROVNIA KAL'TSIIA V KISTI RUKI PUTEM AKTIVATSII NEITRONAMI OT PU-238-BE-ISTOCHNIKOV]

V. E. ZAICHIK, A. P. DUBROVIN, A. M. KORELO, and B. V. MORUKOV
Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina (ISSN 0321-5044), vol. 25, Sept.-Oct. 1991, p. 58-61. In Russian. refs
Copyright

The method of neutron-activation analysis (NAA) described by Zherbin and Zaichik (1976), Zaichik et al. (1980, 1986), and Zaichik (1987) was applied in vivo for determining calcium levels in the tissues of the hand. The instrumental setup for the experiment is described together with the details of the procedure and the results of an experiment. The high accuracy of the results obtained with the procedure, together with the relatively low levels of exposure and the simplicity of the instrumental setup, recommend this method for applications to both space studies and clinical tests of calcium depletion. I.S.

A92-26007

A MODEL OF THE PILOT'S PERCEPTION OF THE PERTURBED ANGULAR MOTION OF THE COCKPIT AS PART OF THE PILOT'S INFORMATION MODEL [MODEL' VOSPRIIATIIA PILOTOM VOZMUSHCHENNOGO UGLOVOGO DVIZHENIIA KABINY KAK CHAST' EGO INFORMATSIONNOI MODELI]

V. N. AZARSKOV, L. N. BLOKHIN, V. V. BURDIN, and L. I. VORONIN
Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 14-17. In Russian. refs

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The paper presents an algorithm of structural identification of a dynamic system, as a model of the pilot's perception of the perturbed angular motion of the cockpit and the motion's transmission to the joystick. Assessments of scalar quasi-linear and multichannel models of pilot's functions are given. Results obtained illustrate the potential of this procedure. I.S.

A92-26008

MICROBIOLOGICAL ASPECTS OF THE ENVIRONMENT OF UNDERWATER HABITATS [MIKROBIOLOGICHESKIE ASPEKTY OBITAEMOSTI GLUBOKOVODNYKH BAROKOMPLEKSOV]

A. N. VIKTOROV, V. K. IL'IN, N. A. POLIKARPOV, M. P. BRAGINA, V. G. SOBOLEVSKII, A. B. SYSOEV, and T. IU. NORKINA
Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 17-21. In Russian. refs
Copyright

The effect of the hyperbaric environment on the counts of a gram-negative organism, *Pseudomonas aeruginosa*, in the mucous membranes of the human mouth, nose, auditory canals, and skin was investigated in deep-sea divers and in volunteers subjected to stays for 1 to 45 days in a hyperbaric chamber. Results revealed significant increases in *P. aeruginosa* counts in samples from all sources investigated, which were larger the longer the time of the barochamber exposure. Some subjects showed symptoms of otitis externa. It was found that the main source of *P. aeruginosa* was the water supply system. Procedures for preventing infection with gram-negative bacteria under conditions of high pressure are discussed. I.S.

A92-26016

BIOCATALYSIS USING IMMOBILIZED CELLS OR ENZYMES AS A METHOD OF WATER AND AIR PURIFICATION IN A HERMETICALLY SEALED HABITAT [BIOKATALIZ NA OSNOVE IMMOBILIZOVANNYKH KLETOK ILI FERMENTOV KAK ODIN IZ PODKHODOV K OCHISTKE VODY I ATMOSFERY V OBITAEMOM GERMOOB'EKTE]

T. E. LEBEDEVA, N. M. NAZAROV, and IU. E. SINIAK
Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 42-45. In Russian. refs
Copyright

The feasibility of using, in a regenerative life support system, immobilized cells to purify water and air in hermetically sealed habitats is discussed. Consideration is given to various methods for immobilizing bacteria that are selected for their adaptive abilities to assimilate organic components that need to be removed, and the suitable substances that can serve as the carriers for immobilized bacteria and enzymes. Particular attention is given to the use of denitrification bacteria immobilized on mineral carriers. The purification technique discussed here is of relevance to long-duration space missions, particularly for the flights to Mars. I.S.

A92-26019

A METHOD FOR A COMPREHENSIVE ASSESSMENT OF TECHNICAL EQUIPMENT FOR THE MEDICAL COMPARTMENT OF A SPACECRAFT [METODIKA KOMPLEKSNOI OTSENKI TEKHNIKESKOGO OSNASHCHENIIA KOSMICHESKOGO MEDITSINSKOGO BLOKA]

A. V. PERKOVSKII and B. A. ADAMOVICH
Kosmicheskaiia Biologiia i Aviakosmicheskaiia Meditsina (ISSN 0321-5044), vol. 25, Nov.-Dec. 1991, p. 49-53. In Russian. refs
Copyright

The paper describes the development of a model of a bacterial defense system (BDS) to be included in the medical compartment or medical section of a spacecraft. The BDS is designed to maintain, in the area designated for medical treatments, conditions of constant temperature, relative humidity, gas exchange, and desired ratios of atmospheric gases, as well as to keep low the levels of bacterial and particle contamination. Special attention is given to the method used for the assessment of the BDS, the set of factors to be assessed, and a model of a data base for computing the cost efficiency of the BDS. I.S.

A92-26333

TEMPERATURE AND HUMIDITY WITHIN THE CLOTHING MICROENVIRONMENT

PATRICK J. SULLIVAN (Canadian Space Agency, Ottawa, Canada) and IGOR B. MEKJAVIC (Simon Fraser University, Burnaby, Canada)
Aviation, Space, and Environmental Medicine (ISSN

0095-6562), vol. 63, March 1992, p. 186-192. Research supported by Science Council of British Columbia and NSERC. refs
Copyright

Different types of clothing are used by human subjects exposed to linear increases in ambient temperature to assess the microenvironmental conditions within the clothing. Subjects in four types of helicopter suits are exposed to a temperature increase from 20 to 40 C over 90 min followed by 90 min at 40 C unchanged. The subjects are monitored continuously to determine the temperature, relative humidity, and vapor pressure within the clothing microenvironment as well as body temperature. The relative humidity and vapor pressure data indicate that the microenvironment leads to more extreme conditions than the ambient air. The temperature is found to remain at a slightly lower level within the microenvironment. The differences between the types of clothing are discussed with reference to material qualities such as permeability. The findings suggest that the microenvironment of protective clothing must be evaluated in conjunction with ambient environmental parameters. C.C.S.

A92-26660* Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SUPERVISORY TELEROBOTICS TESTBED FOR UNSTRUCTURED ENVIRONMENTS

S. HAYATI and J. BALARAM (JPL, Pasadena, CA) Journal of Robotic Systems (ISSN 0741-2223), vol. 9, March 1992, p. 261-280. refs

A telerobotics testbed for performing tasks such as assembly and repair of spacecraft in unstructured environments is described. This fully operational multiarm system can operate in teleoperated or supervisory control modes, as well as mixed shared-control modes, thus enabling operations in totally to partially unstructured environments. Various sources of uncertainty are identified and approaches to minimize their effects are presented. In the teleoperated mode, the system uses two force-reflecting hand controllers to operate two manipulator arms. A third arm is utilized to position four cameras to view the scene. In the supervisory mode, the system can be operated from three different levels: task, process, and servo levels, providing different levels of autonomy and performance. Various tools are provided so that an operator can perform tasks even when objects are partially occluded or their positions are not known a priori. P.D.

A92-27373

ARM OF THE FUTURE

IAN PARKER Space (ISSN 0267-954X), vol. 8, Feb.-Mar. 1992, p. 38, 39, 41.
Copyright

The use of robotics to service the Space Station Freedom is described in terms of the Hermes Robot Arm (HRA) presently being developed which can reduce total costs. The HRA project is based on the parallel development of the manipulator arm, the control system, and simulation and test facilities to investigate indirect vision, relocatability, and in-orbit maintenance of the HRA. A high degree of redundancy is designed into the HRA to protect against failures, and the HRA incorporates an optical sensor and a proximity sensor to aid service operations. C.C.S.

A92-28150

NEAR-MINIMUM-TIME CONTROL OF A FLEXIBLE MANIPULATOR

N. K. HECHT and J. L. JUNKINS (Texas A & M University, College Station) Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol. 15, Mar.-Apr. 1992, p. 477-481. Research supported by Texas Advanced Technology Program. Previously cited in issue 24, p. 3900, Accession no. A90-52997. refs
(Contract F49620-87-C-0078)
Copyright

N92-18009# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA.

COMPUTER SIMULATION MODEL OF COCKPIT CREW COORDINATION: A CREW-LEVEL ERROR MODEL FOR THE US ARMY'S BLACKHAWK HELICOPTER

WILLIAM E. GRIFFITH and JOHN E. STEWART, II Sep. 1991 69 p
(AD-A243618; ARI-RR-1601) Avail: NTIS HC/MF A04 CSCL 23/2

The purpose of this research effort was to build a crew performance computer model, using Micro Saint, a modeling framework which has been used extensively to model workload. The current model should be able to predict crew navigation and obstacle clearance errors as a function of crew workload and a variety of other variables not directly tied to workload (e.g., crew experience and familiarity, and mission threat environment). The UH-60 Blackhawk helicopter was chosen because it is a complex two-pilot aircraft. Terrain flight navigation was selected as the mission because of workload demands and the necessity that crew members communicate and coordinate with one another. This report details the conceptual development of the model and presents preliminary results from parametric experiments that were performed to validate it. Comparisons are made of workload and error probabilities for two variants of the Blackhawk: the UH-60 utility aircraft, and the MH-60K, a special operations variant soon to enter production. GRA

N92-18051# Aeronautical Research Labs., Melbourne (Australia).

AIRCREW TASKS AND COGNITIVE COMPLEXITY

J. G. MANTON and P. K. HUGHES Nov. 1991 27 p Presented at the Silver Jubilee Conference of the Australian Psychological Society, Melbourne, Australia, 23-28 Sep. 1990
(ARL-SYS-TM-150; AR-006-650) Copyright Avail: NTIS HC/MF A03

There is an increasing demand for human factors engineering of aircrew tasks during the design and development of future aircraft cockpits and aircrew workstations. The extensive data base of experimental research literature on human performance is of marginal value in aiding the design process. Outlined here are several techniques associated with the analysis and description of aircrew activities for use in prospective studies of aircrew task design. The techniques of protocol analysis, eye movement monitoring, and task analysis, among others, are reviewed. The underlying issue of cognitive complexity in the management of aircrew interfaces is addressed. Author

N92-18080# Naval Postgraduate School, Monterey, CA.

A MANAGEMENT PROPOSAL FOR DETERMINING THE EFFECTS OF COMBAT STRESS ON THE MAN-MACHINE INTERFACE OF COMPLEX INFORMATION DISPLAY SYSTEMS
M.S. Thesis

KAREN M. KEMPTON Dec. 1990 69 p
(AD-A243422) Avail: NTIS HC/MF A04 CSCL 05/8

This thesis culminates in a management plan for determining the effects of combat stress on the man-machine interface of complex information display systems. The objective is to provide to the reader background information detailing the historical development of military attitudes towards combat stress and a survey of the physiological and psychological factors which influence the resolution of this problem. Current research in these areas is discussed with emphasis on research which supports the problem's resolution. The management plan cites those agencies that have a specific background, expertise, and capability to accomplish portions of the research. For concepts requiring further study, individuals within established institutions whom are currently addressing these areas are suggested. An overall program coordinator is recommended. In conclusion, recommendations for implementation of changes in the areas of training and acquisition are cited. GRA

N92-18481# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (Germany, F.R.). Product Assurance Support.

ORGANIZATIONAL ASPECTS FOR PREVENTING HUMAN FAULTS IN SPACE SYSTEMS: SYSTEMS ENGINEERING APPROACHES TO TOTAL QUALITY MANAGEMENT

HANS JOERG KELLER 1991 24 p Presented at the ESA Symposium on Space Product Assurance for Europe in the 1990s, Noordwijk, Netherlands, 15-19 Apr. 1991

(MBB-UK-0139-91-PUB; ETN-92-90600) Avail: NTIS HC/MF A03

Approaches for improving the quality of human action, based on the fundamental systems engineering concept of interacting cybernetic control loops, are discussed. Such approaches are designed to result in Total Quality Management (TQM) principles. Motivational topdown conclusions are drawn in considering the modes of human orientation in a surrounding environment. A bottom up approach based on individual failure causes is matched with a standard model of individual responsibility. A more general collective tree model of system engineering tasks provides a preliminary survey of problem roots and respective problem solving branches which are further broken down. ESA

N92-18516# University of Northeastern Illinois, Chicago.

INDIVIDUAL DIFFERENCE EFFECTS IN HUMAN-COMPUTER INTERACTION Final Report

ANITA K. AMBARDAR Oct. 1991 225 p

(Contract MDA903-82-C-0157)

(AD-A243172; ARI-RN-92-05) Avail: NTIS HC/MF A10 CSDL 23/2

The optimum design for human-computer interfaces has become an increasingly important concern. Optimization requires interface to match the characteristics of the user with those of the computer system. At present, it is not clear what user characteristics, beyond a limited set related to experience and training, should be considered. This research project addresses this question. Many forms of human-computer interaction can be viewed as problem-solving activities. Therefore, the cognitive characteristics that affect problem-solving performance may also affect problem-solving performance in the context of user interaction with a computer system. The ideas addressed in this research program were these: (1) how fundamental, inherent individual difference dimensions of cognitive operations might influence interface design; (2) what cognitive dimension, beyond experience, is really important to human-computer interaction; and (3) aside from the classification of users into expert and novice categories, a given interface design is equally good in supporting the problem solving activity of any particular person. Two experiments were conducted. The results revealed that efficiency in using computer systems depends on user cognitive characteristics and design features of computer interface. Further, usage of interface design features significantly interacts with a subject's fundamental cognitive characteristics/cognitive style. GRA

N92-18816# Pennsylvania Univ., Philadelphia. Dept. of Engineering.

MULTIDIMENSIONAL SIGNAL CODING IN THE VISUAL

SYSTEM Annual Report No. 1, 1 Nov. 1990 - 31 Oct. 1991

GERSHON BUCHSBAUM 30 Nov. 1991 6 p

(Contract AF-AFOSR-0082-91; AF PROJ. 2313)

(AD-A244281; AFOSR-91-1013TR) Avail: NTIS HC/MF A02 CSDL 06/4

This work shows that units in the visual system are tuned to principal components of real world color natural images and provides insight on the strategy the visual system may be using to confront natural imagery. In addition, we developed an efficient coding model for natural time varying imagery in the early visual system. GRA

N92-18927*# FWG Associates, Inc., Tullahoma, TN.

CHEMICAL HAZARDS DATABASE AND DETECTION SYSTEM FOR MICROGRAVITY AND MATERIALS PROCESSING FACILITY (MMPF) Final Report

JIMMY STEELE and ROBERT E. SMITH 14 Oct. 1991 67 p

(Contract NAS8-37746)

(NASA-CR-184274; NAS 1.26:184274) Avail: NTIS HC/MF A04 CSDL 06/11

The ability to identify contaminants associated with experiments and facilities is directly related to the safety of the Space Station. A means of identifying these contaminants has been developed through this contracting effort. The delivered system provides a listing of the materials and/or chemicals associated with each facility, information as to the contaminant's physical state, a list of the quantity and/or volume of each suspected contaminant, a database of the toxicological hazards associated with each contaminant, a recommended means of rapid identification of the contaminants under operational conditions, a method of identifying possible failure modes and effects analysis associated with each facility, and a fault tree-type analysis that will provide a means of identifying potential hazardous conditions related to future planned missions. Author

N92-18988# British Aerospace Aircraft Group, Kingston-upon-Thames (England).

THE MILITARY AIRCREW HEAD SUPPORT SYSTEM (MAHSS)

A. A. MARSHALL *in* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 5 p Oct. 1991

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The Military Aircrew Head Support System (MAHSS) is designed to give the pilot extra support to his head and torso by means of cables under the control of a microprocessor. This calculates the expected tension on the cables under the prevailing G forces. It then compares these values with the actual strain on the cables. Any differences in tension to those calculated should be as a result of the pilot trying to move, and the cables will be adjusted to assist him. The MAHSS should offer benefits in terms of less fatigue (biology) and injury and the ability of the pilot to move his head while maneuvering without the danger of getting stuck in a slumped position during high G. It could also be useful during the ejection sequence, by reeling in the cables and this stabilizing the pilot's body and spine in the line of the ejection force. A simplified system was tested to 6 G in a human centrifuge with manual control of the cable lengths. The development of the system is described, including biomechanical modeling and a study into its acceptability to pilots, and other human factors issues. Author

N92-18993# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

PHYSIOLOGICAL REQUIREMENTS FOR PARTIAL PRESSURE ASSEMBLIES FOR ALTITUDE PROTECTION

A. J. F. MACMILLAN *in* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 7 p Oct. 1991

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Partial pressure assemblies using an oronasal mask and garments providing counter pressure to the torso and lower limbs may be used to provide protection against a short term exposure (1 to 2 minutes) to altitudes up to 60,000 to 65,000 feet. The performance characteristics of the delivery system used in such emergency exposures must be at least as good as that required during routine operations. Mask cavity pressure of up to 80 mmHg may be tolerated for a short period, provided adequate chest and lower limb counter pressure is provided. When upper body counter pressure is limited to the chest, then anti-G suit pressure should be at least 3 times the breathing pressure. Further tradeoffs of breathing pressure and counter pressure against absolute oxygen pressure with the use of gas mixtures with less than 100 percent oxygen should be defined by examining the effect of these tradeoffs on performance, arterial gas tensions and cardiovascular responses. Author

N92-18994# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France). Centre d'Essais en Vol.

FRENCH EQUIPMENT FOR INTEGRATED PROTECTION OF COMBAT AIRCRAFT CREWS: PRINCIPLES AND TESTS AT HIGH ALTITUDES [L'EQUIPEMENT FRANCAIS DE PROTECTION INTEGREE POUR EQUIPAGES D'AVIONS DE COMBAT MODERNE: PRINCIPES ET ESSAIS EN HAUTE ALTITUDE]

HENRI MAROTTE, HENRI VIEILLEFOND (Service de Sante des Armees, Paris, France), DAMIEN LEJEUNE, and JEAN-MICHEL CLERE *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 11 p Oct. 1991 *In* FRENCH; ENGLISH summary

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Personal flight equipment, manufactured and tested in France, to be used to protect aircraft crews against the risk of loss of pressurization at high altitudes is discussed. Slow decompression tests up to 60,000 feet showed that the altimetric positive pressure schedule was badly adapted for this kind of equipment. Specific schedules for altimetric dilution and positive pressure were established and tested with a series of rapid decompression experiments (in 2 seconds). Some explosive decompression tests were also performed. The homologation was obtained for the maximum altitude of 65,000 feet, maximum duration above 40,000 feet of 2 to 3 minutes, and an aircraft pressurization schedule of 35 kPa. Author

N92-18995# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

THE EXPERIMENTAL ASSESSMENT OF NEW PARTIAL PRESSURE ASSEMBLIES

D. P. GRADWELL *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 5 p Oct. 1991

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A new generation of partial pressure assemblies were assessed with particular reference to the optimization of counter-pressure relationships. A system of non-invasive assessment of the physiological consequences of using such assemblies during pressure breathing and following rapid decompression to altitudes between 45,000 and 60,000 feet were developed. The methods used are described and an outline of the results achievable with this system are discussed. The physiological benefits of enhanced lower body counter-pressure compared with uniform levels of pressure garment inflation are described. Suggestions for further research are given. Author

N92-18996# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France). Centre d'Essais en Vol.

PHYSIOLOGICAL PROTECTION EQUIPMENT FOR COMBAT AIRCRAFT: INTEGRATION OF FUNCTIONS, PRINCIPAL TECHNOLOGIES [PROTECTION PHYSIOLOGIQUE DES EQUIPAGES D'AVIONS DE COMBAT: INTEGRATION DE FONCTIONS, PRINCIPES TECHNOLOGIQUES]

HENRI MAROTTE, RAYMOND BEAUSSANT, RICHARD ZAPATA (L'Air Liquide, Sassenage, France), JEAN-MICHEL CLERE, and DAMIEN LEJEUNE *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 8 p Oct. 1991 *In* FRENCH; ENGLISH summary

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New generation combat aircraft crews are submitted to many kinds of constraints during flight. New technologies were developed, such as the molecular sieve oxygen concentrator (MSOC) or the electronic technology for command and/or control of regulation systems. The equipment developed allows a survey of data from the unlimited oxygen supply, with low pressure oxygen regulation systems, to anti-G protection, thanks to the assisted positive pressure breathing (APPB) apparatus. These systems are orderly integrated into the same multiple equipment systems with both respiratory and anti-G functions. New perspectives were developed: altimetric dilution schedules usable with a partial pressure suit;

compatibility of the flight equipment with non-integrated functions; and thermal (cold) protection in case of accidental immersion or nonbattle casualty (NBC) protection equipment. Author

N92-18997# Toronto Univ. (Ontario). Dept. of Mechanical Engineering.

MODEL OF AIR FLOW IN A MULTI-BLADDER PHYSIOLOGICAL PROTECTION SYSTEM

P. S. E. FARRELL, D. F. JAMES, and A. A. GOLDENBERG *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 5 p Oct. 1991

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New physiological protection systems are needed in order to keep the pilot in control of the aircraft during high G and high altitude maneuvers. A model was developed for air flow in a multi-bladder physiological protection system. Each bladder of the protection system is modeled as a flexible pressure vessel. The governing equations are derived for fluid flow from one vessel to another. The equations are simplified by five assumptions which are based on the fluid being compressible and inviscid. The result is a set of nonlinear differential equations which describe the isentropic pressure variation within the vessels. The equations are integrated numerically and yield the thermodynamic quantities within each vessel as a function of time. Based on the differential equations, a computer simulation of the flexible pressure vessel model was performed. The simulation allows for many possible configurations and scenarios. Five basic configurations are discussed here. Author

N92-18998# Royal Aircraft Establishment, Farnborough (England). Aircrew Integration Section.

THE DESIGN AND DEVELOPMENT OF A FULL-COVER PARTIAL PRESSURE ASSEMBLY FOR PROTECTION AGAINST HIGH ALTITUDE AND G

A. E. HAY and JUDY E. APLIN *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 6 p Oct. 1991

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A partial pressure assembly comprising a chest counter pressure garment (CCPG) and full-cover trousers (FAGTS) were designed and constructed. The CCPG is a simple two-layer outer garment located under the life preserver and supplied with breathing gas from the demand regulator. The FAGTS comprise a single bladder which covers the abdomen, legs, and feet, retained by an outer inextendable layer of Nomex, with the ability to be donned quickly by employing zips and low friction lacing for final fit adjustment. Gas supplied from a suitably programmed G-valve inflates the garment to provide protection. Details of the design approach and the developmental stages to date are given together with an outline of the anthropometric considerations required to provide a snug fitting assembly from a limited size roll. Author

N92-18999# Normalair-Garrett Ltd., Yeovil (England). Military Breathing Systems.

ADVANCES IN THE DESIGN OF MILITARY AIRCREW BREATHING SYSTEMS WITH RESPECT TO HIGH ALTITUDE AND HIGH ACCELERATION CONDITIONS

NIGEL P. J. LOVETT *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 4 p Oct. 1991

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It was concluded that for future aircraft systems the combining of an anti-gravity valve and a breathing regulator into one unit provides the most compact and effective system. The advances made by the research establishments in the development of new aircrew garments reduces the need for quick response, electronically controlled valves, thus suggesting that mechanically controlled systems still provide the optimum protection for aircrews under high acceleration conditions. Author

N92-19000# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

HIGH ALTITUDE HIGH ACCELERATION AND NBC WARFARE PROTECTIVE SYSTEM FOR ADVANCED FIGHTER AIRCRAFT: DESIGN CONSIDERATIONS

A. J. F. MACMILLAN *In* AGARD, High Altitude and High Acceleration Protection for Military Aircrew 7 p Oct. 1991
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The physiological, technical and flight safety aspects of the design of an integrated system providing protection against high sustained acceleration, short duration exposure to high altitude and nuclear-biological-chemical (NBC) warfare agents are discussed. The proposed system employs a molecular sieve oxygen concentrator and seat mounted demand regulator and anti-gravity valve together with a source of clean filtered air and an emergency gaseous oxygen supply. The personal equipment assembly comprises counter pressure garments worn external to the NBC protective layer and a man-mounted filter. The filter assembly is used on the ground with a portable ventilator, in the air connected to the breathing gas supply, and post escape as part of a lung powered respirator system. Author

N92-19008# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.

HELMET MOUNTED DISPLAYS AND NIGHT VISION GOGGLES

Dec. 1991 121 p *In* ENGLISH and FRENCH Symposium held in Pensacola, FL, 2 May 1991
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Papers covered basic and applied issues related to human factors and device integration. Three papers considered the ergonomics of helmet design and the snugness of fit to the head and the integration of new helmet mounted devices with existing equipment. Two papers considered the effects of novel helmet designs on the pilot's ability to control head position and avoid fatigue. Two papers reported in-flight testing of human performance using novel devices. Several papers considered the human factors of visual performance related to such topics as degree of binocular overlap, overall field of view, and the ability to maintain level flight. Other papers considered issues of the nature of information displayed, including data fused from multiple sources and the design of abstract symbolologies that present parameters of flight.

N92-19009# IBIS Aerosystems Ltd., Sharnbrook (England).

FIXED WING NIGHT ATTACK EO INTEGRATION AND SENSOR FUSION

LES EVANS *In* AGARD, Helmet Mounted Displays and Night Vision Goggles 5 p Dec. 1991
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Discussed here are some of the aeromedical aspects of the development of fixed wing night attack using electro-optic sensors. Addressed are some of the problems encountered when night vision goggles (NVG's) and Forward Looking Infra-Red (FLIR) equipment were integrated into a complete airborne system. The aeromedical problems encountered when NVG's were used in fast jet aircraft are discussed. It was found that helmet fit had to be tight to ensure that the high helmet rotational forces produced by normal accelerations were contained, and also that when wearing NVG's while pulling 'g', a tumbling sensation could be induced in the pilot by head movements. Author

N92-19010# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.

THE DESIGN AND EVALUATION OF FAST-JET HELMET MOUNTED DISPLAYS

A. KARAVIS and G. J. N. CLARKSON *In* AGARD, Helmet Mounted Displays and Night Vision Goggles 8 p Dec. 1991
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The design philosophy adopted by the Flight Systems Department of the Royal Aerospace Establishment (RAE), Farnborough for its fast-jet helmet display program is discussed. Details are given on the development of two devices and the tests and methods used to meet flight safety measurements. The devices, a Helmet Mounted Sight (HMS) and an Oxygen Mask Mounted Sight (OMMS), each posed different problems due to their inherently dissimilar concepts. Modifications to these devices as a result of ground and air testing to meet flight safety and operational requirements are covered. The ergonomic considerations applicable to the use of these and other head mounted devices when employed as integral components of the weapon system are also discussed. A brief account is given of display design considerations. Two helmet devices were successfully produced for evaluation in a combat environment. Author

N92-19011# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (Germany, F.R.). Helicopter Div.

HELICOPTER INTEGRATED HELMET REQUIREMENTS AND TEST RESULTS

HANS-DIETER VONBOEHM and HERBERT SCHREYER *In* AGARD, Helmet Mounted Displays and Night Vision Goggles 17 p Dec. 1991 Previously announced as N92-12422
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Integrated Helmet (IH) requirements for helicopter applications and some test results are given. A modern IH consists of two Image Intensifier Tubes (IIT) and two Cathode Ray Tubes (CRT) with an optical system, including combiners to present binocular images. Additional symbology can be superimposed on the CRT or IIT image. An IH is a further development of a helmet mounted display. A Helmet Mounted Sight (HMS) can steer a sensor platform with a thermal camera, or an air to air missile system. The main helicopter requirements of such a system are given. Author

N92-19012# Aerospace Medical Research Labs., Wright-Patterson AFB, OH. Human Engineering Div.

AN EVALUATION OF THE PROTECTIVE INTEGRATED HOOD MASK FOR ANVIS NIGHT VISION GOGGLE COMPATIBILITY

MARY M. DONOHUE-PERRY and JOSEPH T. RIEGLER (Logicon Technical Services, Inc., Dayton, OH.) *In* AGARD, Helmet Mounted Displays and Night Vision Goggles 4 p Dec. 1991
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An evaluation was conducted to determine potential compatibility problems found while using the Protective Integrated Hood Mask (PIHM) with the Aviator's Night Vision Imaging System (ANVIS). The evaluation consisted of field tests performed at Pope Air Force Base using qualified C-130E crewmembers, and laboratory tests conducted at Wright-Patterson Air Force Base. Examinations of horizontal and vertical intensified fields of view, cockpit lighting compatibility, and a subjective evaluation of fit were conducted at Pope Air Force Base. Visual acuity through the ANVIS/PIHM, and distortion and transmissivity of the PIHM visor were determined Wright Patterson Air Force Base. Acuity through ANVIS with and without PIHM was assessed under quarter moon and starlight illuminations. Acuity was tested using 20 percent and 90 percent Landolt C targets depicted in one of four orientations. Overall conclusions were that potential compatibility problems of ANVIS and PIHM can be reduced or eliminated with proper fit and adjustment of the ANVIS/PIHM. Author

N92-19013# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

THE RAF INSTITUTE OF AVIATION MEDICINE PROPOSED HELMET FITTING/RETENTION SYSTEM

JOHN V. BARSON and ROGER J. CROFT *In* AGARD, Helmet Mounted Displays and Night Vision Goggles 5 p Dec. 1991
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The role of the protective flying helmet has expanded from being a device for protecting the flyer from impact and noise

hazards to include mounting platforms for vision enhancement devices as well as target sighting and designation systems. A new helmet fitting and/or retention system is described that has the potential to provide a quick and effective method of rendering a good, safe, and stable helmet fit using a minimum number of helmet sizes. The fitting or retention system also provides a relatively consistent eye position for optical systems and allows rapid donning of a chemical defense respirator. Also, the fitting or retention system can be used for a 'one size fits all' helmet while retaining all the features for personnel who are only flying on specific missions and normally are not issued a flight helmet. The system uses a series of straps and an occipital pusher plate to accommodate head length. The height adjustment is provided by a specifically shaped and contoured pad in the top of the helmet which contacts the head in such a way and over a large area to correctly position the helmet vertically on the head for a wide range of pupil-vertex heights. Author

N92-19014# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France). Centre d'Essais en Vol.
BIOMECHANICAL RESPONSE OF THE HEAD TO G+ ACCELERATIONS: BENEFIT FOR STUDIES IN COMBAT SIMULATORS [REPOSE BIOMECHANIQUE DE LA TETE AUX ACCELERATIONS+ GZ: INTERET POUR LES ETUDES EN SIMULATEUR DE COMBAT]

A. LEGER, P. SANDOR, C. BOURSE, and A. ALAIN *In* AGARD, *Helmet Mounted Displays and Night Vision Goggles* 9 p Dec. 1991 *In* FRENCH Prepared in cooperation with Centre d'Electronique de l'Armement, Bruz (France)
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Fixed base simulators cannot provide the effect of biomechanical constraints resulting from accelerations, which can pose problems in interpreting studies of helmet mounted sights. One study, in a human centrifuge, of the biomechanical response of the head during an orientation task was conducted for different gradients of variation of acceleration (0.3, 0.6, and 1 G/s). Terminal acceleration in every case plateaued at +5 G. The results obtained show that the stability of the orientation (Mean Quadratic Deviation) on an infinitely collimated target varied from 0.8 deg at 0.3 G/s to more than 2 deg at 1 G/s. The characteristics of the biomechanical response of the head were analyzed. Practical recommendations are made for modeling the effect of the biomechanical constraint at the time of combat simulator studies.

Transl. by M.G.

N92-19015# New Orleans Univ., LA. Dept. of Mathematics.
A KINEMATIC MODEL FOR PREDICTING THE EFFECTS OF HELMET MOUNTED SYSTEMS

TERRY A. WATKINS, M. S. WEISS, D. W. CALL, and S. J. GUCCIONE, JR. (Naval Biodynamics Lab., New Orleans, LA.) *In* AGARD, *Helmet Mounted Displays and Night Vision Goggles* 7 p Dec. 1991
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A statistical study was made using head kinematic response data from a set of 79 human -X impact acceleration tests. Five volunteer subjects were tested successively in three configurations: (1) no helmet; (2) helmet only; and (3) helmet with weights. The peak acceleration levels ranged from 3 to 10 g. Three kinematic responses, the X and Z components of the linear acceleration and the Y axis angular acceleration, were analyzed. These acceleration curves were fitted with polynomial splines using least squares techniques. The fitted peaks and times to peak were then regressed against sled acceleration, initial head orientation and head/neck anthropometric parameters. Statistical measures of goodness of fit were highly significant. The regression equations were used to simulate the effects of varying individual parameters (such as total head mass, peak sled acceleration, neck length, etc.). The results show an analytical approach for extrapolating human neck/head kinematics to levels and types of exposure where injury would be expected. Future applications of this

modeling technique include analysis of the effects of mass distribution parameters on head/neck dynamic response to +Z vertical impact acceleration. Author

N92-19016# British Aerospace Public Ltd. Co., Bristol (England). Human Factors Dept.

THE EFFECTS UPON VISUAL PERFORMANCE OF VARYING BINOCULAR OVERLAP

G. K. EDGAR, K. T. CARR, M. WILLIAMS, J. PAGE, and A. L. CLARKE *In* AGARD, *Helmet Mounted Displays and Night Vision Goggles* 15 p Dec. 1991

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In a helmet mounted display, there is a tradeoff between the binocular overlap of the images presented to each eye and the total field of view. It is therefore desirable to see whether decreasing the binocular overlap (and thus making possible a large total FOV) adversely affects performance. The results are reported of four experiments examining the effects of different binocular overlaps upon performance on a visual search task, and the factors that may explain any differences in the results obtained with different overlap conditions. The results indicated that performance was poorer in all non-100 pct. overlap conditions, and suggested that this decrement in performance could be explained by the presence of depth boundaries introduced by a disparity between the images presented to each eye. Author

N92-19017# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).

RESTRICTION OF THE FIELD OF VISION: INFLUENCE ON EYE-HEAD COORDINATION DURING ORIENTATION TOWARDS AN ECCENTRIC TARGET [RESTRICTION DU CHAMP DE VISION: INFLUENCE SUR LA COORDINATION OEIL-TETE PENDANT L'ORIENTATION VERS UNE CIBLE EXCENTREE]

PATRICK SANDOR and ALAIN LEGER *In* AGARD, *Helmet Mounted Displays and Night Vision Goggles* 6 p Dec. 1991 *In* FRENCH

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Vision in a limited field of vision deviates more and more frequently with use of optronic helmet-mounted systems. The consequences of restricted field on the characteristics of eye-head coordination were studied during a task of orientation toward an eccentric pinpoint target. Three sizes of binocular fields were tested (20 degree, 70 degree, and free field). A pinpoint target is projected onto a round screen in a horizontal plane passing in front of the subject's eyes. The target is presented with three different eccentricities: 45, 65, and 85 degrees. The tests are carried out in two modes: expected and semi-expected, where only the side (left or right) is indicated. The unexpectedness increases the time to acquisition. It is accompanied by an increase in the number of eye motions. The mean and maximum rates of eye motion seem to be maintained constant by means of continual adjustment of eye and head speeds. Amplitude limitation of the eye movements linked to vision restriction is not compensated by use of the entire available field. Generally, only the half-field of vision of the same side as the displacement is used. In conclusion, the results show that restriction of the field of vision modifies the motor behaviors involved in eye-head coordination, especially when the placement of the target is unexpected. An understanding of these mechanisms can eventually contribute to optimizing the use of helmet-mounted optronic devices. Author

N92-19018# Aerospace Medical Research Labs., Wright-Patterson AFB, OH. Human Engineering Div.

THE EFFECT OF FIELD-OF-VIEW SIZE ON PERFORMANCE OF A SIMULATED AIR-TO-GROUND NIGHT ATTACK

ROBERT K. OSGOOD and MAXWELL J. WELLS (Logicon Technical Services, Inc., Dayton, OH.) *In* AGARD, *Helmet Mounted Displays and Night Vision Goggles* 7 p Dec. 1991

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Five experienced fighter pilots flew a simulated, night attack, pop-up bomb delivery, with a flight simulator that had a head-mounted display. The mission was conducted with an aircraft-fixed forward looking infrared sensor (FLIR) or a head-steered FLIR. With the head-steered FLIR, the sensor image was viewed on a helmet-mounted display, whereas, the aircraft-fixed FLIR was presented on a heads-up display (HUD). With both types of sensor, the field of view (FOV) size may affect performance, and to provide data for the determination of the minimum FOV size for helmet-mounted displays (HMD's). With a head-steered sensor, subjects acquired the targets earlier in the mission and released their bomb at a higher altitude. Increasing the size of the FOV also resulted in earlier target acquisition. It is explained how early target acquisition allowed subjects to modify their flight paths and position their aircraft for higher releases. Using criterion, HMD FOV's of 20 and 30 degrees were significantly worse than FOV's of 40, 60, or 80 degrees. Author

N92-19019# Centre d'Etudes et de Recherches de Medecine Aeronautique, Paris (France). Div. Vision et Ergonomie.

DOES THE FUTURE LIE IN BINOCULAR HELMET DISPLAY? [L'AVENIR EST-IL AU VISUEL DE CASQUE BINOCULAIRE?]

CORINNE ROUMES, JUSTIN PLANTIER, and JEAN-PIERRE MENU *In* AGARD, Helmet Mounted Displays and Night Vision Goggles 9 p Dec. 1991 *In* FRENCH

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The introduction of a binocular capability in helmet displays can be considered as a rebalancing of visual stimuli between the two eyes, given the specific properties of human vision. The potential advantage of binocular helmets rests with the transposition of visual processing capabilities to the conditions of image generation and reconstruction in the helmet's display. Several problems resulting from this transfer are envisaged: some require experimental investigation, especially determining the tolerance of partial binocularity and to the constraints of the aeronautical environment. In view of these difficulties, the role of binocularity in the display can be envisaged differently in the presentation of real world images through sensors or synthesized input, in the framework of an actual flight or of simulation. Author

N92-19020# Center for Night Vision and Electro-Optics, Fort Belvoir, VA.

DESIGN OF HELICOPTER NIGHT PILOTAGE SENSORS: LESSONS LEARNED FROM RECENT FLIGHT EXPERIMENTS AND FIELD ASSESSMENTS Abstract Only

RICHARD VOLLMERHAUSEN, TRANG BUI, and CAROLYN NASH *In* AGARD, Helmet Mounted Displays and Night Vision Goggles 1 p Dec. 1991

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The Army requirement to fly helicopters at low level at night led to the development and fielding of night vision pilotage sensors. These sensors have included image intensifiers (I sup 2) operating in the near infrared as well as 8 to 12 micron thermal imagers. The design of current pilotage sensors was driven by available technology. There were no clear data for optimum pilotage sensor design, to enable the designer to trade off sensor field of view (FOV) and resolution or to predict the performance sensitivity. The Center of Night Vision and Electro-Optics (CCNVEO) is establishing design criteria for night pilotage sensors. Our program included flight experiments to define sensor characteristics which optimize flight tasks as well as assessments of the performance of fielded systems. We conclude that terrain flight can be accomplished with reasonable pilot workload using a head-tracked sensor with 40 degree FOV and 0.6 cycles per milliradian (cy/mrad) resolution. Larger FOV or better resolution will lessen workload and improve confidence; however, the ability to resolve scene detail of 0.6 cy/mrad is essential and should not be traded for increased FOV. Furthermore, a pilotage system which provides both thermal and I sup 2 imagery will significantly enhance system capability to support a variety of flight tasks under a wide range of environments. We also conclude that solid state cameras with

detector dwell time equal to the standard video field rate are not suitable for use in helicopter pilotage systems. The long dwell time leads to image blur due to the head and scene motion associated with many pilotage tasks. Author

N92-19021# Royal Aircraft Establishment, Farnborough (England). Flight Systems Dept.

HELMET MOUNTED DISPLAYS: HUMAN FACTORS AND FIDELITY

PETER L. N. NAISH and HELEN J. DUDFIELD *In* AGARD, Helmet Mounted Displays and Night Vision Goggles 5 p Dec. 1991

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Helmet mounted display (HMD) systems, of the kind able to present what has been termed virtual reality, will not be able to present a completely faithful rendering of the world. This paper shows how non-HMD technology may be used to assess the effects of this deficiency. Three aspects of the helmet mounted system are considered, and experiments are reported, which were designed to determine the degree of reality required in flyable equipment. The areas covered are time lag in the display, the need for color, and the use of 3-D sound. It is concluded that, for the parameters considered, currently available technology is able to produce stimuli which are adequate for the anticipated use of HMDs. Author

N92-19022# Aerospace Medical Research Labs., Wright-Patterson AFB, OH. Human Engineering Div.

ATTITUDE MAINTENANCE USING AN OFF-BORESIGHT HELMET-MOUNTED VIRTUAL DISPLAY

ROBERT K. OSGOOD, ERIC E. GEISELMAN, and CHRISTOPHER S. CALHOUN (Logicon Technical Services, Inc., Dayton, OH.) *In* AGARD, Helmet Mounted Displays and Night Vision Goggles 7 p Dec. 1991

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Helmet mounted displays (HMDs) enable flight information to be displayed within the pilot's field of view, regardless of head position in the cockpit. The present research investigates an off boresight HMD (OBHMD), which appears when the pilot's head position is greater than 20 deg from the aircraft's boresight. Nine subjects flew a simulated, low level, high speed, airborne surveillance/reconnaissance mission, while monitoring a hostile adversary aircraft. The results indicate pilots were able to spend more time and look further off boresight with an OBHMD than without one. In addition, missions with an OBHMD produced fewer terrain impacts. Author

N92-19023# Sextant Avionique, Saint Medard en Jalles (France). Div. Visualisation Interface.

DESIGN METHODOLOGY FOR A HELMET DISPLAY: ERGONOMIC ASPECTS [METHODOLOGIE DE CONCEPTION D'UN VISUEL DE CASQUE: LES ASPECTS ERGONOMIQUES]

J. M. KRAUS, P. LACROUX, and A. LEGER *In* AGARD, Helmet Mounted Displays and Night Vision Goggles 6 p Dec. 1991 *In* FRENCH

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Purely from the standpoint of vision, the design of a helmet display presents relatively few differences from that of a more classic visualization device such as a head-up display. For the engineer, one of the major difficulties encountered in designing a head mounted system rests in the fact that the carrying structure is far from being as well defined as are the usual supports. The diversity of anatomical and functional specifications of the pilot's head constitutes the source of ergonomic constraints that must be taken into account. The first part of this study addressed the precise identification of the limiting constraints encountered: antropometric and biomechanical constraints as well as those of secuness, comfort, manipulation, and environment. The data from previous research, computer aided design (CAD), and the simultaneous development of ergonomic and physical models permit a global approach to these different problems. The second

part of the study exposes the essential aspects of the methodological principles used. In conclusion, reflection on the design development for helmet displays makes apparent the need for early integration of the vision aspects and physical ergonomic requirements. This is a major and indispensable asset that will lead to the creation of a device that will satisfy the requirements imposed by weapon systems and their users. Transl. by M.G.

N92-19179# Air Force Inst. of Tech., Wright-Patterson AFB, OH. School of Engineering.

APPLICATION OF FINITE ELEMENT MODELING AND ANALYSIS TO THE DESIGN OF POSITIVE PRESSURE OXYGEN MASKS M.S. Thesis

BRUCE H. BITTERMAN Dec. 1991 127 p
(AD-A244045; AFIT/GAE/ENY/91D-22) Avail: NTIS HC/MF A07 CSCL 05/8

This study investigated tools and techniques for performing finite element analysis of the MBU-20/P pilot's oxygen mask. The problem which was investigated was the fit of the mask to the face at Positive Pressure Breathing (PPB) pressures. Deformed geometry of the mask and reaction forces on the face were calculated to provide a measure of the fit. The MBU-20/P mask was first digitized by 3-D digitizer. A computer program was written to translate the digitized coordinate data to a finite element format for two commercial packages. The packages targeted were SDRC I-DEAS and PDA PATRAN. Other supplementary programs were written to perform some functions which would have been difficult to accomplish within the commercial codes. The tools and techniques developed are applicable to a wide class of problems, beyond the specific application to the oxygen mask analysis. They provide a capability to rapidly develop finite element models from existing prototypes for redesign, detailed analysis, or reverse engineering. GRA

N92-19447# Center for Night Vision and Electro-Optics, Fort Belvoir, VA.

COMPARISON OF SECOND AND THIRD GENERATION NIGHT VISION GOGGLES IN TIME-LIMITED SCENARIOS Final Report
EDWARD J. BENDER, CHARLES E. BRADFORD, and RAYMOND J. STEFANIK Jul. 1991 97 p

(AD-A244330; AMSEL-NV-TR-0080) Avail: NTIS HC/MF A05 CSCL 17/5

This report addresses eight nights of field testing which occurred at three sites (pine canopy, cluttered range, open meadow) in the Deschutes National Forest, OR, during May 1988. The primary objective of these field evaluations was to characterize changes in detection performance of second and third generation Night Vision Goggles. These changes were to be examined as a function of both allowed observation time and progressive user fatigue. GRA

N92-19772*# National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX.

A METHOD OF EVALUATING EFFICIENCY DURING SPACE-SUITED WORK IN A NEUTRAL BUOYANCY ENVIRONMENT

MICHAEL C. GREENISEN, PHILLIP WEST, FREDERICK K. NEWTON, JOHN H. GILBERT, and WILLIAM G. SQUIRES (Texas Lutheran Coll., Seguin.) Oct. 1991 11 p
(NASA-TP-3153; S-648; NAS 1.60:3153) Avail: NTIS HC/MF A03 CSCL 05/8

The purpose was to investigate efficiency as related to the work transmission and the metabolic cost of various extravehicular activity (EVA) tasks during simulated microgravity (whole body water immersion) using three space suits. Two new prototype space station suits, AX-5 and MKIII, are pressurized at 57.2 kPa and were tested concurrently with the operationally used 29.6 kPa shuttle suit. Four male astronauts were asked to perform a fatigue trial on four upper extremity exercises during which metabolic rate and work output were measured and efficiency was calculated in each suit. The activities were selected to simulate actual EVA tasks. The test article was an underwater dynamometry system to which the astronauts were secured by foot restraints. All metabolic

data was acquired, calculated, and stored using a computerized indirect calorimetry system connected to the suit ventilation/gas supply control console. During the efficiency testing, steady state metabolic rate could be evaluated as well as work transmitted to the dynamometer. Mechanical efficiency could then be calculated for each astronaut in each suit performing each movement.

Author

N92-19808# Galaxy Scientific Corp., Mays Landing, NJ.
HUMAN FACTORS IN AVIATION MAINTENANCE, PHASE 1 Interim Report, Sep. 1989 - Jan. 1991

WILLIAM T. SHEPHERD, WILLIAM B. JOHNSON, COLIN G. DRURAY, JAMES C. TAYLOR, and DANIEL BERNINGER Nov. 1991 168 p
(AD-A243844; DOT/FAA/AM-91/16) Avail: NTIS HC/MF A08 CSCL 01/3

This human factors research in aviation maintenance addresses four tasks including studies of organizational behavior, job and task analysis in maintenance and inspection, advanced technology for training, and the application of job aiding to maintenance. The first phase of a three phase research program describes extensive preliminary investigation of airline maintenance practices. Each chapter describes the Phase 1 investigation and problem definition followed by the plan for the Phase 2 demonstrations. GRA

N92-19829# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.

HORIZONTAL IMPACT TESTS OF THE ADVANCED DYNAMIC ANTHROPOMORPHIC MANIKIN (ADAM) Final Report, 1 Nov. - 30 Dec. 1988

JOSEPH P. STRZELECKI and JOHN R. BUHRMAN Apr. 1991 126 p
(Contract AF PROJ. 2868; AF PROJ. 7231)
(AD-A243857; AL-TR-1991-0096) Avail: NTIS HC/MF A07 CSCL 05/8

Forty four tests were conducted to demonstrate the structural integrity, functional capability, and stability of the electronics under impact conditions of up to -40 Gx and +14 Gy. The CREST ejection seat configuration was used along with two versions of the CREST X-Band harness. Test results indicated the Anthropomorphic Manikins are structurally sound but prone to circuit board and wiring failures. The capability of the ADAMs to reproduce specific dynamic response of human subjects taken as a whole was good, but the accuracy of the instrumentation was not able to provide measurements consistently within five percent of the true value. GRA

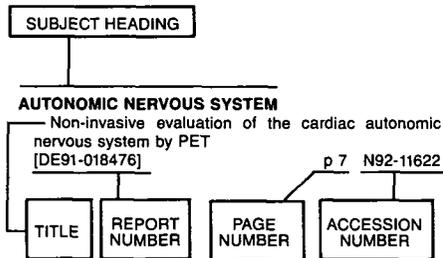
N92-19926# Centre d'Etudes et de Recherches Bio-Physiologiques Appliquees a la Marine, Toulon (France). Div. d'Electrophysiologie et Psychophysiologie.

DEVELOPMENT OF AN ELECTROMYOGRAPHY AND ACCELEROMETRY AMBULATORY RECORDING SYSTEM [MISE AU POINT D'UN SYSTEME D'ENREGISTREMENT AMBULATOIRE D'ELECTROMYOGRAPHIE ET D'ACCELEROMETRIE]

J. GRAPPERON, F. LORENZO, F. VIDAL, S. C. P. PITTET, D. BRUSCHERA, D. VILLARD, and A. TROUSSET May 1991 15 p In FRENCH; ENGLISH summary
(Contract DRET-91-1012-J)
(CERB-91-07; ETN-92-91083) Avail: NTIS HC/MF A03

An ambulatory recorder was developed to record, in aircraft, cervical electromyogram and acceleration along two axes measured on the helmet. The work consisted of the adaptation of a pre-existing polygraphic recorder (Medilog 9000). Its working under acceleration was checked, and outputs with those obtained from a laboratory recorder were compared. ESA

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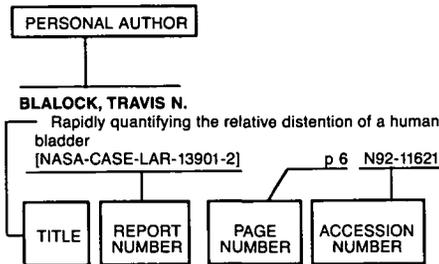
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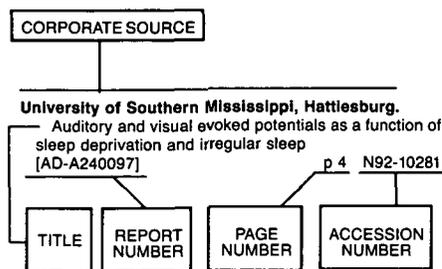
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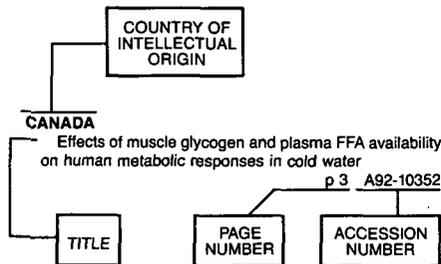
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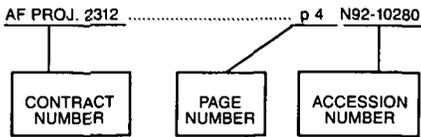
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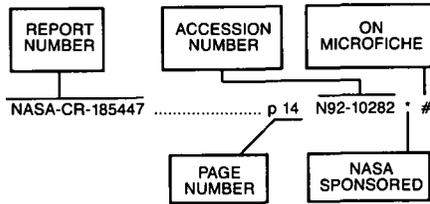
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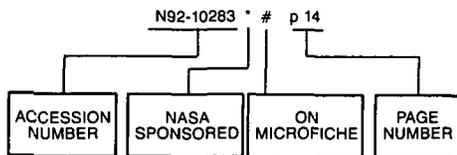


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(208) 885-6344 FAX: (208) 885-6817

ILLINOIS

ILLINOIS STATE LIBRARY
Reference Dept.
300 South Second
Springfield, IL 62701-1796
(217) 782-7596 FAX: (217) 524-0041

INDIANA

INDIANA STATE LIBRARY
Serials/Documents Section
140 North Senate Avenue
Indianapolis, IN 46204
(317) 232-3678 FAX: (317) 232-3728

IOWA

UNIV. OF IOWA LIBRARIES
Govt. Publications Dept.
Washington & Madison Streets
Iowa City, IA 52242
(319) 335-5926 FAX: (319) 335-5830

KANSAS

UNIV. OF KANSAS
Govt. Documents & Map Library
6001 Malatt Hall
Lawrence, KS 66045-2800
(913) 864-4660 FAX: (913) 864-5380

KENTUCKY

UNIV. OF KENTUCKY LIBRARIES
Govt. Publications/Maps Dept.
Lexington, KY 40506-0039
(606) 257-3139 FAX: (606) 257-1563;
257-8379

LOUISIANA

LOUISIANA STATE UNIV.
Middleton Library
Govt. Documents Dept.
Baton Rouge, LA 70803
(504) 388-2570 FAX: (504) 388-6992

LOUISIANA TECHNICAL UNIV.

Prescott Memorial Library
Govt. Documents Dept.
305 Wisteria Street
Ruston, LA 71270-9985
(318) 257-4962 FAX: (318) 257-2447

MAINE

TRI-STATE DOCUMENTS DEPOSITORY
Raymond H. Fogler Library
Govt. Documents & Microforms Dept.
Univ. of Maine
Orono, ME 04469
(207) 581-1680

MARYLAND

UNIV. OF MARYLAND
Hornbake Library
Govt. Documents/Maps Unit
College Park, MD 20742
(301) 454-3034 FAX: (301) 454-4985

MASSACHUSETTS

BOSTON PUBLIC LIBRARY
Govt. Documents Dept.
666 Boylston Street
Boston, MA 02117
(617) 536-5400 ext. 226
FAX: (617) 267-8273; 267-8248

MICHIGAN

TRETOIT PUBLIC LIBRARY
5201 Woodward Avenue
Detroit, MI 48202-4093
(313) 833-1440; 833-1409
FAX: (313) 833-5039

LIBRARY OF MICHIGAN

Govt. Documents Unit
P.O. Box 30007
Lansing, MI 48909
(517) 373-0640 FAX: (517) 373-3381

MINNESOTA

UNIV. OF MINNESOTA
Wilson Library
Govt. Publications Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 624-5073 FAX: (612) 626-9353

MISSISSIPPI

UNIV. OF MISSISSIPPI
J.D. Williams Library
Federal Documents Dept.
106 Old Gym Bldg.
University, MS 38677
(601) 232-5857 FAX: (601) 232-5453

MISSOURI

UNIV. OF MISSOURI - COLUMBIA
Ellis Library
Govt. Documents
Columbia, MO 65201
(314) 882-6733 FAX: (314) 882-8044

MONTANA

UNIV. OF MONTANA
Maureen & Mike Mansfield Library
Documents Div.
Missoula, MT 59812-1195
(406) 243-6700 FAX: (406) 243-2060

NEBRASKA

UNIV. OF NEBRASKA - LINCOLN
D.L. Love Memorial Library
Documents Dept.
Lincoln, NE 68588
(402) 472-2562

NEVADA

UNIV. OF NEVADA
Reno Library
Govt. Publications Dept.
Reno, NV 89557
(702) 784-6579 FAX: (702) 784-1751

NEW JERSEY

NEWARK PUBLIC LIBRARY
U.S. Documents Div.
5 Washington Street -
P.O. Box 630
Newark, NJ 07101-0630
(201) 733-7812 FAX: (201) 733-5648

NEW MEXICO

UNIV. OF NEW MEXICO
General Library
Govt. Publications Dept.
Albuquerque, NM 87131-1466
(505) 277-5441 FAX: (505) 277-6019

NEW MEXICO STATE LIBRARY

325 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827-3826 FAX: (505) 827-3820

NEW YORK

NEW YORK STATE LIBRARY
Documents/Gift & Exchange Section
Federal Depository Program
Cultural Education Center
Albany, NY 12230
(518) 474-5563 FAX: (518) 474-5786

NORTH CAROLINA

UNIV. OF NORTH CAROLINA - CHAPEL HILL
CB#3912, Davis Library
BA/SS Dept.—Documents
Chapel Hill, NC 27599
(919) 962-1151 FAX: (919) 962-0484

NORTH DAKOTA

NORTH DAKOTA STATE UNIV. LIBRARY
Documents Office
Fargo, ND 58105
(701) 237-8886 FAX: (701) 237-7138
In cooperation with Univ. of North
Dakota, Chester Fritz Library
Grand Forks

OHIO

STATE LIBRARY OF OHIO
Documents Dept.
65 South Front Street
Columbus, OH 43266
(614) 644-7051 FAX: (614) 752-9178

OKLAHOMA

OKLAHOMA DEPT. OF LIBRARIES
U.S. Govt. Information Div.
200 NE 18th Street
Oklahoma City, OK 73105-3298
(405) 521-2502, ext. 252, 253
FAX: (405) 525-7804

OKLAHOMA STATE UNIV.

Edmon Low Library
Documents Dept.
Stillwater, OK 74078
(405) 744-6546 FAX: (405) 744-5183

OREGON

PORTLAND STATE UNIV.
Millar Library
934 SW Harrison - P.O. Box 1151
Portland, OR 97207
(503) 725-3673 FAX: (503) 725-4527

PENNSYLVANIA

STATE LIBRARY OF PENN.
Govt. Publications Section
Walnut St. & Commonwealth Ave. -
P.O. Box 1601
Harrisburg, PA 17105
(717) 787-3752

SOUTH CAROLINA

CLEMSON UNIV.
Cooper Library
Public Documents Unit
Clemson, SC 29634-3001
(803) 656-5174 FAX: (803) 656-3025
In cooperation with Univ. of South
Carolina, Thomas Cooper Library,
Columbia

TENNESSEE

MEMPHIS STATE UNIV. LIBRARIES
Govt. Documents
Memphis, TN 38152
(901) 678-2586 FAX: (901) 678-2511

TEXAS

TEXAS STATE LIBRARY
United States Documents
P.O. Box 12927 - 1201 Brazos
Austin, TX 78711
(512) 463-5455 FAX: (512) 463-5436

TEXAS TECH. UNIV. LIBRARY

Documents Dept.
Lubbock, TX 79409
(806) 742-2268 FAX: (806) 742-1920

UTAH

UTAH STATE UNIV.
Merrill Library & Learning Resources
Center, UMC-3000
Documents Dept.
Logan, UT 84322-3000
(801) 750-2684 FAX: (801) 750-2677

VIRGINIA

UNIV. OF VIRGINIA
Alderman Library
Govt. Documents
Charlottesville, VA 22903-2498
(804) 924-3133 FAX: (804) 924-4337

WASHINGTON

WASHINGTON STATE LIBRARY
Document Section
MS AJ-11
Olympia, WA 98504-0111
(206) 753-4027 FAX: (206) 753-3546

WEST VIRGINIA

WEST VIRGINIA UNIV. LIBRARY
Govt. Documents Section
P.O. Box 6069
Morgantown, WV 26506
(304) 293-3640

WISCONSIN

ST. HIST. SOC. OF WISCONSIN LIBRARY
Govt. Publications Section
816 State Street
Madison, WI 53706
(608) 262-2781 FAX: (608) 262-4711
In cooperation with Univ. of Wisconsin-
Madison, Memorial Library

MILWAUKEE PUBLIC LIBRARY

Documents Div.
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 278-2167 FAX: (414) 278-2137

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