



Aerospace Medicine and Biology
A Continuing Bibliography with Indexes

NASA SP-7011 (220)
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STAR (N-10000 Series) N81-17981 – N81-20004

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 220)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in May 1981 in

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

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 137 reports, articles and other documents announced during May 1981 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

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

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1981 Supplements.

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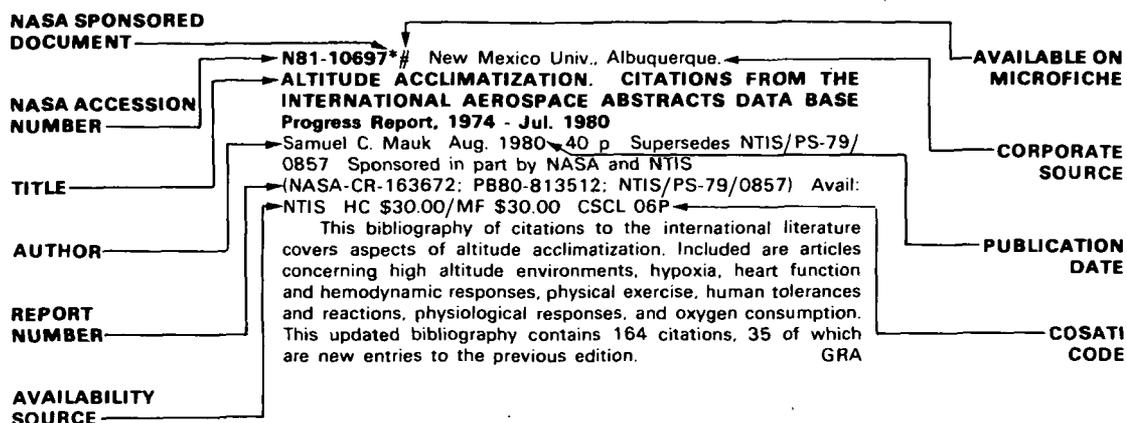
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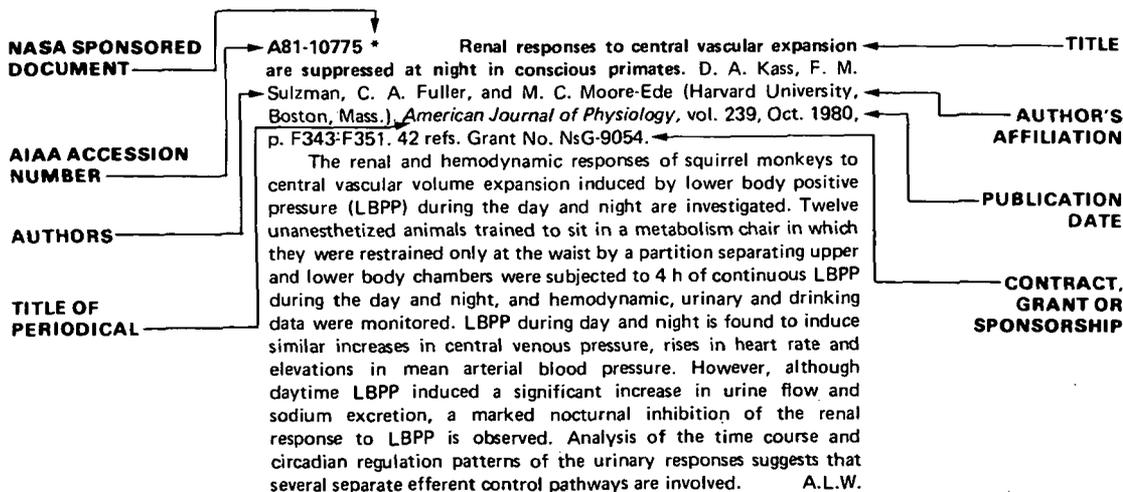
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TYPICAL CITATION AND ABSTRACT FROM IAA



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 220)

JUNE 1981

IAA ENTRIES

A81-23370 Pilot's aeromedical guide. H. N. Brown. Blue Ridge Summit, Pa., TAB Books, Inc., 1980. 62 p. \$3.95.

The book presents practical information on the aviation environment and aviation medicine for use by private pilots. Consideration is given to the occurrence, effects and prevention of hypoxia at altitudes above 5000 ft, the effects of the reduced gas pressures encountered at altitude, the physical requirements for pilot certification and flight activities despite certification, and the perceptual characteristics of flight under instrument conditions.

A.L.W.

A81-23389 * Frequency response of the vestibulo-ocular reflex /VOR/ in the monkey. U. W. Buettner, V. Henn, and L. R. Young (University Hospital, Zurich, Switzerland). *Aviation, Space, and Environmental Medicine*, vol. 52, Feb. 1981, p. 73-77. 18 refs. Deutsche Forschungsgemeinschaft Contract No. Bue-379/2; Grant No. NsG-2032.

The frequency response of the vestibulo-ocular reflex has been investigated in the alert monkey during sinusoidal rotation about a vertical axis in a frequency range of 0.001-0.5 Hz. Phase and gain of nystagmus slow phase velocity was determined. In the frequency range above 0.1 Hz, nystagmus slow phase velocity was in phase with (compensated for) head velocity. At lower frequencies, an increasing phase lead was present which could reach more than 90 deg. Gain fell off correspondingly at low frequencies. Calculated time constants were 10-40 s in different monkeys. Animals which had been exposed to numerous previous rotary stimuli in the laboratory showed much shorter time constants than did 'native' monkeys. (Author)

A81-23390 Neck muscle resistance to head impact. S. E. Reid (Evanston Hospital; Northwestern University, Evanston, Ill.), S. E. Reid, Jr. (Illinois, University, Chicago, Ill.), and G. Raviv. *Aviation, Space, and Environmental Medicine*, vol. 52, Feb. 1981, p. 78-84. 7 refs. Research supported by the Grainger Foundation.

The role of neck muscles in the body's response to the 'whiplash' type of motion which occurs during frontal impact has been studied. This type of motion was simulated by a sudden backward pull of a subject's head. Head and neck response to low-level acceleration has been researched by recording the externally applied force, the head accelerations in the median sagittal plane, and the electrical activity in the sternomastoid muscle (EMG) as functions of time. The resultant acceleration-time curve and recorded EMG have been analyzed, with numerical values of applied resistance to the external force recorded. An analog computer model was built incorporating resistance developed by two main variables: (1) the elasticity coefficient; (2) the active damping factor. Together these two variables, combined with a resistance function, enable us to measure the resistance of the head/neck response. Using this model, variations in magnitude of these two components were studied under six varying conditions of impact: (1) length of warning time; (2) type of instruction given to the subject; (3) amount of previous

experience on the part of the subject in similar situations; (4) anticipation of impact by the subject; (5) magnitude and kind of impact; (6) presence or absence of a preload. (Author)

A81-23391 Metabolic responses of resting man immersed in 25.5 C and 33 C water. A. C. Weihl, H. C. Langworthy, A. R. Manalaysay, and R. P. Layton (National Naval Medical Center, Naval Medical Research Institute, Bethesda, Md.). *Aviation, Space, and Environmental Medicine*, vol. 52, Feb. 1981, p. 88-91. 19 refs. Navy Task M0099,PN002,6011.

This study was undertaken to determine the hormonal responses to disabling hypothermia as a result of cold water immersion. Thermally unprotected male divers trained by the U.S. Navy were subjected to total body immersion in water at 25.5 C and 33 C. Plasma epinephrine, norepinephrine, growth hormone, and cortisol were measured. Other variables monitored included oxygen consumption, carbon dioxide production, minute ventilation, and rectal temperature. Immersion without cold stress caused suppression of plasma epinephrine without affecting plasma norepinephrine. Cold stress combined with immersion caused a significant increase in plasma norepinephrine in the absence of other indicators of a generalized stress reaction. The degree of chilling seen in this study will produce disabling hypothermia within 1-2 h and may be shown initially only by an increase in plasma norepinephrine. (Author)

A81-23393 In vivo bone strain measurements - Clinical results, animal experiments, and a proposal for a study of bone demineralization in weightlessness. M. Hinsenkamp, F. Burny, R. Bourgois, and M. Donkerwolcke (Bruxelles, Université Libre; Ecole Royale Militaire; Hôpital Universitaire Erasmus, Brussels, Belgium). *Aviation, Space, and Environmental Medicine*, vol. 52, Feb. 1981, p. 95-103. 76 refs.

A81-23394 Residence time and carbon dioxide scrubbing efficiency in life support systems. T. C. Wang (Harbor Branch Foundation, Fort Pierce, Fla.). *Aviation, Space, and Environmental Medicine*, vol. 52, Feb. 1981, p. 104-108. 14 refs.

The effects of residence time on the absorption of CO₂ by absorbents used in life support systems are investigated. CO₂ absorption capacity was measured as a function of the time a gas flow containing 1% CO₂ in air was in contact with lithium hydroxide, Sodasorb and Baralyme absorbents with different granule porosities at 80 F and 90% relative humidity. The greatest absorption capacity, defined as the ratio of CO₂ weight absorbed to weight of absorbent, in lithium hydroxide is observed at a residence time of 0.8 sec, with capacity decreasing at longer or shorter times. For Sodasorb and Baralyme, the absorption capacity is found to increase with residence time, and to be greatly reduced at residence times less than 1.0 sec. The CO₂ absorption capacities of the more porous absorbents are also found to be significantly greater than those of less porous absorbents at the same residence times, with that of Sodasorb generally 20-30% greater than that of Baralyme at any given residence time. A.L.W.

A81-23396 The effects of tobacco on aviation safety. J. R. Dille and M. K. Linder (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine*, vol. 52, Feb. 1981, p. 112-115. 24 refs.

In 1976, the Federal Aviation Administration was petitioned to issue regulations that would prohibit all smoking in the cockpit during commercial flight operations and prohibit preflight smoking by flight crewmembers within 8 h before commercial flight operations. A review of the literature was conducted to determine the effects on pilot performance of carbon monoxide (CO), nicotine, and smoking withdrawal. The records of 2,660 fatal general aviation aircraft accidents in 1973-1976 have been examined. Smoking was not identified as a causal factor but may have contributed to the cause of some of these accidents. However, the compound factors that were often found and the dire consequences are far less likely to occur in air commerce operations. For some, withdrawal symptoms may occur and more than offset any benefits to aviation safety that are claimed for a ban on preflight and in-flight smoking. (Author)

A81-23397 Biofeedback rehabilitation of airsick aircrew. R. A. Levy, D. R. Jones, and E. H. Carlson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aviation, Space, and Environmental Medicine*, vol. 52, Feb. 1981, p. 118-121. 9 refs.

The biofeedback treatment of 20 aircrew, disabled by chronic severe airsickness, is reported. The USAF School of Aerospace Medicine (SAM) Airsick Rehabilitation Program requires careful selection to insure high motivation and thorough medical screening to rule out intercurrent medically disqualifying conditions. Patients are trained in relaxation techniques and placed in a modified Barany chair, capable of tilting as well as rotating. Psychological responses to motion stimulation are constantly monitored by both patient and investigators. Motion sickness is provoked, which the patient learns to control and abort through exercising autonomic control. Of 19 eligible, 16 have been returned to full flying duties. (Author)

A81-23398 Evaluation of the Cavitron Spirometric Computer for accuracy in clinical screening spirometry. J. H. Cissik, T. J. Cramer, and L. L. Shelman (USAF, Cardiopulmonary Laboratory, Scott AFB, Ill.). *Aviation, Space, and Environmental Medicine*, vol. 52, Feb. 1981, p. 125-129. 16 refs.

Ten healthy male cardiopulmonary technicians, 10 aircrew members, and 10 patients performed a series of pulmonary function studies to compare the Cavitron Spirometric Computer to the conventional water-sealed Collins 13.5-l spirometer. A total of 50 studies were performed on the spirometers individually and then with the spirometers linked in-line. The Cavitron FVC averaged 6% less, the FEV1 - 7% less, and the FEF 25-75% - 11.6% less than comparable measurements from the Collins spirometer. Since these differences are within the suggested guidelines for screening studies, the Cavitron Spirometric Computer is acceptable for use in clinical screening spirometry. (Author)

A81-23399 # Changes in rat erythrocyte 2,3-DPG concentration under various experimental influences (Izmeneniia kontsentratsii 2,3-DFG eritrotsitov krys pri razlichnykh eksperimental'nykh vozdeistviakh). A. K. Baishukurova (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 66, Dec. 1980, p. 1808-1811. 15 refs. In Russian.

Changes in the concentration of 2,3-diphosphoglyceric acid (2,3-DPG) in rat erythrocytes are monitored as indicators of hemoglobin oxygen affinity under various conditions of breathing gas oxygen content and erythrocyte composition. Following both hemic hypoxia (induced by blood loss) and hypoxic hypoxia, erythrocyte 2,3-DPG concentrations are observed to increase significantly, while hyperbaric hyperoxia and artificially induced post-transfusion polycythemia are found to be associated with decreases in 2,3-DPG concentration. The results obtained suggest that 2,3-DPG concentration in erythrocytes depends on the organism's oxygen demand, and thus the changes in 2,3-DPG concentration, which are associated with changes in hemoglobin oxygen affinity, have adaptive significance. A.L.W.

A81-23400 # The resistance of rats to acute hypoxia during anemia (Ustoichivost' krys k ostroi gipoksii pri anemii). A. M. Volzhskaja, L. S. Maslennikova, and G. V. Troshikhin (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 66, Dec. 1980, p. 1839-1841. 8 refs. In Russian.

Changes in the resistance of rats to acute hypoxia under conditions of reduced hematocrit brought on by post-hemorrhagic and phenylhydrazine-induced anemia are investigated. Muscular oxygen tensions were determined by a variant of the polarographic method and resistance to hypoxia was determined by rat mean lifetime relative to controls at a simulated altitude of 11,000 m in rats within a day of bloodletting 2-3% of body mass, or five days after the initiation of phenylhydrazine injections. Results indicate that resistance to acute hypoxia in anemia is directly connected with hematocrit level, with the moderately reduced hematocrit induced by bloodletting leading to a slight decrease in longevity and the greater decrease in hematocrit brought on by phenylhydrazine associated with markedly decreased lifetimes and muscular oxygen tensions. It is concluded that hypoxia resistance is thus connected with changes in tissue metabolism arising from the destruction of the oxygen-carrying capacity of the blood. A.L.W.

A81-23501 On-board feeding - Its goals, its risks and their prevention (L'alimentation à bord - Ses finalités, les risques et leur prévention). J. Sirot (Compagnie Nationale Air France, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol. 19, 4th Quarter, 1980, p. 246-249. In French.

The objectives and risks associated with the offering of meals to airline passengers and crews are discussed, and possible means for managing the risks are outlined. It is pointed out that aside from physiological necessity, a primary motivation for the serving of in-flight meals is the desire on the part of the airline to make a favorable impression on the most primitive level, and that an adverse reaction to the food provided would have the opposite effect. Possible organoleptic digestive, and parasitological consequences of improperly selected foods are indicated, and the more serious risks associated with bacteriological infections are examined. The scientific and technical principles of food preparation and storage at temperatures inhibiting bacterial growth are considered, and human factors which may be responsible for outbreaks of bacterial infections despite proper food handling procedures are pointed out. Finally, directions of current research on food sanitation are indicated. A.L.W.

A81-23502 The physiological behavior of man in space (Le comportement physiologique de l'homme dans l'espace). J. Colin (Service de Santé des Armées, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol. 19, 4th Quarter, 1980, p. 254-257. In French.

The physiological modifications induced by human weightlessness in a space environment are discussed. Consideration is given to effects relating to changes in blood distribution and blood pressure, including the inhibition of orthosympathetic activity, the increase of renin and angiotensin I and II secretion, and the decrease in ADH secretion leading to a decrease in circulating blood volume, effects relating to the lack of gravitational stresses on bones and muscles, including bone decalcification, changes in height, and muscular weakness, and effects relating to spatial orientation, posture and locomotion, particularly the functioning of the otolith organ. Effects of weightlessness on digestive functions, sleep, and working efficiency are also considered, and means used for the prevention of weightlessness effects are indicated, including muscular exercise, and special flight and post-flight clothing. It is concluded that, with the use of some preventative measures, man may live and work without major difficulties in the absence of gravity. A.L.W.

A81-23503 Cosmonaut feeding (L'alimentation des cosmonautes). G. Perdriel (Ecole d'Application du Service de Santé pour l'Armée de l'Air, Centre de Recherches de Médecine Aéronautique, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Sub-*

aquatique et Hyperbare, vol. 19, 4th Quarter, 1980, p. 259, 260. In French.

Various aspects of the nourishment of cosmonauts during space flights of extended duration are discussed. The feeding arrangements and provisions used by the Skylab crews are presented, with attention given to the caloric content of the food, its nutrient composition and vitamin, mineral and water supplies, and the similar arrangements of Soviet space crews are indicated. Problems associated with food and drinking water storage requirements for space flights of duration longer than several months are discussed, and possible solutions including water recovery, in-flight reprovisioning and space gardens are considered. A.L.W.

A81-23504 **Vision in space (La vision dans l'espace).** J. P. Chevaleraud (Ecole d'Application du Service de Santé pour l'Armée de l'Air, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol. 19, 4th Quarter, 1980, p. 261-264. In French.

Visual problems associated with the on-orbit or en route phases of space flight are discussed. Following a review of the differences in luminous environment between terrestrial and space conditions, attention is given to problems encountered with visual acuity, color vision and depth perception in space. The possible sources of the flashes of light (phosphenes) seen by the Apollo astronauts on their way to the moon are considered, including X-ray and cosmic ray effects. Incidences of ocular pathology on board the Salyut and Skylab spacecraft are related, and procedures for the selection of space personnel according to their visual characteristics are outlined. A.L.W.

A81-23505 **Radiobiological problems posed by prolonged sojourns in space (Les problèmes radiobiologiques posés par les séjours prolongés dans l'espace).** R. P. Delahaye (Service de Santé des Armées, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol. 19, 4th Quarter, 1980, p. 266-270. 5 refs. In French.

The radiobiological aspects of prolonged exposure to space flight conditions are discussed. The types of radiation to be encountered in the space environment are reviewed, with attention given to galactic cosmic radiation, the Van Allen belt, and solar cosmic radiation. Results of radiobiological experiments performed on board balloons, rockets and satellites are noted to have shown no certain adverse effects of heavy ion bombardment on various biological specimens, and future efforts remaining to be done to determine the effects of the interactions of cosmic radiation and other space flight factors on humans are indicated. Estimates are then presented of the radiation doses to be expected on missions in low earth or polar orbit, elliptical and high elliptical orbits, synchronous orbits, and on short-duration lunar missions. It is pointed out that even if dose-response curves for cosmic radiation were known, reliable predictions of risks in the space environment could not be made without knowledge of the interactions of flight conditions. A.L.W.

A81-23507 **Remarks on some psychological problems of the private pilot (Aperçus sur quelques problèmes psychologiques du pilote privé).** R. J. Digo (Centre Principal d'Expertise Médicale du Personnel Navigant, Paris, France). *Médecine Aéronautique et Spatiale, Médecine Subaquatique et Hyperbare*, vol. 19, 4th Quarter, 1980, p. 279-283. In French.

Various aspects of the psychology of the private pilot in relationship to aircraft flight are considered. The evolution of the relationship between man and machine since the early days of aviation is discussed, and the feeling of freedom associated with leisure aviation as opposed to military or commercial aviation is pointed out. Attention is then given to the motivations of private pilots, including pleasure, the need for self-affirmation, the fulfillment of fantasies, and various neurotic or psychopathic traits. The administrative, medical and technical regulations relating to leisure aviation are considered, and their insufficiencies are pointed out. A set of proposals for ensuring the safety of private aviation with

respect to psychological factors is presented, and it is concluded that the freedom associated with leisure aviation must in effect be deserved. A.L.W.

A81-23651 # **The application of human visual system processing techniques to remotely sensed data.** A. P. Pentland (MIT, Cambridge, Mass.). In: International Symposium on Remote Sensing of Environment, 14th, San Jose, Costa Rica, April 23-30, 1980, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1980, p. 1477-1486. 13 refs. Research supported by the Environmental Research Institute of Michigan.

The current understanding of the processing strategies used by the human visual system is summarized with reference to its purpose, mechanisms, and its mathematical basis. It is shown that this early visual processing strategy can be applied to some of the remote sensing problems, where the human visual system is more successful than machine processing algorithms. These problems include accurate location of feature boundaries in the presence of noise and the problems caused by very small, weak, or elongated image features or haze. V.L.

A81-23771 **A theoretical model in organic cosmochemistry.** A. Espinosa-Müller and A. Bravo (Concepción, Universidad, Concepción, Chile). *Journal of Chemical Physics*, vol. 74, Jan. 15, 1981, p. 1431-1437. 50 refs. Research supported by the Universidad de Concepción.

A generalized scheme for molecular force field calculations is developed for the study of the occurrence of chemical equilibrium reactions in a reducing or nearly reducing planetary atmosphere. The energy minimization scheme of Boyd (1968) is extended to incorporate force constants other than those between carbon and hydrogen, and confirmed by comparisons with experimentally observed molecular geometries, vibrational spectra and thermodynamic functions. Equilibrium temperatures are reported for the formation of carbon monoxide, carbon dioxide, methane, hydrocyanic acid, ammonia, formaldehyde, formic acid, acetylene, acetaldehyde, acetic acid, ethanol, glycine, alanine and urea, as well as thermodynamic results for hydrogen and water. A.L.W.

A81-23841 # **Bioelectrical opposing phenomena and space brain research.** L. Mei, W. Wu, Z. Wang, and C. Zhou. *Chinese Society of Astronautics, Journal (Yuhang Xuebao)*, no. 2, 1980, p. 77-87. 18 refs. In Chinese, with abstract in English.

Bioelectric methods have led to the discovery of opposing brain-activity relations in modeled space environment and information processing systems. Opposing bioelectric relations were found between hypergravity and hypodynamic effects, red and green-blue color stimuli, amphetamine and 5-HT administrations, and good and poor performance in memory-learning tasks. Particular attention was given to the opposing relation between negative and positive waves of evoked potentials, frontal and occipital opposing, and opposing phenomena in the pattern of EEG power spectra. Experimental results suggest that neuro-opposing is an important principle in brain functional organization. B.J.

A81-23924 # **Attenuation of heat induced physiological strain by 100% oxygen breathing.** M. B. Dikshit, E. M. Iyer (Indian Air Force, Institute of Aviation Medicine, Bangalore, India), and A. M. Mahmood (Iraqi Air Force, Baghdad, Iraq). *Aviation Medicine*, vol. 24, Dec. 1980, p. 61-67. 19 refs.

Eleven healthy male volunteers were exposed to an environment of 57 C db, 35.50 C wb during air breathing and 100% oxygen breathing. The latter procedure reduced excess heat storage at the end of the heat exposure, thereby increasing the time taken to reach the level of physiological strain at which performance decrement is likely to occur. This demonstrates an increase in tolerance to severe heat stress. Further experiments suggest that the beneficial effect of 100% oxygen is due to an increased respiratory heat exchange because of the dryness of the gas. (Author)

A81-23925 # Tolerance to aviation stresses after yogic exercise - A psychophysiological evaluation. J. M. Wadhawan, M. B. Dikshit, N. Ramachandran, E. M. Iyer, and M. M. Singh (Indian Air Force, Institute of Aviation Medicine, Bangalore, India). *Aviation Medicine*, vol. 24, Dec. 1980, p. 68-75. 12 refs.

A study on the effects of some yogic exercises on psychophysiological functioning and tolerance to aviation stresses on six healthy, well motivated subjects in the age group of 33-40 years was carried out. After a period of twenty weeks, a statistically significant reduction in heart rate and rise in alpha index were found. Reduction in systolic/diastolic blood pressure and weight were also noticed though not significant. Two subjects whose baseline ECG had shown low amplitude of T wave in the lateral precordial leads showed return of T to normal amplitude. There was a suggestion of more effective thermoregulation under severe heat stress. Performance on perceptual speed test and Flight Oriented Psychomotor test showed improvement. (Author)

A81-24154 Geomagnetic-biological correlations - Some new results. B. J. Srivastava and S. Saxena (National Geophysical Research Institute, Hyderabad, India). (*National Space Sciences Symposium, Banaras Hindu University, Varanasi, India, Jan. 22-25, 1980.*) *Indian Journal of Radio and Space Physics*, vol. 9, Aug. 1980, p. 121-126. 21 refs.

Daily admissions of heart attack cases to three Indian hospitals for the medium sunspot year 1972 and the high sunspot year 1978 are studied against the corresponding daily sums of the three-hourly planetary geomagnetic activity indices and the local indices. Daily data on the number of road and air accidents, the latter restricted to ones due solely to pilot error of judgment, are also correlated with geomagnetic activity indices. The correlation coefficients and their standard errors are computed. No significant correlation is found between the daily indices of geomagnetic activity and the daily hospital admissions, nor for the daily number of road accidents. However, a 50% increase in hospital admissions is observed during 1978 as against 1972, and 76% of air accidents are found to occur during enhanced geomagnetic pulsation activity, which thus appears to play a key role in triggering cardiovascular and nervous disturbances in weak and imperfect systems. D.K.

A81-24250 Phase shifting circadian rhythms produces retrograde amnesia. W. N. Tapp and F. A. Holloway (Oklahoma University, Oklahoma City, Okla.). *Science*, vol. 211, Mar. 6, 1981, p. 1056-1058. 19 refs. NSF Grant No. BNS-76-24339.

Phase shifting circadian rhythms in rats shortly after passive avoidance training impaired their performance on retention tests. The amnesia was not due to simple performance deficits accompanying the 'jet lag' effects of phase shifting or to differences in lighting or circadian phase at training and at testing. Amnesia was associated with specific rhythm reentrainment patterns. These data indicate that disrupting circadian organization can produce retrograde amnesia in rats. (Author)

A81-24541 # The effects of a hyperbaric medium on the human and animal organisms (Deistvie giperbaricheskoi sredy na organizm cheloveka i zhivotnykh). G. I. Kurenkov, B. O. Iakhontov, A. V. Syrovegin, A. V. Sterlikov, V. P. Nikolaev, and D. B. Vandyshv. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 39), 1980. 259 p. 718 refs. In Russian.

The book presents the results of investigations into the effects of elevated pressures of breathing gas mixtures on the human and animal organisms. Attention is given to the problems of the dynamics of the transfer of inert gases between the organism and its environment during compression and decompression, human respiratory functions under hyperbaric conditions, and the toxicity of high partial pressures of oxygen. The neurophysiological and clinical signs of inert gas effects at elevated pressures are presented, and the characteristics of heat transfer in humans under conditions of elevated gas pressure and under water are considered. A.L.W.

A81-24542 # The biological effects of electromagnetic radiation in the microwave range (Biologicheskoe deistvie elektromagnitnykh izlucheniĭ mikrovolnovogo diapazona). V. V. Antipov, B. I. Davydov, and V. S. Tikhonchuk. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 40), 1980. 222 p. 587 refs. In Russian.

The book examines current experimental and clinical knowledge concerning the biological and biophysical effects of electromagnetic radiation, particularly that in the microwave range. The biophysical bases of the interaction of electromagnetic radiation with matter are reviewed with emphasis on biological systems, and the effects of radiation on critical biological systems, including the nervous, reproductive, visual and blood-forming systems are compared. Data concerning the lethal effects of nonionizing radiation is presented and characteristics of the effects of electromagnetic radiation on the whole mammalian organisms are examined. Various reactions of the neuroendocrine system to electromagnetic radiation are described, with particular attention given to the adrenal system, and the combined effects of ionizing and microwave radiation in the flight environment are discussed. Results are also presented of a series of animal experiments on the quantitative effects of microwave radiation on various levels of biological organization. A.L.W.

A81-24543 Sanitary, hygienic and physiological aspects of manned spacecraft (Sanitarno-gigienicheskie i fiziologicheskie aspekty obitaemykh kosmicheskikh korabli). Edited by Iu. G. Nefedov. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 42), 1980. 268 p. In Russian.

The book treats various toxicological, hygienic, epidemiological, microbiological, physiological, and nutritional aspects of the creation of favorable living conditions on board manned spacecraft. Particular attention is given to the sources and toxicological effects of cabin atmosphere contamination, the hygienic effects of the ionization of cabin atmospheres, the microbiological and epidemiological aspects of closed living spaces, the capabilities of human physiological systems under extreme, closed living conditions, and the design of the feeding components of spacecraft life support systems. A.L.W.

A81-24544 # Sources of microimpurity contamination of cabin atmospheres and their toxicological evaluation (Istochniki zagriazneniia atmosfery kabin mikroprimesiami i ikh toksikologicheskaiia otsenka). V. P. Savina and T. I. Kuznetsova. In: Sanitary, hygienic and physiological aspects of manned spacecraft.

Moscow, Izdatel'stvo Nauka, 1980, p. 11-42. 42 refs. In Russian.

The role of human metabolic products in the contamination of the atmosphere of a hermetically sealed volume is investigated. Mean daily values for the deposition of harmful impurities including carbon monoxide, ammonia acetone, fatty acids, alcohols and aldehydes, from exhaled air, sweat, urine and intestinal gases into a closed environment were determined for humans under normal conditions. The influence of variations in microclimate, feeding regimes, fasting and antiorthostatic hypokinesia on breathing gas composition were also measured. Results indicate that hunger, and abnormal environmental temperatures and humidities have the most pronounced effects on the composition of metabolic end products. A.L.W.

A81-24545 # The hygiene and toxicology of nonmetallic materials (Gigiena i toksikologiya nemetallicheskich materialov). G. I. Solomin. In: Sanitary, hygienic and physiological aspects of manned spacecraft. Moscow, Izdatel'stvo Nauka, 1980, p. 43-67. 34 refs. In Russian.

Consideration is given to various questions concerning the use of polymeric materials in the inhabitable compartments of manned spacecraft. The outgassing of potentially dangerous volatile compounds including alcohols, aldehydes, ketones, acetates and aromatic and aliphatic hydrocarbons from environmental materials in the spacecraft cabin is discussed, and means for the hygienic evaluation

and selection of cabin polymers are indicated. Experimental results demonstrating the effects of the space flight environment on polymer outgassing are presented, and the influence of the microimpurities on the gaseous medium is considered. Guidelines for the conduct of toxicological tests of outgassing materials are also presented. A.L.W.

A81-24546 # The hygienic significance of the ionization of the cabin atmosphere of a manned spacecraft (Gigienicheskoe znachenie ionizatsii atmosfery kabin pilotiruemykh kosmicheskikh korablei). B. V. Anisimov. In: Sanitary, hygienic and physiological aspects of manned spacecraft. Moscow, Izdatel'stvo Nauka, 1980, p. 68-79. 37 refs. In Russian.

Consideration is given to the physiological effects of the level of atmosphere ionization in a spacecraft cabin. Expected air ion concentrations on the order of 14,000 pairs/cm in spacecraft atmospheres are noted to be 20-100 times greater than those normally encountered on earth, and means for the generation of such air ion concentrations for ground-based experiments are considered. Previous observational and experimental data concerning the effects of increased air ionization is reviewed, and results are presented of an experiment concerning the long-term effects of exposure to elevated levels of unipolar and bipolar ionized air and deionized air which demonstrate variation in the states of all functional systems, including the visual, perceptual, hemodynamic, respiratory and immunological systems. The contribution of air ionization to air freshness is considered, and it is concluded that in order to maintain adequate biological functions, the cabin atmosphere must be controlled for both air ion concentration and polarity. A.L.W.

A81-24547 # The sanitary-microbiological and epidemiological aspects of habitability (Sanitarno-mikrobiologicheskie i epidemiologicheskie aspekty obitaemosti). S. N. Zaloguev, A. N. Viktorov, and N. D. Startseva. In: Sanitary, hygienic and physiological aspects of manned spacecraft. Moscow, Izdatel'stvo Nauka, 1980, p. 80-140. 110 refs. In Russian.

Microbiological and epidemiological aspects of infectious diseases in humans inhabiting a spacecraft are discussed. The unfavorable changes observed in the quantities of microorganisms on the integumentary tissues of cosmonauts due to increases in the numbers of staphylococci, hemolytic streptococci, gram-negative bacteria and fungi are examined, and the significance of the phenomenon of carriers of various autotrophic flora is considered. Attention is then given to mechanisms for the transfer of conditionally pathogenic microorganisms in spacecraft cabins, including the release of microorganisms from human integumental tissues, the propagation of microorganisms in the spacecraft cabin, and the transfer of microorganisms between cabin inhabitants. On the basis of the above considerations, it is suggested that the transfer of microorganisms in space flight conditions may be more rapid than on earth. A.L.W.

A81-24548 # Intestinal microecology under extreme conditions (Mikroekologiya kishchnika v ekstremal'nykh usloviakh). V. M. Shilov and N. N. Liz'ko. In: Sanitary, hygienic and physiological aspects of manned spacecraft. Moscow, Izdatel'stvo Nauka, 1980, p. 140-170. 61 refs. In Russian.

The composition of the intestinal microflora and their role in determining the health of an organism under normal and extreme conditions such as those which may be found during a space flight are discussed. The beneficial activity of the intestinal microflora in preventing disease, vitamin synthesis and digestion are indicated, as well as the harmful effects arising from the breakdown of the normal ecology of the gastrointestinal system. Experimental observations of variations in microfloral composition in subjects exposed to extreme isolation in a closed chamber and in cosmonauts before and after space flights of various durations are discussed, and the successful use of bifidobacterine and vitamin-amino acid supplements for the prevention of dysbacteriosis is pointed out. A.L.W.

A81-24549 # Evaluation of the functional capabilities of humans under extreme living conditions (Otsenka funktsional'nykh vozmozhnostei cheloveka v ekstremal'nykh usloviakh obitaniia). G. A. Manovtsev and V. V. Zhuravlev. In: Sanitary, hygienic and physiological aspects of manned spacecraft. Moscow, Izdatel'stvo Nauka, 1980, p. 171-191. 46 refs. In Russian.

An evaluation is presented of the functional condition of human physiological systems under conditions of prolonged isolation in a sealed environmental chamber under optimal and suboptimal microclimatic conditions. Consideration is given to the reactions of the cardiovascular system, respiratory system, neuromuscular activity, acid-base equilibrium and the thermoregulatory system during exposure to a controlled, sealed environment of temperature 21 C, relative humidity 60-80%, oxygen concentration 21-23% and carbon dioxide concentration less than 1.0%, and to the effects of deviations from optimal conditions on systems functioning during 30-day isolation studies. It is pointed out that even under ideal microclimatic conditions, degradations in functional capacities are observed, due to factors including decreased mobility, and emotional stress, which are worsened at elevated temperatures, relative humidities and carbon dioxide and carbon monoxide concentrations. A.L.W.

A81-24550 # The immunological reactivity of an organism during habitation of hermetic chambers (Immunologicheskai reaktivnost' organizma pri obitanii v hermetichnykh pomeshcheniakh). I. V. Konstantinova and E. N. Antropova. In: Sanitary, hygienic and physiological aspects of manned spacecraft. Moscow, Izdatel'stvo Nauka, 1980, p. 191-213. 22 refs. In Russian.

Results are presented of an investigation of the effects of the contamination of the artificial atmosphere of a closed living space by biological and chemical microimpurities on human immunological reactivity. Ground-based experiments are indicated which show that variations in microclimatic parameters induce changes in immunological reactivity. Analysis of data obtained from space flights lasting 30 to 140 days indicates the presence of changes in cosmonaut immune systems, including a degradation of the functional condition of T-lymphocytes, changes in the contents of the various subpopulations of immunocompetent lymphocytes and the levels of immunoglobulins G and A, sensibilization to bacterial allergens, and the activation of indicators of autoimmune processes. A.L.W.

A81-24551 # Principles of the creation of the feeding elements of spacecraft life support systems (Printsipy sozdanii pishchevykh zven'ev v sistemakh zhizneobespechenii ekipazhei kosmicheskikh korablei). V. P. Bychkov. In: Sanitary, hygienic and physiological aspects of manned spacecraft. Moscow, Izdatel'stvo Nauka, 1980, p. 214-264. 205 refs. In Russian.

Principles for the design of crew feeding systems for space flights of various durations are discussed. Experimental observations concerning the nutritional functions of space crews of U.S. and Soviet manned spacecraft from the first Vostok and Mercury flights to Skylab and the Soyuz-Salyut flights are presented, with attention given to weight losses, caloric requirements, food composition and caloric content, and mineral losses as functions of flight duration. The feeding systems of future potential space missions of extended duration are considered. The directivity of changes in metabolic processes under space flight conditions is discussed, and areas for further research to prevent these changes are indicated. A.L.W.

A81-24929 # A hypothalamic model of adaptation and deadadaptation under altitude hypoxia and the controllable effect on the reactivity and resistance of the organism (Gipotalamicheskaia model' adaptatsii i dezadaptatsii pri vysotnoi gipoksii i upravliaemoe vozdeistvie na reaktivnost' i rezistentnost' organizma). Iu. N. Orestenko, N. M. Kovalev, and V. A. Zhulinskii (Zaporozhskii Meditsinskii Institut, Zaporozhe, Ukrainian SSR). *Fiziologicheskii Zhurnal* (Kiev), vol. 27, Jan.-Feb. 1981, p. 3-9. 20 refs. In Russian.

The involvement of the hypothalamus and the hippocampus in the formation of adaptation and deadadaptation mechanisms is

investigated for the case of altitude hypoxia. Reactions of the zone of paraventricular nuclei of the hypothalamus and the dorsal hippocampus, as well as cardiac activity and peripheral blood composition, in rats exposed to episodes of chronic hypoxia at simulated altitudes of 4, 7 and 9 km over the course of 10 days were measured. During the initial stages of hypoxia exposure, the zones of the paraventricular nuclei are observed to exhibit increased electrical activity, accompanied by the stimulation of cardiac activity, blood composition changes typical of a stress reaction and an increase in the resistance of the organism to hypoxia. In subsequent exposures, hypothalamic activity is decreased along with cardiac activity, blood composition is characteristic of the breakdown phase of the adaptation syndrome, and the resistance of the organism to hypoxia is decreased. The results are used as the basis for the formulation of a model of altitude adaptation and resistance, and it is noted that the zone of paraventricular nuclei includes more effective protective mechanisms than does the dorsal hippocampus. A.L.W.

A81-24930 # The influence of hyperbaric oxygenation on catecholamine concentration in the rat brain and adrenal glands (Vliianie giperbaricheskoi oksigenatsii na sodержanie katekholaminov v golovnom mozge i nadpochechnikakh krysa). N. N. Nagnibeda (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologicheskii Zhurnal* (Kiev), vol. 27, Jan.-Feb. 1981, p. 10-15. 14 refs. In Russian.

A81-24931 # The effect of elevated carbon dioxide partial pressure on oxygen consumption and glycolysis in the tissues of albino rats (Vliianie povyshennogo partial'nogo davleniia uglekisloty na potreblenie kisloroda i glikoliz v tkaniakh belykh krysa). A. I. Nazarenko, T. N. Govorukha, and N. F. Zadorozhnaia (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologicheskii Zhurnal* (Kiev), vol. 27, Jan.-Feb. 1981, p. 16-19. 10 refs. In Russian.

Oxygen consumption and the rate of anaerobic glycolysis are determined for the tissues of rats exposed to normoxic gas mixtures with elevated partial pressures of carbon dioxide. Manometric measurements of oxygen uptake by the brain and liver and determinations of blood lactic acid and pyruvic acid were performed in groups of male albino rats exhibiting high and low resistance to hypoxia. Exposure of hypercapnic gas mixtures with carbon dioxide partial pressures equal to 19.9 and 39.9 kPa is found to lead to significant decreases in the oxygen consumption of the tissues investigated, as well as decreases in the indicators of an aerobic glycolysis in intact rats. The decrease in oxygen uptake is found to be more pronounced in the highly resistant rats, and lactic acid levels are even observed to increase in those rats previously found to have low resistance to hypoxia. It is thus suggested that the more pronounced decrease in tissue oxygen uptake is a factor contributing to the greater hypoxia resistance of these animals. A.L.W.

A81-24932 # The role of the vegetative nervous system in the regulation of glucose absorption in the intestine during motion sickness (O roli vegetativnoi nervnoi sistemy v reguliatsii vsasyvaniia gliukozy v kishechnike pri ukachivani). T. V. Gladkii and V. D. Taranenko (Odesskii Gosudarstvennyi Universitet, Odessa, Ukrainian SSR). *Fiziologicheskii Zhurnal* (Kiev), vol. 27, Jan.-Feb. 1981, p. 41-47. 14 refs. In Russian.

The means by which the vestibular apparatus, acting through the vegetative nervous system, influences the functioning of the intestine during conditions of motion sickness are investigated. Rates of the absorption of an 0.28 M glucose solution in isolated loops of the small intestines of dogs were determined during chronic 30-min exposures to linear, sign-changing accelerations (shaking). Compared with the resting condition, shaking is found to inhibit glucose absorption in intact animals, but to enhance absorption in animals in which the celiac nerves had been severed, and in delabyrinthized animals with severed celiac nerves, which also exhibited higher absorption rates at rest. The results demonstrate the major role of the sympathetic branch of the vegetative nervous system in the suppression of intestinal glucose absorption during conditions induc-

ing motion sickness, and the effects of impulses from the vestibular apparatus on vegetative nervous system tonus in general. A.L.W.

A81-24962 * Mitochondrial role in cell aging. J. Miquel, J. Fleming (NASA, Ames Research Center, Moffett Field, Calif.), A. C. Economos (San Jose State University, San Jose, Calif.), and J. E. Johnson, Jr. (Hitachi, Nissei Sangyo America, Ltd., Rockville, Md.). *Experimental Gerontology*, vol. 15, 1980, p. 575-591. 130 refs.

The experimental studies on the mitochondria of insect and mammalian cells are examined with a view to an analysis of intrinsic mitochondrial senescence, and its relation to the age-related changes in other cell organelles. The fine structural and biochemical data support the concept that the mitochondria of fixed postmitotic cells may be the site of intrinsic aging because of the attack by free radicals and lipid peroxides originating in the organelles as a by-product of oxygen reduction during respiration. Although the cells have numerous mechanisms for counteracting lipid peroxidation injury, there is a slippage in the antioxidant protection. Intrinsic mitochondrial aging could thus be considered as a specific manifestation of oxygen toxicity. It is proposed that free radical injury renders an increasing number of the mitochondria unable to divide, probably because of damage to the lipids of the inner membrane and to mitochondrial DNA. L.S.

A81-24963 * Antihistamine effect on synaptosomal uptake of serotonin, norepinephrine and dopamine. P. A. Brown and J. Vernikos (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.). *European Journal of Pharmacology*, vol. 65, 1980, p. 89-92. 10 refs. Grant No. NCA2-OR-675-710.

A study on the effects of five H1 and H2 antihistamines on the synaptosomal uptake of serotonin (5HT), norepinephrine (NE), and dopamine (DA) is presented. Brain homogenates from female rats were incubated in Krebs-Ringer phosphate buffer solution in the presence of one of three radioactive neurotransmitters, and one of the five antihistamines. Low concentrations of pyrilamine competitively inhibited 5HT uptake, had little effect on NE uptake, and no effect on DA uptake. Promethazine, diphenhydramine, metiamide, and cimetidine had no effect on 5HT or DA uptake at the same concentration. Diphenhydramine had a small inhibitory effect on NE uptake. It is concluded that pyrilamine is a selective and potent competitive inhibitor of 5HT uptake at concentrations between .05 and .5 micromolars. L.S.

A81-24965 * Otoconial formation in the fetal rat. M. S. Salamat, M. D. Ross, and D. R. Peacor (Michigan, University, Ann Arbor, Mich.). *Annals of Otology, Rhinology and Laryngology*, vol. 89, May-June 1980, p. 229-238. 34 refs. Grants No. NIH-AG-00767; No. NsG-9047.

Otoconial formation in the fetal rat is examined by scanning and transmission electron microscopy, and by X-ray elemental analysis. The primitive otoconia appear highly organic, but are trigonal in cross section, indicating that they already possess a three-fold axis of symmetry and a complement of calcite. These otoconia develop into spindle-shaped and, subsequently, dumbbell-shaped units. Transmission electron microscopy of dumbbell-shaped otoconia not exposed to fluids during embedment showed that calcite deposits mimicked the arrangement of the organic material. X-ray elemental analysis demonstrated that calcium was present in lower quantities in the central core than peripherally. It is concluded that organic material is essential to otoconial seeding and directs otoconial growth. L.S.

A81-24966 * Polarity and the movement of ¹⁴C-14/indol-3-ylacetic acid in the Coenocyte, *Caulerpa prolifera*. T. Brennan and W. P. Jacobs (Princeton University, Princeton, N.J.). *Annals of Botany*, vol. 46, 1980, p. 129-131. 17 refs. Grant No. NsG-7280.

A81-25298 Time course of plasma growth hormone during exercise in humans at altitude. J. Raynaud, L. Drouet, J. P. Martineaud, J. Bordachar, J. Coudert, and J. Durand (Paris XI,

Université, Le Plessis-Robinson, Hauts-de-Seine, France). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 50, Feb. 1981, p. 229-233. 26 refs. Research supported by the Ministère des Affaires Étrangères, Institut Pyrénéen d'Études Anthropologiques, and Université Paris XI.

The effects of hypoxia on the time course of plasma growth hormone concentration during submaximal exercise in humans at altitude are investigated. Concentrations of immunoreactive human growth hormone, blood glucose, free fatty acids and lactate were determined at rest, during 1 hr of bicycle ergometer exercise, and for 1 hr during recovery in eight mountain inhabitants tested at an altitude of 3800 m and five lowlanders tested at sea level, after five days at 2850 m, and while breathing a hypoxic gas mixture corresponding to an altitude of 2850 m one month after returning to sea level. Compared with the lowlanders at sea level, the highlanders are found to have a higher rest concentration of growth hormone, a faster and earlier rise of the hormone during exercise, but a similar mean maximal value. The response pattern in lowlanders exposed to hypoxia is observed to resemble that of highlanders. No correlation is detected between peak growth hormone levels and maximal values of lactate and free fatty acid concentrations or minimal values of glucose concentration. A mechanism involving the sudden release of growth hormone due to the state of the pituitary is suggested to account for the growth hormone dynamics. S.C.S.

A81-25299 *Influence of small mechanical loads on variability of breathing pattern.* J. A. Daubenspeck (Dartmouth College, Hanover, N.H.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 50, Feb. 1981, p. 299-306. 20 refs. Grant No. NIH-HL-19248.

The effects of low-level elastic or flow resistive mechanical loads on the variability of the breathing pattern in humans are investigated. Breath-by-breath values of integrated inspiratory airflow, inspiratory and expiratory breath durations and inspired and end-tidal CO₂ tensions were measured in six normal subjects in nominal 300-breath tests using a closed-circuit bag-in-box breathing circuit under conditions of no external load, an added elastic load of 9.3 cm H₂O/1 sec intended to halve the total respiratory time constant, and an added viscous-resistance load of 2.98 cm H₂O/1 sec intended to double the time constant. Elastic loading is found to increase the mean estimated work rate, while resistance loading increases mean tidal volume, inspiratory duration and estimated work rate and decreases mean breathing frequency, mean inspiratory flow and their variabilities. Elastic loading is also observed to reduce significantly the frequency of large breaths, whereas the effect of resistance loading is not significant. In addition, resistance loading is observed to increase and elastic loading to decrease the significant tidal volume-inspiratory duration correlation found in the nonloaded state. S.C.S.

A81-25300 *Age and altitude tolerance in rats - Temperature, plasma enzymes, and corticosterone.* P. D. Altland and B. A. Rattner (National Institutes of Health, Laboratory of Chemical Physics, Bethesda, Md.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 50, Feb. 1981, p. 367-373. 31 refs.

The influence of age on altitude tolerance in rats is investigated on the basis of changes in body weight and temperature, plasma enzyme levels and corticosterone concentration as indicators of condition. Immature (24-34 days), young adult (130-140 days) and old (600-625 days) rats were exposed to simulated altitudes from 6096 to 8230 m for four hours, and plasma activities of aspartate amino transferase (AsAT), fructose diphosphate aldolase (FDA), lactate dehydrogenase (LDH) and creatine kinase were determined, along with body weight and temperature and corticosterone. A critical survival threshold of 8230 m is obtained for the immature rats, while mortality was observed in some young adult and old rats at 7620 m, indicating the greater altitude tolerance of the immature animals. The degree of hypothermia and corticosterone elevation induced by altitude exposure in immature rats, but not young adult or old rats, is found to be directly related to the severity of hypoxia.

Plasma enzyme activities are found to be relatively unchanged in immature rats, but AsAT and LDH activities in old rats, as well as FDA in young adults, were elevated at the critical survival threshold. Results thus indicate the usefulness of body temperature and plasma corticosterone in determining the altitude tolerance of immature rats, and enzyme activities for tolerance assessment in young adult and old rats. S.C.S.

A81-25572 *Systems analysis of behavioral mechanisms (Sistemnyi analiz mekhanizmov povedeniia).* Edited by K. V. Sudakov (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR), V. B. Shvyrkov, and D. G. Shevchenko (Akademiia Nauk SSSR, Institut Psikhologii, Moscow, USSR). Moscow, Izdatel'stvo Nauka, 1979. 360 p. In Russian.

The possibility of a systems approach in goal-directed behavioral analysis is demonstrated by examples including the role of neurons in behavioral actions, integral characteristics of the bioelectric activity of the brain, and complex movements in the mechanism of vision. The applications of the Anokhin functional system of analysis of goal-directed behavior of men and animals (1970) are presented; methods of investigating neurophysiological behavior, relations between psychic and physiological processes, and mechanisms of memory, emotions, and motivations are discussed. A.T.

A81-25638 *The search for early forms of life in other planetary systems - Future possibilities afforded by spectroscopic techniques.* T. Owen (New York, State University, Stony Brook, N.Y.). In: *Strategies for the search for life in the universe; Proceedings of the Meeting, Montreal, Canada, August 15, 16, 1979.* Dordrecht, D. Reidel Publishing Co., 1980, p. 177-185.

Spectroscopic techniques for the determination of the likelihood of life on planets in extrasolar planetary systems are discussed. Theoretical and observational considerations are presented in support of the idea that carbon compounds and a water solvent are necessary for life, and the environmental constraints on the presence of life are considered, including atmospheric composition, planetary size and distance from the central star. Procedures for the spectroscopic observation of an extrasolar planet of a likely size and distance are then discussed, including low-resolution searches for methane, ozone, molecular oxygen, water vapor and other examples of nonequilibrium chemistry. It is pointed out that the use of these techniques will increase considerably knowledge of many of the terms in the Drake equation for the number of advanced civilizations in the galaxy. A.L.W.

A81-25775 * *Stability of individual loudness functions obtained by magnitude estimation and production.* R. P. Hellman (Boston University, Boston, Mass.). *Perception and Psychophysics*, vol. 29, no. 1, Jan. 1981, p. 63-70. 34 refs. NASA-supported research.

A correlational analysis of individual magnitude estimation and production exponents at the same frequency is performed, as is an analysis of individual exponents produced in different sessions by the same procedure across frequency (250, 1000, and 3000 Hz). Taken as a whole, the results show that individual exponent differences do not decrease by counterbalancing magnitude estimation with magnitude production and that individual exponent differences remain stable over time despite changes in stimulus frequency. Further results show that although individual magnitude estimation and production exponents do not necessarily obey the .6 power law, it is possible to predict the slope of an equal-sensation function averaged for a group of listeners from individual magnitude estimation and production data. On the assumption that individual listeners with sensorineural hearing also produce stable and reliable magnitude functions, it is also shown that the slope of the loudness-recruitment function measured by magnitude estimation and production can be predicted for individuals with bilateral losses of long duration. Results obtained in normal and pathological ears thus suggest that

individual listeners can produce loudness judgements that reveal, although indirectly, the input-output characteristic of the auditory system. C.R.

A81-25891 **Velocity after-effects - The effects of adaptation to moving stimuli on the perception of subsequently seen moving stimuli.** P. Thompson (Cambridge University, Cambridge, England). *Vision Research*, vol. 21, no. 3, 1981, p. 337-345. 34 refs.

Following adaptation to movement in one direction, subsequently seen movement in both the same and opposite directions can be distorted in its apparent velocity. Experiments in which the adaptation and test stimuli moved in the same direction systematically varied the spatial and temporal parameters of the stimuli. These experiments suggest that the velocity rather than the temporal frequency of the adaptation stimulus determines the magnitude of the velocity after-effect. When adaptation stimuli move in the opposite direction to the test stimuli, changes in adaptation velocity or temporal frequency have little effect on the after-effect. (Author)

A81-25892 **Spatial and temporal factors in the predictive generation of saccadic eye movements.** J. M. Findlay (Durham University, Durham, England). *Vision Research*, vol. 21, no. 3, 1981, p. 347-354. 25 refs. Medical Research Council of England Grant No. G977/865/N.

Horizontal saccadic eye movements were recorded when a spot target moves in a sequence of steps, designed to manipulate the variables of spatial and temporal predictability. This allowed a comparison of anticipatory saccades with saccades elicited by visual stimulation, and evidence is presented which suggests that these categories are discrete and exclusive. Anticipatory saccades were produced both when the target position was predetermined and when it was not, but only in the former case was there also a systematic effect of temporal predictability. Spatial predictability and temporal predictability both reduced latencies for visually elicited saccades, and no interaction was found. The results are interpreted in terms of a model where the timing of a saccade is controlled by a separate mechanism from that controlling the amplitude. (Author)

A81-25919 # **Study of the characteristics of damage to yeast cells caused by high-intensity UV radiation at 266 nm (Izuchenie spetsifiki porazheniia drozhzhevykh kletok vysokimi intensivnostiami u.f. izlucheniia 266 nm).** T. G. Burchuladze, G. Ia. Fraikin, and L. B. Rubin (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 256, no. 5, 1981, p. 1239-1243. 9 refs. In Russian.

A81-26032 **Measurement of mass under weightless conditions.** V. A. Sarychev, V. V. Sazonov, A. A. Zlatorunskii, I. A. Samorukov, V. R. Freidel', S. F. Khlopina, A. D. Egorov, and V. I. Somov. (*Kosmicheskie Issledovaniia*, vol. 18, July-Aug. 1980, p. 536-549.) *Cosmic Research*, vol. 18, no. 4, Jan. 1981, p. 386-397. 5 refs. Translation.

The properties of a massmeter - a device for measuring the human mass during space missions - are examined, and the measurement accuracy is assessed. The calibration and testing of the device under terrestrial conditions are described, along with the measurement procedure under conditions of weightlessness. Some measurement data obtained for crew members of Salyut 5 and 6 are examined. V.P.

A81-26175 **The physiology of blood circulation - The physiology of the heart (Fiziologiya krovoobrashcheniia - Fiziologiya serdtsa).** Edited by E. B. Babskii and G. P. Konradi. Leningrad, Izdatel'stvo Nauka, 1980. 600 p. In Russian.

The book presents fundamental information necessary to the understanding of the functioning of the heart and the various manifestations of heart function. The ultrastructural organization of the myocardium is outlined, and the general properties of myocardial

cells are examined, with attention given to their energetics, electrophysiology and contractile mechanisms. The automatic functioning of the heart is discussed, and the propagation of electrical stimulation in the various structures of the heart is considered. Attention is given to the electrical structure of myocardial tissues, the contraction process in the cardiac musculature and the role of heart rate in regulating myocardial contractility. The pumping function of the heart is described, with consideration given to its structural basis, cardiodynamics, the mechanical manifestations of heart activity and heart output. The regulation of heart function is also examined, with attention given to myogenic autoregulation, the effects of cardiac nerve stimulation, mechanisms of parasympathetic and sympathetic control, afferent and efferent connections, hormonal control and cardiac reflexes. A.L.W.

A81-26413 # **Biomedical problems involved in assuring the safety and performance of manned space flights (Mediko-biologicheskie problemy obespecheniia bezopasnosti i effektivnosti pilotiruemykh kosmicheskikh poletov).** N. M. Rudnyi, S. A. Gozulov, I. D. Pestov, and A. V. Eremin. In: *Scientific lectures in aviation and astronautics 1978.* Moscow, Izdatel'stvo Nauka, 1980, p. 100-112. In Russian.

Biomedical requirements imposed on astronauts, the spacecraft, and the flight control system in manned space flight are described. A complex approach to the assurance of the safety and performance of manned space flights is developed. B.J.

A81-26414 # **Life support and safety of spacecrews (Problema obespecheniia zhiznedeiatei'nosti i bezopasnosti ekipazhei kosmicheskikh letatel'nykh apparatov).** V. N. Pravetskii. In: *Scientific lectures in aviation and astronautics 1978.* Moscow, Izdatel'stvo Nauka, 1980, p. 113-122. In Russian.

A general functional approach is taken to the life support and safety assurance of spacecrews: man, the environment, and the spacecraft are considered as functional systems. Subsystems for the support of the thermal environment, and subsystems of air and water regeneration are considered within the framework of the functional approach. B.J.

A81-26417 # **Aspects of the mechanics of a walking robot as a variable-structure system (Nekotorye voprosy mekhaniki lokomotionnogo shagaiushchego robota kak sistemy s peremennoi strukturoi).** A. P. Bessonov, D. Ts. Bal'zhanov, G. G. Levitskii, A. Ia. Pogrebniak, and N. V. Umnov. In: *Scientific lectures in aviation and astronautics 1978.* Moscow, Izdatel'stvo Nauka, 1980, p. 145-157. 8 refs. In Russian.

Three methods for the investigation of the locomotion of walking machines are described: (1) a qualitative method, which uses topographic diagrams; (2) an analytic method, which uses systems of inequalities; and (3) a geometric method, which uses stability regions. The static stability and adaptive capacities of a walking machine for various types of locomotion are examined. B.J.

A81-26444 **Motion sickness caused by rotations about earth-horizontal and earth-vertical axes.** A. Leger, K. E. Money, J. P. Landolt, B. S. Cheung, and B. E. Rodden (Department of National Defence, Defence and Civil Institute of Environmental Medicine, Downsview, Ontario, Canada). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 50, Mar. 1981, p. 469-477. 31 refs.

Rotation at constant angular velocity about the head's z-axis, with the rotational axis horizontal (barbecue-spit rotation), causes motion sickness and illusory perceptions of bodily movement. To determine whether such rotations about the head's x- and y-axes cause similar effects, and to test the validity of the mismatch theory of motion sickness, more than 200 tests (using vertical axes as well as horizontal axes) were administered to 14 subjects. Three different visual conditions were also investigated: normal external vision, vision of only the inside walls of the rotating capsule, and eyes closed in the dark. In earth-horizontal rotation, the x- and y-axis stimuli

were found to be equally as effective in provoking sickness as was the original z-axis stimulus, and a comparable loss of perception of gravity occurred for all three stimuli. The horizontal axis stimuli were found to be very effective in producing sickness in all the three visual conditions, but the external vision conditions was significantly less effective than the other two conditions. The findings were generally inconsistent with the mismatch theory. (Author)

A81-26445 Exchanges of oxygen and carbon dioxide alter inert gas pattern in single-breath tests. H. D. Van Liew and R. Arieli (New York, State University, Buffalo, N.Y.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 50, Mar. 1981, p. 487-492. 13 refs. Grant No. NIH-P01-HL-14414; Contract No. N00014-76-000742.

The effects of metabolic gas exchanges on expired inert gas concentration in single-breath tests are investigated. Eight normal male subjects were asked to perform various respiratory maneuvers while breathing either air or a mixture of low concentrations of SF₆, Ar, Ne and He with N₂ and O₂, and volumes and compositions of the exhaled gases were determined. During air breathing, nitrogen concentrations are observed to increase with time throughout most of the breath after an air vital capacity with a breath hold at total lung capacity, however the results in nonbreath hold expirations are variable and rising patterns are found in subjects expiring to residual volume. For subjects breathing gas mixtures low in N₂ with a high concentration of Ne, the patterns of the two inert gases intended to displace each other are found not to be exact mirror images of each other, but to sometimes be parallel and sometimes intersect, due to variable O₂ and CO₂ exchanges. The metabolic gas effect is shown to be dependent on inert gas concentrations, and formulas for correction of the metabolic effect are presented. It is concluded that metabolic gas effects must be taken into account in the interpretation of single breath tests, particularly when expiratory flow is slow. A.L.W.

A81-26446 Volume, flow, and timing of each breath during negative airway pressure in humans. J. A. Hirsch and B. Bishop (New York, State University, Buffalo, N.Y.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 50, Mar. 1981, p. 552-560. 30 refs. Contract No. F41609-75-C-003; Grant No. NIH-5-P01-HL-14414.

The changes in steady-state end-expiratory lung volume, mean flow rates and breathing pattern induced continuous negative airway pressure breathing in humans are investigated. Fourteen healthy adult subjects, in a full body box, breathed through a mouthpiece connected to an external bag-in-box system for periods of 4 to 6 min at negative airway pressures of 5, 10 and 15 cm Hg, and inspiratory and expiratory duration, tidal volume, minute ventilation, and mean inspiratory and expiratory flows were determined on a breath-by-breath basis from pneumotachometer recordings. Decreases in end-expiratory lung volume, tidal volume and inspiratory flow together with increases in expiratory flow, breathing frequency and inspiratory activity are observed in the presence of negative breathing pressure. End-tidal CO₂ and minute volume are not altered significantly, indicating no alveolar hyperventilation. The human compensatory response to negative-pressure breathing is shown to be made up of multiple components which are engaged at different levels of negative pressure. A.L.W.

A81-26447 Blood volume and plasma protein responses to heat acclimatization in humans. M. H. Harrison, R. J. Edwards, M. J. Graveney, L. A. Cochrane, and J. A. Davies (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 50, Mar. 1981, p. 597-604. 35 refs.

The effects of heat acclimatization on intravascular volume and protein responses to acute heat stress and exercise were studied in six male subjects. Absolute values for hematocrit and hemoglobin concentration were lower after acclimatization, indicating hemodilution. Also, after acclimatization, the magnitude of the hemoconcentration

response to exercise in the heat was significantly increased. There was no change in the concentration of plasma protein during or after acclimatization compared with before acclimatization, but there was a net increase in the total intravascular protein content. It is suggested that the hemodilution associated with heat acclimatization may be explained in terms of an increase in the intravascular oncotic pressure following an exercise-induced augmentation of protein, occurring at the expense of the interstitial compartment. It is concluded that this hemodilution is unlikely to be primarily responsible for the cardiovascular adjustment accompanying heat acclimatization and that it should be regarded as a secondary feature of adaptation to heat. (Author)

A81-26768 Development of occupational and environmental health criteria for the F-16. M. H. McLendon (USAF, F-16 System Program Office, Wright-Patterson AFB, Ohio). (*Aerospace Medical Association, Annual Scientific Meeting, 50th, Washington, D.C., May 14-17, 1979.*) *Aviation, Space, and Environmental Medicine*, vol. 52, Mar. 1981, p. 145-147.

This paper describes the approach used by the F-16 System Program Office to develop occupational and environmental health criteria and guidance for the design and support of a hydrazine (N₂H₄) fueled Emergency Power System. Because of the early integration of the medical and industrial hygiene communities in the aircraft and subsystem development process, evaluations of exposures to hydrazine during maintenance activities resulted in timely and significant engineering and logistics support improvements. (Author)

A81-26769 Industrial hygiene and the F-16 air combat fighter. W. D. Christensen (USAF, Occupational and Environmental Health Laboratory, Brooks AFB, Tex.). (*Aerospace Medical Association, Annual Scientific Meeting, 50th, Washington, D.C., May 14-17, 1979.*) *Aviation, Space, and Environmental Medicine*, vol. 52, Mar. 1981, p. 147-149. 7 refs.

This paper describes a program of mutual cooperation between a defense contractor and the line and medical service of the USAF in controlling potential exposures to hydrazine as it is used on the F-16 aircraft. The early involvement of USAF industrial hygienists in the evaluation of exposures to hydrazine during various maintenance activities is described. These efforts have led to an engineering design concept which emphasizes control of exposure and minimizing the potential for accidental exposure. Recognizing that the risk of an accidental exposure will never be reduced to zero, the USAF Medical Service has implemented a comprehensive program of medical surveillance and health education directed towards the work force responsible for maintenance of the F-16 hydrazine system. (Author)

A81-26771 * Variations in gravito-inertial force level affect the gain of the vestibulo-ocular reflex - Implications of the etiology of space motion sickness. J. R. Lackner (Brandeis University, Waltham, Mass.) and A. Graybiel (U.S. Naval Aerospace Medical Center, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). *Aviation, Space, and Environmental Medicine*, vol. 52, Mar. 1981, p. 154-158. 37 refs. Contract No. NAS9-15147; NASA Order T-5904-B.

Recordings of horizontal nystagmus were obtained on 16 male subjects exposed to repeated patterns of horizontal angular acceleration, constant velocity rotation, and sudden-stop deceleration in the laboratory and in the free-fall and high-force periods of parabolic flight. Nystagmus intensity was a clear function of gravito-inertial force level: slow phase velocity and beat frequency increased during exposure to high force levels and decreased in free-fall compared to values obtained at 1 G. These findings indicate that the gain of the vestibulo-ocular reflex decreases in free-fall. This fact likely accounts for the disorientation and dizziness sometimes experienced by astronauts when moving their heads in the early phases of orbital flight and again after splashdown. The implications of the present findings, both for the etiology and for the treatment of space motion sickness, are discussed. (Author)

A81-26772 **Functional steadiness of the cerebral circulatory system under altered gravitational conditions.** Iu. E. Moskalenko (Akademii Nauk SSSR, Leningrad, USSR). *Aviation, Space, and Environmental Medicine*, vol. 52, Mar. 1981, p. 159-161.

The maintenance of hemodynamic stability is a functional characteristic of the cerebral circulatory system. This characteristic developed during the evolutionary process. It can be of use as an indicator of the activity of the central processes regulating cerebral blood flow under different stress conditions, particularly, during a long space mission. Rheoencephalographic methods are qualitative and yield information that permits assessment of the changes in the functional status of the cerebral circulatory system. This was confirmed by results obtained during the Saliut-4 mission. The observations permitted us to assess indirectly the status of the cosmonauts. (Author)

A81-26773 **Lack of hyperbaric O₂ effect on blood-brain barrier permeability in conscious rats.** S. P. Gruenau, M. T. Folker, and S. I. Rapoport (U.S. Naval Medical Research Institute, Bethesda; National Institutes of Health, National Institute on Aging, Baltimore, Md.). *Aviation, Space and Environmental Medicine*, vol. 52, Mar. 1981, p. 162-165. 13 refs.

Conscious rats were exposed to 100% O₂ at 2.5 ATA for 90 min for up to 10 consecutive days, or to an N₂-O₂ mixture (partial pressure of O₂ = 0.3 ATA) under the same conditions (control animals). Cerebrovascular permeability to (C-14)-sucrose in the experimental animals was not altered by hyperbaric O₂ exposure when compared to the value in control animals. These results differ with other reports that similar hyperbaric O₂ exposure increases cerebrovascular permeability to ferritin and to a protein enzyme. (Author)

A81-26774 **Hypobaric hypoxia - Central catecholamine levels and cortical PO₂ and avoidance response in rats treated with apomorphine.** C. Saligaut, N. Moore, J. L. Leclerc, F. Boismare (Hôtel-Dieu, Rouen, France), R. Boulu, M. Plotkine (Paris V, Université, Paris, France), and M. Prioux-Guyonneau (Paris XI, Université, Châtenay-Malabry, Hauts-de-Seine, France). *Aviation, Space, and Environmental Medicine*, vol. 52, Mar. 1981, p. 166-170. 22 refs.

The learning of a conditioned avoidance response, the catecholamine levels in some cerebral structures, and the evolution of the cortical partial pressure of O₂, were studied under hypobaric hypoxia (300 torr) and under normoxia, in rats treated or not with apomorphine, at the dose of 1 or 10 mg/kg i.p. Apomorphine at 1 mg/kg improves the learning capacity and stabilizes the cerebral catecholamine levels under hypoxia; no modification of the evolution of the cortical partial pressure of O₂ during hypoxia was observed between control rats and rats treated with this dose of apomorphine. Apomorphine at 10 mg/kg totally inhibits learning under normoxia or hypoxia. It is therefore possible to suppose that the antihypoxic protective mechanism of low-dose apomorphine is due to a stabilization of the levels of both dopamine and nonadrenaline during hypoxia, but not to an increase in the cerebral oxygen availability. These data suggest the clinical possibility of using other dopaminergic stimulating agents for their eventual antihypoxic properties. (Author)

A81-26775 **Use of tympanometry in an airline medical service.** E. A. Demar (United Air Lines, Inc., San Francisco, Calif.) and R. Harper (United Air Lines, Inc., Chicago, Ill.). (*International Academy of Aviation and Space Medicine, International Congress of Aviation and Space Medicine, 27th, Manila, Philippines, Oct. 8-12, 1979.*) *Aviation, Space, and Environmental Medicine*, vol. 52, Mar. 1981, p. 181-184. 7 refs.

Tympanometry is a procedure in otologic medicine which enables the examiner to objectively evaluate the mobility and patency of the eardrum, the functional condition of the middle ear, and to ascertain the ventilation capability of the Eustachian tube. It does this by varying the air pressure in the closed ear canal, emitting

a low-frequency sound concurrently, and measuring the compliance or mobility of the eardrum on a graph. It has been found to be a very useful adjunct in the evaluation and management of the otological problems in a commercial air carrier. (Author)

STAR ENTRIES

N81-18625 California Univ., San Diego.
VASOMOTION PATTERNS IN SKELETAL MUSCLE IN NORMAL AND HYPERTENSIVE RATS Ph.D. Thesis
 Jeffrey Lynn Borders 1980 144 p
 Avail: Univ. Microfilms Order No. 8103782

The vasomotor patterns of skeletal muscle arterioles were studied in the rat spinotrapezius muscle in relation to resistance changes associated with the onset of hypertension. A theoretical model was proposed for vasomotion. It is based on a slowly diffusible circulating vasoconstrictor. The model links changes seen in the vasomotion patterns to changes in vessel wall properties. A computer simulation was done for the case of increased vessel wall thickness. The simulation showed that thicker vessel wall is more stable to diffusion related oscillations and is less likely to show spontaneous diameter changes. The simulation also predicted graded diameter responses and a shift to lower frequencies for the thicker wall structure. These features agree with the experimentally observed patterns of vasomotion in normal and hypertensive animals. Dissert. Abstr.

N81-18626 California Univ., Los Angeles.
THE BACTERIAL PRODUCTION OF METHANE IN MARINE SEDIMENTS Ph.D. Thesis
 Paul Robin Doose 1980 262 p
 Avail: Univ. Microfilms Order No. 8102822

The sequence of biodiagenetic reactions that occurs in marine sediments is determined by the free energy of the reaction. This leads to a succession of chemotrophic respiratory electron acceptors which pass through O₂, NO₃(-), SO₄(=), HCO₃(-) and ends with the fermentation of organic matter. In Santa Barbara Basin, this sequence starts with SO₄(=) reduction due to the anoxic condition of the bottom water. An advection model was developed. It is shown that the advective flux is small compared to other sedimentary processes. An advective flux of water does not leave the sediment water interface, since sedimentation is always faster than advection. A procedure for dating subaqueous sediment cores was developed which is easy to use, inexpensive, and gives a continuous profile of ages. Scatter in the water content data for Santa Barbara Basin appears to be a real property of the sediment which correlates with known indicators of paleoclimates. Similar time correlated fluctuations in water content are found in San Pedro, San Nicolas, and Tanner Basins. Dissert. Abstr.

N81-18627* Desert Research Inst., Reno, Nev. Atmospheric Science Center.
INVESTIGATIONS RELATED TO EVALUATION OF ULTRA-MICROFLUOROMETER Final Report, 1 Nov. 1979 - 31 Dec. 1980
 Bruce Whitcomb Feb. 1981 43 p refs
 (Contract NAG2-14)
 (NASA-CR-163972) Avail: NTIS HC A03/MF A01 CSCL 06B

High resolution emission and excitation fluorescent spectra were obtained for several samples in an effort to determine the optimum operational design for the instrument. The instrument was used to determine the required nature of a sample which could be detected, and in so doing, several different sample preparation techniques were considered. Numerous experiments were performed to determine the capabilities of the instrument with regard to the detection of suitably prepared virus specimens. Significant results were obtained in several areas. The fluorescent spectra indicated that substantial changes in the laser might be used advantageously to greatly improve the performance of the instrument. In the existing configuration, the instrument was shown to be capable of detecting the presence of suitably prepared virus samples. Author

N81-18628# Rice Univ., Houston, Tex. Coal Combustion Systems Div.
BIOFILM DEVELOPMENT AND DESTRUCTION Final Report
 W. G. Characklis Sep. 1980 313 p refs Sponsored by EPRI (EPRI Proj. 902-1)
 (EPRI-CS-1554) Avail: NTIS HC A14/MF A01

Fouling biofilm formation, its effects on energy losses and, finally, its destruction were studied. Special apparatus and simulated cooling water were used in the laboratory. A tubular reactor and an annular reactor consisting of a stationary outer cylinder and a rotating inner cylinder were used. Experiments and apparatus were designed to isolate the effects of biofouling from other processes such as corrosion or particulate fouling which could complicate data interpretation. Biofilm development rate is affected by fluid velocity, wall temperature, and nutrient concentration. Increase in fluid frictional resistance, resulting from biofilm formation, is a good indication of biofouling after the biofilm reaches a critical thickness corresponding to the viscous sublayer thickness. Changes in heat transfer are the net result of decrease in conductive heat transfer due to biofilm accumulation and increase in convective heat transfer due to increase in fluid frictional resistance. Destruction of biofilms by chemical oxidants is a diffusion limited process. Consequently, oxidants are more effective when applied at high concentration for short periods. High flow rates enhance biofilm destruction by oxidants. Several promising techniques for monitoring biofouling film development and destruction were developed and tested. DOE

N81-18629# National Academy of Sciences - National Research Council, Washington, D. C. Div. of Biological Sciences.
RESEARCH PRIORITIES IN TROPICAL BIOLOGY
 1980 130 p refs
 (PB81-114902; ISBN-0-309-03043-9; LC-80-15773) Avail: NTIS HC A07/MF A01 CSCL 06F

Partial contents include: biological inventory; tropical ecosystem studies; studies of tropical aquatic systems; monitoring forest population; conversion rates of tropical moist forest; land use, population growth; and food production; preservation of the forests; and inventory of tropical organisms. GRA

N81-18630# Silesian Medical Academy, Katowice (Poland). Dept. of Pharmacology.
CHRONIC TOXICITY OF LEAD AND CADMIUM. 1: CHANGES IN THE CENTRAL NERVOUS SYSTEM OF THE PARENTAL GENERATION OF RATS AFTER CHRONIC INTOXICATION WITH LEAD AND CADMIUM Interim Report
 Zbigniew S. Herman, Krystyna Kmiecik-Kolada, Ryszard Szkilnik, Ryszard Brus, and Kornel Ludyga Jan. 1980 23 p refs
 (Contract EPA-JB5-531-1)
 (PB81-110850; EPA-600/1-80-012) Avail: NTIS HC A02/MF A01 CSCL 06T

Treatments consisted of two levels of lead (5 or 50 ppm), two levels of cadmium (0.1 or 5 ppm), and two combined dosages (5 ppm lead and 0.1 ppm cadmium, or 50 ppm lead and 5 ppm cadmium). Treatments were administered in buffered drinking water. The lower dosages generally produced hyperactivity, while higher dosages produced hypoactivity. Effects of lead and cadmium on biogenic amines varied with dose and area of the brain. Biochemical analysis of blood and urine showed no changes in the hematocrit or hemoglobin, but the activity of Delta-ALA dehydratase and serum phosphatase were differentially affected. Concentrations of lead and cadmium in the liver and kidney increased, and positive interaction effects were noted. GRA

N81-18631 California Univ., Los Angeles.
THE ULTRASTRUCTURAL BASIS FOR THE PHOTOMECHANICAL RESPONSE IN THE PHOTORECEPTORS OF THE VERTEBRATE RETINA Ph.D. Thesis
 Gerald E. Adomian 1980 104 p
 Avail: Univ. Microfilms Order No. 8103980

The mechanical response of rod and cone cells to light, in certain vertebrate retinas, involves extensive changes in length in the myoid region of the inner segment. The objective was to

determine the morphological basis for this phenomenon. Retinas from a hybrid of *Ictalurus melas* and *nebulosus* were prepared for electron microscopic examination after varying degrees of light and dark adaptation. Of the 58 animals used in the study, 16 were used for the quantitative analysis. Myoids of the shortened cells consist of a supranuclear region 4 to 7 microns in diameter and 9 to 5 microns long, in rods and cones, respectively, which contains numerous ribosomes, glycogen, Golgi apparatus, smooth surfaced cytomembranes delimiting vacuolar spaces, and membrane bound granules with a particular content. The myoids of extended cells have a supranuclear region, but unlike shortened cells, also have a long thin stalk. With the appearance of the stalk, a new structural component was observed--a bundle of uniformly distributed microtubules extending the length of the stalk. Dissert. Abstr.

N81-18632 Rhode Island Univ., Kingston.
AORTIC BLOOD FLOW ESTIMATION FROM PRESSURE MEASUREMENTS Ph.D. Thesis
 Shankar Muthukrishnan 1980 291 p
 Avail: Univ. Microfilms Order No. 8103060

The method is based on modeling aorta as a distributed, nonuniform thin walled tube with exponential variations of geometric and viscoelastic properties. An experimental transfer function, between selected proximal and distal points along the descending thoracic aorta, was computed as the ratio of the corresponding frequency components of the measured pressure waveforms. Model transfer function could be calculated from nominal values of the aortic model. A cost function was defined as mainly a function of the mismatch between the experimental transfer function and the model transfer function. A nonlinear transformation of the cost function was performed to assure positive real values of the aortic model parameters. To the cost function formulation an additional term containing a relationship between local pressure and radius was included in order to avoid multiple solutions. A computerized optimization technique utilizing a variation of Powell's derivative free algorithm was employed to minimize the cost function, yielding the optimal parameters for the aortic model. Dissert. Abstr.

N81-18633* Texas Univ., Galveston. Medical Branch.
SKYLAB: CYTOGENETIC STUDIES OF BLOOD (EXPERIMENT MILL) Final Report
 Lillian H. Lockhart 1981 22 p refs
 (Contract NAS9-13102)
 (NASA-CR-163970) Avail: NTIS HC A02/MF A01 CSCL 06P

Preflight and postflight chromosomal analyses of space flight crews are presented. Special attention is given to findings suggestive of exposure to ionizing radiation. Information was obtained by study of persons receiving an external body source, such as, therapeutic dosage or those accidentally exposed. Others receiving radiation exposure from an internal source, such as the decay of radioisotopes administered for diagnosis or treatment, were also analyzed. T.M.

N81-18634* Santa Clara Univ., Calif.
PRELIMINARY REPORT: BIOMEDICAL CONSIDERATIONS FOR FUTURE MANNED SPACE FLIGHTS
 Faren Ray Akins 1 Oct. 1978 93 p refs
 (Contract NCA2-OR685-805)
 (NASA-CR-152383) Avail: NTIS HC A05/MF A01 CSCL 06P

The behavioral, psychological, and sociological aspects of space travel, particularly with emphasis on longer duration missions, are discussed along with the biomedical aspects of space flight. These factors may strongly interact with the various psycho-social factors and as such they stand as an immensely important area of concern in and of themselves. A foundation for understanding weightlessness related medical problems through a discussion of the history of symptoms reported specific details on the major areas of concern and approaches to their investigation are presented. Also, discussion is given to the possibility of various countermeasures. Some indication of the effects of various biomedical changes in performance are also covered. T.M.

N81-18635* Wisconsin Univ. - Madison.
NASA: BIOMEDICAL APPLICATIONS TEAM Final Report, 1 Jul. 1976 - 31 Dec. 1978
 15 Jan. 1979 155 p refs
 (Contract NAS5-23500)
 (NASA-CR-166636) Avail: NTIS HC A08/MF A01 CSCL 06B

Biomedical applications of NASA technology are summarized and discussed. Included are: diagnostic devices, treatment aids, design improvements and patient tracking systems. S.F.

N81-18636* National Aeronautics and Space Administration, Washington, D. C.
GNOTOBIOLOGY IN MODERN MEDICINE
 G. I. Podoprigora Sep. 1980 20 p refs Transl. into ENGLISH from *Priroda* (USSR), no. 6, Jun. 1978 p 3-15 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Lab. of Experimental Simulations, Academy of Medical Sciences (USSR)
 (Contract NASw-3199)
 (NASA-TM-76362) Avail: NTIS HC A02/MF A01 CSCL 06E

A review is given of currently accepted theories and applications of gnotobiology. A brief history of gnotobiology is supplied. Problems involved in creating germ-free gnotobioti and the use of these animals in experimental biology are cited. Examples of how gnotobiology is used in modern medical practice illustrate the future prospects for this area of science. Author

N81-18637* National Aeronautics and Space Administration, Washington, D. C.
AGE CHARACTERISTICS OF CHANGES IN INVERTASE ACTIVITY OF THE MUCOUS MEMBRANE OF THE SMALL INTESTINE
 K. R. Rakhimov and N. V. Aleksandrova Sep. 1980 6 p refs Transl. into ENGLISH from *Uzbeksk. Biol. Zh.* (USSR), no. 3, May - Jun. 1979 p 41-43 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
 (Contract NASw-3199)
 (NASA-TM-76385) Avail: NTIS HC A02/MF A01 CSCL 06S

Rats of varying ages were subjected to stress from heat, cold, and hydrocortisone injection. Invertase activity in homogenates of small intestine mucous membranes was studied following sacrifice. Invertase activity was low in young animals, but increased sharply in 30 day old ones, remaining at a relatively constant level until old age. The study concludes that the stress hormone (corticosteroids, etc.) levels in the blood, which affects the formation of enteric enzyme levels and activities, and that age related peculiarities in invertase activity are a consequence of altered hormone status and epitheliocyte sensitivity. Author

N81-18638* National Aeronautics and Space Administration, Washington, D. C.
RHEOGRAPHY IN WEIGHTLESSNESS
 I. Kasyan and V. Turchaninova Oct. 1980 6 p Transl. into ENGLISH from *Med. Gazeta* (USSR), 23 Feb. 1980 p 3 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by USSR Ministry of Public Health
 (Contract NASw-3199)
 (NASA-TM-76439) Avail: NTIS HC A02/MF A01 CSCL 06S

Small-scale rheographic devices for use on a space ship were developed and used during flights for the study of blood flow in vascular regions. The processes that occur during space flight and the adaptation of the human body to weightlessness are understood. The future condition of the cosmonauts' health is predicted. Author

N81-18639* National Aeronautics and Space Administration, Washington, D. C.
RESULTS OF THE STUDY OF THE VESTIBULAR APPARATUS AND THE FUNCTIONS OF THE PERCEPTION OF SPACE IN COSMONAUTS (PRE- AND POST-FLIGHT OBSERVATIONS)

I. Ya. Yakovleva, L. N. Kornilova, I. K. Tarasov, and V. N. Alekseyev Jan. 1980 17 p refs Transl. into ENGLISH of "Resultaty Issledovaniya Vestibulyarnogo Apparta i Funktsii Vospriyatiya Prostranstva Kosmonavtov (Pred- i Poslepoletnyye Oslbledovaniya)" Moscow, 1980 p 22 Presented at the 11th Joint Soviet-Am. Working Group on Space Biol. and Med., Moscow, Oct. 1980 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Ministry of Health, Moscow (Contract NASw-3198) (NASA-TM-76485) Avail: NTIS HC A02/MF A01 CSCL 06P

The effect of the set of space flight factors caused a change in the activity of the vestibular apparatus and the spatial perception function. More significant and longer shifts were observed during expeditions of great duration. The detected disorders (increase in reactivity of the otolithic apparatus, decrease in sensitivity of the cupula receptor, deterioration in the perception accuracy, etc.) had a definite tendency to be restored. The primary damage to the otolithic reflex (changes were found in practically all the subjects) is probably caused by the specific effect of zero gravitation, and apparently, may be one of the trigger mechanisms for discrepancy in the activity of the sensory systems, disorders in the correcting function of the cerebellum, and central vestibular formations. E. D. K.

N81-18640* National Aeronautics and Space Administration, Washington, D. C.

RESULTS OF MEDICAL RESEARCH DURING THE 175-DAY FLIGHT OF THE THIRD MAIN CREW ON THE SALYUT-6-SOYUZ ORBITAL COMPLEX

A. D. Yegorov, O. G. Gazenko, ed., and A. M. Genin, ed. Jan. 1981 209 p refs Transl. into ENGLISH of the mono. "Rezultaty Meditsinskikh Issledovaniy vo Vremya 175 Sutochnogo Poleta Tret'yego Osnovnog Ekipazha na Orbitalnom Komplekse Salyut-6-Soyuz" Moscow, 1980 p 299 Presented at the 11th Meeting of the Joint Soviet-Am. Working Group on Space Biol. and Med., Moscow, Oct. 1980 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Academy of Sciences, Moscow, and Ministry of Health, Moscow (Contract NASw-3199) (NASA-TM-76450) Avail: NTIS HC A10/MF A01 CSCL 06P

Preflight, inflight and postflight procedures, and results of cardiopulmonary, neuromuscular, locomotor, biochemical, hematological, immunological, microbiological, and water salt metabolism and kidney function studies in the 175 day flight of the 3rd main crew aboard the Salyut 6 Soyuz orbital station are discussed. Prophylactic measures to prevent unfavorable effects of flight factors and the return to Earth gravity are described. Comparisons are made with the results of similar tests and measures in shorter space flights. Some recommendations for further research are listed. E. D. K.

N81-18641* National Aeronautics and Space Administration, Washington, D. C.

THE USE OF ANTI-GRAVITY SUITS FOR THE CONTROL OF CRITICAL INTRA-ABDOMINAL HEMMORHAGE

Stein Kravik and Knud Landmark Aug. 1980 10 p refs Transl. into ENGLISH from Tidsskr. Morske Laegforen. (Norway), v. 99, no. 30, 1979 p 1498-1500 Transl. by Kanner (Leo) Associates, Redwood City, Calif. (NASA-TM-75786) Avail: NTIS HC A02/MF A01 CSCL 06B

The history and use as well as the physiology of the use of antigravity suits for the control of critical intra-abdominal hemorrhages is reviewed. The use of this suit is highly recommended, especially for first aid. Author

N81-18642* Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A PREDICTOR OF HUMAN VISUAL PERFORMANCE (PREVIP) AT FORM DISCRIMINATION TASKS

Roger A. Gagnon Dec. 1980 42 p refs (AF Proj. 7233) (AD-A093991; AFAMRL-TR-80-1) Avail: NTIS HC A03/MF A01 CSCL 05/5

This technical report presents an algorithm which implements the form (Shape) discrimination task performed by a model of the human visual system. This task is important because there is no known method by which the suitability of a symbol set can be evaluated without conducting expensive and time consuming psychophysical tests. The algorithm reported herein is a PREDICTOR of Visual Performance (PREVIP) at visual discrimination tasks. PREVIP is also used to display the results of the spatial frequency filtering performed by the model and to test the modeling of new tasks. PREVIP accepts a digital representation of a set of visual stimuli and applies a pre-programmed visual response filter. PREVIP then uses these filter outputs to compare the stimuli against a set of previously defined prototypes. This procedure generates a distance metric upon which visual discrimination errors are predicted or against which human errors can be correlated. PREVIP can also be used to test new visual prediction tasks and visual model improvements. Improvements to be included in future versions of PREVIP are: stimulus contrast and illumination effects, masking phenomena, and peripheral visual tasks. GRA

N81-18643# Michigan State Univ., East Lansing. Dept. of Biomechanics.

A FOUNDATION FOR SYSTEMS ANTHROPOMETRY Final Report

Herbert M. Reynolds, Jeff Marcus, James Freeman, and Laurie Batzer 25 Nov. 1980 22 p refs (Contract F49620-78-C-0012; AF Proj. 2313) (AD-A094395; AFOSR-81-0086TR) Avail: NTIS HC A02/MF A01 CSCL 06/14

System Anthropometry has laid the foundation for a three dimensional anthropometry. A unique, dedicated laboratory has been built and is currently used in an investigation of the lumbar/pelvic/femur linkage system. Data have been analyzed describing the three dimensional seated posture of 281 young female subjects. Through the use of a multivariant clustering procedure, two postures were identified: slouched and erect. Data have been collected and analyzed on the sacroiliac and hip joint motion in three dimensional space. Thus, the basis for describing in three dimensional space a fixed body posture and for obtaining data on joint mobility (the anatomical site at which a change of posture is made) has been established. GRA

N81-18644# Enviro Control, Inc., Rockville, Md.

BIOLOGICAL EFFECTS OF SHORT, HIGH-LEVEL EXPOSURE TO GASES: AMMONIA Phase Report, May 1979 - May 1980

Llewellyn J. Legters May 1980 87 p refs (Contract DAMD17-79-C-9086; DA Proj. 3E1-62777-A-846) (AD-A094501) Avail: NTIS HC A05/MF A01 CSCL 06/20

This report presents an analysis and synthesis of the available literature concerned with possible health and performance effects of exposures to ammonia. The US Army's concern is with short, high level exposures that may exceed present threshold limit values of the American Conference of Governmental Industrial Hygienists (25 ppm or 17 mg/cum as a TWA and a ceiling of 35 ppm or 24 mg/cum for 15 minutes). The organs primarily affected by exposure to ammonia gas are the respiratory tract and the eyes. During brief exposures to concentrations of 500 ppm (348 mg/cum) or less, the biologic responses are immediate, reversible, and mainly irritant. Below 50 ppm (35 mg/cum), there are no significant effects except that the odor of ammonia is detectable. Between 50-100 ppm (35-70 mg/cum), most people experience some degree of irritation of the eyes, nose and throat. There is some evidence indicating that personnel may become acclimated to the irritant effects after only 1 or 2 weeks of intermittent exposure at these levels. Around 130 ppm (90 mg/cum), approximately half of exposed personnel experience lacrimation. Lacrimation has been reported in subjects inhaling 500 ppm (348 mg/cum) of ammonia via face mask, which should have prevented direct contact of ammonia with the eyes. GRA

N81-18645# Enviro Control, Inc., Rockville, Md.

BIOLOGICAL EFFECTS OF SHORT, HIGH-LEVEL EXPOSURE TO GASES: NITROGEN OXIDES Phase Report, May

1979 - May 1980

John D. Morton Jul. 1980 95 p refs
(Contract DAMD17-79-C-9086; DA Proj. 3E1-63777-A-846)
(AD-A094502) Avail: NTIS HC A05/MF A01 CSCL 06/20

This report presents an analysis of the available literature describing the health and performance effects of exposure to nitrogen oxides (NOx). The US Army's concern is with high level, short term exposures that may exceed present threshold limit values of the American Conference of Governmental Industrial Hygienists: 5 ppm (9 mg/cum) as a TWA; intended changes are a TWA of 3 ppm (5.4 mg/cum) with a short term exposure limit of 5 ppm (9 mg/cum) for 15 minutes. Dose-response relationships were developed for intensities of exposure from the highest (fatal) level to thresholds of minimal response. It is concluded that NOx can in general be equated to nitrogen dioxide (NO2) because this is much more toxic than the only other oxide of importance, nitric oxide (NO), which oxidizes to NO2 in air. If NO is present in equal or greater concentration, an allowance for its effect is recommended. NO2 exhibits mainly two sets of toxicological characteristics: immediate irritancy and delayed, cumulative tissue damage. Proven effects are mainly on the respiratory tract. Intense exposures result in death, hospitalization with recovery, or severe responses not requiring hospitalization. Survivors may be free from permanent effects. This range covers concentrations from 20 ppm (38 mg/cum) to 200 ppm (376 mg/cum) and up, for single exposures of a few minutes up to 1 hour. GRA

N81-18646# Enviro Control, Inc., Rockville, Md.
BIOLOGICAL EFFECTS OF SHORT, HIGH-LEVEL EXPOSURE TO GASES: AMMONIA, CARBON MONOXIDE, SULFUR DIOXIDE, AND NITROGEN OXIDES Final Summary Report, 1 Jun. 1979 - 15 Aug. 1980

Llewellyn J. Legters, Thomas E. Nightingale, M. Janet Normandy, and John D. Morton Jun. 1980 31 p refs
(Contract DAMD17-79-C-9086; DA Proj. 3E1-62777-A-846)
(AD-A094505) Avail: NTIS HC A03/MF A01 CSCL 06/20

This project addressed the exposure of soldiers to toxic gases for periods of less than one hour and at concentrations above occupational exposure standards, with repetition up to six times per day for 14 days. Sources of the four gases are primarily propellant fumes and engine exhaust. Measurements have shown physiologically significant exposures to carbon monoxide and ammonia. Literature reviews and critical evaluations developed acceptable data bases on the types of biologic effects to be expected and on quantitative relationships between exposure level and intensity of response. These were interpreted in the context of the military exposure scenario and exposure criteria were suggested. Information gaps were identified and suggestions were made for further research. GRA

N81-18647# Enviro Control, Inc., Rockville, Md.
BIOLOGICAL EFFECTS OF SHORT, HIGH-LEVEL EXPOSURE TO GASES: SULFUR DIOXIDE Phase Report, May 1979 - May 1980

Mary Janet Normandy, Philip Szlyk, and Brenda Brienza May 1980 176 p refs
(Contract DAMD17-79-C-9086; DA Proj. 3E1-62777-A-846)
(AD-A094504) Avail: NTIS HC A09/MF A01 CSCL 06/20

This report presents an analysis and synthesis of the available literature concerned with possible health effects of exposures to sulfur dioxide. The U.S. Army is concerned with short, high level exposures to sulfur dioxide that may exceed present threshold limit values of the American Conference of Governmental Industrial Hygienists (5 ppm, 13 mg/cu m as a time-weighted average). The organ systems primarily affected by exposure to sulfur dioxide are the respiratory tract and the eyes. Certain neurologic effects (including suppression of dark adaptation and decreased light sensitivity) are of unknown significance and warrant further study. Below about 5 ppm, there are no significant irritant or pulmonary effects. Between 5 and 8 ppm (13 and 20.8 mg/cu m), most people will experience coughing, moderate irritation of the eyes, nose, and throat, and bronchoconstriction. At about 10 ppm (26 mg/cu m), moderate to severe eye irritation, copious lacrimation, and nasal and chest irritation will

occur. At 20 to 30 ppm (52 to 78 mg/cu m), intense lacrimation, respiratory tract irritation, bronchoconstriction, epistaxis, sneezing, coughing, and hemoptysis may occur. With nasal breathing, about 99% of inspired sulfur dioxide is absorbed by the nasal mucosa and only 1% penetrates the lower airways. With mouth breathing, the effects of sulfur dioxide at a given concentration may be intensified. GRA

N81-18648# Army Research Inst. of Environmental Medicine, Natick, Mass.

USE OF A WETTED COVER TO REDUCE HEAT STRESS IN IMPERMEABLE CLOTHING

John R. Breckenridge Oct. 1980 38 p refs
(DA Proj. 3E7-6277-A-845)

(AD-A094322; USARIEM-T-7/80) Avail: NTIS
HC A03/MF A01 CSCL 06/19

A mathematical model based on physical relations for heat exchange between clothed man and his environment has been developed which describes the cooling effect of a wet cover worn over an impermeable ensemble, in terms of the ensemble characteristics and the ambient environment. The model has been validated at low air movement for one such ensemble by comparing predictions of increased skin heat loss and cover evaporation with values obtained using an electrically heated copper mannikin dressed in the ensemble, with the cover both dry and wetted. The model predicts for this ensemble supplementary cooling (increased skin heat loss) ranging from 40 watts at 35 C, 70% relative humidity, and low air movement to almost 200 watts for a hot/dry environment of 50 C, 20% r.h., with 5 meters/second wind. Predicted water requirements to maintain the cover wet under these conditions range from 0.2 kilograms/hr to 1.9 kilograms/hr. The model also reveals that the wet cover would reduce the heat load imposed on a man by sunlight by 20 to 40 watts in full sun, but with a 0.2 to 0.3 kilograms/hr increase in water requirements. GRA

N81-18649# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

EFFECTS OF LONG-TERM EXPOSURE TO LOW LEVELS OF OZONE: A REVIEW

C. E. Melton Sep. 1980 17 p refs

(AD-A094426; FAA-AM-80-16) Avail: NTIS
HC A02/MF A01 CSCL 06/20

Available literature regarding long term effects of ozone on animals and humans is reviewed. Emphasis is placed on reports that have appeared since 1976, but some earlier reports are cited for completeness and perspective. This review shows that ozone concentration is more important than is duration of exposure in determining the effectiveness of an ozone exposure (dose). This conclusion calls into question the validity of the Time-Weighted Average (TWA) as an index of severity of ozone exposure. The literature review further reveals that there is wide variation in susceptibility of different animal species to ozone, making it difficult to apply results of animal experiments to humans. It further appears that a dose of ozone that is acutely innocuous is also innocuous over the long term. The effects of a symptom-producing dose of ozone are initially cumulative for the first two or three exposures, then an adaptive response may ensue that involves a plateau of response or even a reversal. These effects are shown by both animals and humans. The mechanisms are unknown. Ozone probably causes damage by free radical formation. Free radical scavengers such as vitamins E and C may provide protection against ozone damage. GRA

N81-18650# California Univ., Davis.
PRELIMINARY REPORT ON SMALL GROUP FACTORS IN LONG DURATION SPACE FLIGHTS: REVIEW AND DIRECTIONS FOR FUTURE RESEARCH

Albert A. Harrison Sep. 1979 54 p refs

(Contract NCA2-OR180-803)
(NASA-CR-152385) Avail: NTIS HC A04/MF A01 CSCL 051

Group dynamics, sociological and psychological factors are examined. Crew composition and compatibility are studied. Group

dynamics analysis includes: leadership; cohesiveness; conformity; and conflict. S.F.

N81-18651*# Santa Clara Univ., Calif.
PERFORMANCE CONSIDERATIONS IN LONG-TERM SPACEFLIGHT

Faren R. Akins Sep. 1979 93 p refs
(Contract NCA2-OR685-805)
(NASA-CR-152384) Avail: NTIS HC A05/MF A01 CSCL 051

Maintenance of skilled performance during extended space flight is of critical importance to both the health and safety of crew members and to the overall success of mission goals. An examination of long term effects and performance requirements is therefore a factor of immense importance to the planning of future missions. Factors that were investigated include: definition of performance categories to be investigated; methods for assessing and predicting performance levels; in-flight factors which can affect performance; and factors pertinent to the maintenance of skilled performance. T.M.

N81-18652*# Santa Clara Univ., Calif.
PRELIMINARY REPORT: ISSUES IN SELECTION AND TRAINING FOR LONG DURATION SPACE FLIGHT

Faren R. Akins Oct. 1979 94 p refs
(Contract NCA2-OR180-805)
(NASA-CR-152386) Avail: NTIS HC A05/MF A01 CSCL 051

Based on previous experience with crew selection, three important avenues of consideration for future missions are discussed: technical qualifications and expertise; medical fitness and ability to tolerate the various conditions of space; and psychological considerations including personality structure, motivation, intelligence, leadership potential, group compatibility, etc. Primary emphasis was given to the psychological considerations. T.M.

N81-18653*# California Univ., Davis.
PRELIMINARY REPORT ON SOCIAL PSYCHOLOGICAL FACTORS IN LONG DURATION SPACE FLIGHTS: REVIEW AND DIRECTIONS FOR FUTURE RESEARCH

Albert A. Harrison Sep. 1978 99 p refs
(Contract NCA2-OR180-803)
(NASA-CR-152382) Avail: NTIS HC A05/MF A01 CSCL 051

Group dynamics, sociological and psychological factors are examined. Crew composition and compatibility are studied. Group dynamics analysis includes: leadership; cohesiveness; conformity; and conflict. S.F.

N81-18654# RAND Corp., Santa Monica, Calif.
PERFORMANCE MODELS FOR SPATIAL AND LOCATIONAL COGNITION Final Report, Oct. 1977 - Sep. 1980

Perry W. Thorndyke, Barbara Hayes-Roth, and Cathleen Stasz Dec. 1980 37 p refs
(Contract N00014-78-C-0042; NR Proj. 157-410)
(AD-A094149; RAND/R-2676-ONR) Avail: NTIS HC A03/MF A01 CSCL 08/2

Summarizes a three year investigation of the knowledge and processes people use to learn and make spatial judgments in large scale environments. Experiments in map learning indicated that both the use of effective study procedures and visual memory ability determine success at learning a map. All but low ability people benefit from training in effective study procedures. Studies of people's procedures for accuracy at estimating distances on maps indicated that map clutter increases subjective distance between two points. A third series of studies investigated differences in the knowledge people acquire from navigation and from map learning. Studying a map leads to a global representation of the environment, while navigation provides a linear, or procedural representation. Navigation experience is optimal for estimating route distances and orienting oneself toward unseen locations. Map learning is optimal for estimating the shortest distance between two points and determining relative locations of objects. GRA

N81-18655*# Umpqua Research Co., Myrtle Creek, Ore.
DESIGN AND FABRICATION OF A FOUR-MAN CAPACITY URINE WICK EVAPORATOR SYSTEM Final Report

1 Nov. 1979 38 p
(Contract NAS2-9677)
(NASA-CR-152226) Avail: NTIS HC A03/MF A01 CSCL 06K

The integrated system was tested to determine the performance characteristics and limitations of the dual catalyst concept. The primary objective of the dual catalyst concept is to remove ammonia and other noxious substances in the gas phase and thereby eliminate the need for and current practice of chemically or electrochemically pretreating urine prior to distillation. T.M.

N81-18656*# Life Systems, Inc., Cleveland, Ohio.
FAULT DIAGNOSTIC INSTRUMENTATION DESIGN FOR ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS Final Report

P. Y. Yang, K. C. You, R. A. Wynveen, and J. D. Powell, Jr. Oct. 1979 63 p refs
(Contract NAS2-10050)
(NASA-CR-152309; LSI-TR-361-5) Avail: NTIS HC A04/MF A01 CSCL 06K

As a development phase moves toward flight hardware, the system availability becomes an important design aspect which requires high reliability and maintainability. As part of continuous development efforts, a program to evaluate, design, and demonstrate advanced instrumentation fault diagnostics was successfully completed. Fault tolerance designs for reliability and other instrumentation capabilities to increase maintainability were evaluated and studied. T.M.

N81-18657*# National Aeronautics and Space Administration, Washington, D. C.

NUTRITION DURING LONG FLIGHT
A. S. Ushakov Oct. 1980 7 p refs Transl. into ENGLISH from Zdorovye (USSR), no. 4(304), 1980 p 4-5 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-76436) Avail: NTIS HC A02/MF A01 CSCL 06K

The nutrition of astronautics during long flights is discussed, especially with respect to the changes brought about in the body by the condition of weightlessness. Author

N81-18658*# National Aeronautics and Space Administration, Washington, D. C.

WORK OF THE COSMONAUT
L. S. Demin Oct. 1980 12 p Transl. into ENGLISH from Zemlya Vseleennaya (USSR), Feb. 1977 p 4-9 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-76437) Avail: NTIS HC A02/MF A01 CSCL 05H

The necessity for the cosmonaut to receive broad training in many fields in order to carry out his multifaceted work is discussed. The work includes: scientific research, engineering, operator's work, participation in technical commissions and councils, training on simulators, and the study of technology and sports. T.M.

N81-18659*# University of Southern California, Los Angeles.
DSN HUMAN FACTORS PROJECT Final Report

Roy L. Chafin and Thomas H. Martin 1 Nov. 1980 131 p refs
(Contracts NAS7-100; JPL-955013)
Avail: NTIS HC A07/MF A01 CSCL 05E

The project plan was to hold focus groups to identify the factors influencing the ease of use characteristics of software and to bond the problem. A questionnaire survey was conducted to evaluate those factors which were more appropriately measured with that method. The performance oriented factors were analyzed and relationships hypothesized. The hypotheses were put to test in the experimental phase of the project. In summary, the initial analysis indicates that there is an initial performance effect favoring

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computer controlled dialogue but the advantage fades fast as operators become experienced. The user documentation style is seen to have a significant effect on performance. The menu and prompt command formats are preferred by inexperienced operators. The short form mnemonic is least favored. There is no clear best command format but the short form mnemonic is clearly the worst. E.D.K.

N81-18660*# Hamilton Standard, Windsor Locks, Conn.
BREADBOARD SOLID AMINE WATER DESORBED CO2 CONTROL SYSTEM Test Report, 1 Sep. 1979 - 30 Jun. 1980

Arthur K. Colling and Mark M. Hultman Nov. 1980 59 p refs

(Contract NAS9-13624)

(NASA-CR-160917; SVHSER-7226) Avail: NTIS
HC A04/MF A01 CSCL 06K

A regenerable CO2 removal system was developed for potential use on the shuttle as an alternate to the baseline lithium hydroxide (LiOH) system. It uses a solid amine material to adsorb CO2 from the atmosphere. The material is regenerated by heating it with steam from a zero gravity water evaporator. A full sized, thermally representative breadboard canister and a preprototype water evaporator were built and tested to shuttle requirements for CO2 control. The test program was utilized to evaluate and verify the operation and performance of these two primary components of the SAWD system. T.M.

N81-18661*# Hamilton Standard, Windsor Locks, Conn.
OPERATION AND MAINTENANCE MANUAL FOR A PREPROTOTYPE SABATIER CARBON DIOXIDE REDUCTION SUBSYSTEM

Gilbert N. Kleiner Jan. 1981 83 p refs

(Contract NAS9-15470)

(NASA-CR-160918; SVHSER-7222) Avail: NTIS
HC A05/MF A01 CSCL 06K

The manual delineates the procedures, precautions and necessary sequences of steps required to prepare the package for test, provide troubleshooting information and perform required maintenance by the operating crew. The manual is divided into five sections: Installation, Checkout, Operation, Failure Detection/Isolation and Maintenance. T.M.

N81-18662*# Hamilton Standard, Windsor Locks, Conn.
DEVELOPMENT OF A PREPROTOTYPE SABATIER CO2 REDUCTION SUBSYSTEM

Gilbert N. Kleiner and Phillip Birbara Jan. 1981 171 p refs
Revised

(Contract NAS9-15470)

(NASA-CR-160919; SVHSER-7221-Rev-A) Avail: NTIS
HC A08/MF A01 CSCL 06K

A lightweight, quick starting reactor utilizes a highly active and physically durable methanation catalyst composed of ruthenium on alumina. The use of this improved catalyst permits a single straight through plug flow design with an average lean component H2/CO2 conversion efficiency of over 99% over a range of H2/CO2 molar ratios of 1.8 to 5 while operating with flows equivalent to a crew size of one person steadystate to 3 persons cyclical. The reactor requires no heater operation after start-up even during simulated 55 minute lightside/39 minute darkside orbital operation over the above range of molar ratios and crew loadings. Subsystem performance was proven by parametric testing and endurance testing over a wide range of crew sizes and metabolic loadings. The subsystem's operation and performance is controlled by a microprocessor and displayed on a nineteen inch multi-colored cathode ray tube. T.M.

N81-18663*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

PILOT REACTIONS TO OPTICAL DEFECTS FOUND IN F-111 BIRD IMPACT RESISTANT WINDSCREENS Technical Report, Oct. 1978 - Sep. 1979

Shelton MacLeod and Robert G. Eggleston Dec. 1980 38 p refs

(AF Proj. 7184)

(AD-A093937; AFAMRL-TR-80-4) Avail: NTIS
HC A03/MF A01 CSCL 05/5

A field study was conducted to assess the scope and severity of mission related optical problems associated with the new F-111 Bird Impact Resistant Transparency (BIRT) windscreen. Data for this study was gathered from an 81 item questionnaire and used to scale the opinions of 33 USAF pilots. Principal findings indicate that: (1) distortion is perceived as the most disruptive optical factor followed in order by multiple images, haze and rainbowing; (2) the worst combination of optical defect and flight task is multiple images during night approach and landing; (3) the extent to which BIRT optical problems are perceived as impairing mission performance is sufficiently great to further justify research for improving windscreen optical quality. (4) pilots with very limited amounts of BIRT flying time (20-80 hours) are less likely to perceive windscreen optical problems than a middle experience group (with 100 to 180 flying hours). This difference is attributed to a lack of exposure to the optical effects; and (5) pilots with relatively extensive BIRT flying experience (over 200 hours) are also less prone to perceive windscreen problems than the middle experience group. This difference is attributed to the effect of a period of adjustment to the optical anomalies. GRA

N81-18664*# Naval Postgraduate School, Monterey, Calif.
THE EFFECTS OF MULTIPLE ANTHROPOMETRIC CONSTRAINTS ON THE ACCOMMODATION OF PERSONNEL IN OPERATIONAL NAVAL AIRCRAFT M.S. Thesis

James Clayton Bartholomew Sep. 1980 121 p refs
(AD-A093626) Avail: NTIS HC A06/MF A01 CSCL 05/8

All Navy aircraft are required to accommodate, anthropometrically, ninety percent of the user population. Some designs have been criticized for their low accommodations but those accommodations have never been quantified. The purpose of this thesis was to quantify the accommodation, by each type of operational Naval aircraft, of populations of Naval aviation personnel of 1964, 1969, and 1975. The Computerized Accommodation Percentage Evaluation (CAPE) model was used to generate data points since only summary statistics were available for two of the populations. Each subject of every population was checked against the requirements of the design specification and against the limitations of each aircraft. All aircraft were found to accommodate more than ninety percent of the 1975 population. Time related changes in the populations were noted and unexplained inconsistencies in the data were discovered. Possible sources of error were discussed and potential solutions proposed. GRA

N81-18665*# Illinois Univ. at Urbana-Champaign.
THE APPLICATION OF ADDITIVE FACTORS METHODOLOGY TO WORKLOAD ASSESSMENT IN A DYNAMIC SYSTEM MONITORING TASK Interim Technical Report

John Micalizzi and Christopher D. Wickens Dec. 1980 50 p refs

(Contract N00014-79-C-0658)

(AD-A094314; EPL-80-2/ONR-80-2) Avail: NTIS
HC A03/MF A01 CSCL 05/8

This report describes the theory that lies behind applications of Sternberg's additive factors methodology to the selective assessment of primary task workload, within the framework of a multiple resources model of human information processing. In applying this methodology, a reaction time task is performed alone and concurrently with a primary task of interest. Orthogonally, a characteristic of the RT task is varied to prolong one stage of processing. If the effect of this manipulation is greater in the presence of the primary task than in its absence (i.e., an interaction), then the resource demands of the primary task are assumed to overlap with those imposed by the RT manipulation. If there is no interaction (additivity), then different resources are required. Conclusions of previous research efforts that have employed additive factors in dual task paradigms are summarized. A validation experiment is then reported in which a failure detection/monitoring task is employed as a primary task. Manipulations of perceptual and response load of a secondary reaction time task are performed while subjects engage in a

primary task of monitoring for, and detecting failures of, an autopilot-controlled dynamic system. This primary task is assumed to place heavy demands on the earlier stages of processing.

GRA

N81-18666# Perceptronics, Inc., Woodland Hills, Calif.
MAN-MACHINE COMMUNICATION IN REMOTE MANIPULATION TASK-ORIENTED SUPERVISORY COMMAND LANGUAGE (TOSC) Final Technical Report, 2 Feb. 1979 - 1 Feb. 1980

Yee-Yeen Chu, William H. Crooks, and Amos Freedy Mar. 1980
226 p refs

(Contract N00014-76-C-0603; NR Proj. 196-140)
(AD-A094482; PFTR-1034-80-3) Avail: NTIS
HC A11/MF A01 CSCL 05/8

This report covers research and development directed toward the investigation and optimization of man-machine communication in computer aided remote manipulation. The purpose of this program was to determine through analytical and experimental studies the relationships between primary man-machine communication factors and system performance and to develop and demonstrate a communication design methodology to improve operator performance with remotely controlled systems. Specific objectives included the following: (1) to perform an analysis of communications requirements in computer aided manipulation and closely related areas of adaptive and autonomous control, (2) to establish an experimental system for study of task oriented supervisory control of a remote manipulator, (3) to implement and evaluate communication systems, encompassing both language and interface, designed to permit natural and efficient control of a variety of remote manipulation tasks, (4) to identify the primary factors influencing the success of shared man-computer control, and to establish quantitative relationships between these factors and the system performance measures, and (5) to provide guidelines for the design of man-computer communication in subsequent autonomous, adaptive and remotely manned systems. GRA

N81-19750# California Univ., Irvine. Dept. of Community and Environmental Medicine.

DIRECT EXPOSURE OF MONOLAYERS OF MAMMALIAN CELLS TO AIRBORNE POLLUTANTS IN A UNIQUE CULTURE SYSTEM Annual Report

Ronald E. Rasmussen and T. Timothy Crocker 1 Feb. 1981
40 p refs

(Contract F49620-79-C-0082; AF Proj. 2312)
(AD-A094785; AFOSR-81-0093TR; HR-3) Avail: NTIS
HC A03/MF A01 CSCL 06/6

The research was concerned with direct interaction between living mammalian cells and airborne pollutants. Mammalian cell lines were grown on cellulose ester membranes (Millipore) and exposed to test atmospheres in a specially designed system which maintained the cells in a viable state and in which pollutant concentrations were controlled and monitored. The specific tasks for this year have been to: (a) modify the exposure system to permit the use of organic vapors such as hydrazine and jet fuels; (b) measure the cytotoxic effects of mixtures of nitrogen dioxide and ozone as well as hydrazine and jet fuels on human and animal cell lines. Effects on cell proliferation and DNA synthesis would be included; (c) initiate studies to test the hypothesis that atmospheric oxidant gases such as NO₂ or O₃ may react with hydrocarbon vapors, such as jet fuels, to produce toxic or mutagenic products; and (d) evaluate two cell strains from adult rat lung tissues for use in the exposure system studies. The use of organic vapors in the exposure system has been facilitated by the employment of resistant materials such as stainless steel, Teflon, and silicone rubber as appropriate. GRA

N81-19751# Oak Ridge National Lab., Tenn.
CHEMICALS IDENTIFIED IN HUMAN BIOLOGICAL MEDIA, A DATA BASE Annual Report

M. V. Cone, comp., Margaret F. Baldauf, comp., Fay M. Martin, comp., and John T. Ensminger, comp. Jan. 1981 675 p refs
Sponsored in part by National Cancer Inst.

(ORNL/EIS-163/V2-P2; AR-2) Avail: NTIS HC A99/MF A01

A comprehensive data base of chemicals identified in human biological media (tissues and body fluids) was established. The data base is contained in tabular format and arranged alphabetically by Chemical Abstracts Service (CAS) preferred chemical name. The chemical is given along with its CAS registry number, formula, atomic weight, melting point, boiling point, and vapor pressure. Tissues are listed alphabetically in with the record number. DOE

N81-19752# California Univ., Livermore. Lawrence Livermore Lab.

DESIGN AND FABRICATION OF A PORTABLE MINICUVETTE SYSTEM FOR MEASURING LEAF PHOTOSYNTHESIS AND STOMATAL CONDUCTANCE UNDER CONTROLLED CONDITIONS

G. E. Bingham, P. I. Coyne, R. B. Kennedy, and W. L. Jackson
14 Aug. 1980 66 p refs

(Contract W-7405-eng-48)
(UCRL-52895) Avail: NTIS HC A04/MF A01

The design specifications and some performance data for a miniaturized cuvette system suitable for measuring photosynthesis and stomatal conductance in the field are reported. The system operates on 12 V power (dc). An electronic support module is attached by an umbilical cord to a stirred reaction leaf chamber and a rechargeable battery pack. The chamber is heated or cooled by thermoelectric modules and humidity and CO₂ concentration are kept steady by bleeding in dry air and CO₂ enriched dry air through capillaries. Relative humidity is measured in situ by a fast response capacitive type humidity sensor. Carbon dioxide concentration is currently monitored by diverting exhaust gas from the chamber to a conventional infrared gas analyzer. A miniaturized, folded path infrared gas analyzer is to be incorporated into the system as an in situ CO₂ sensor in a manner analogous to the humidity sensor. True CO₂ can be estimated using (14)CO₂ labeled air. The system features solid state pressure transducers for monitoring flow rate and digital readout for all parameters. DOE

N81-19753# Brookhaven National Lab., Upton, N. Y. Biology Dept.

CYCLES AND Q-CYCLES IN PLANT PHOTOSYNTHESIS

D. Crowther and Geoffrey Hind 1980 22 p refs Presented at the Conf. on Function of Quinones in Energy Conserving Systems, Hanover, N.H., 28-29 Oct. 1980

(Contract DE-AC02-78CH-00016)
(BNL-28684; CONF-8010149-1) Avail: NTIS
HC A02/MF A01

The classical description of electron transfer in chloroplasts linked photosystem 2 to photosystem 1 with a simple hydrogen-carrying plastoquinone shuttle which transferred one H(+) per electron travelling through the chain. An additional H(+)/e(-) liberated inside the thylakoid with the splitting of water provided an overall H(+)/e(-) stoichiometry of 2. Cyclic electron transfer around photosystem 1 via cytochrome b563 was considered to reenter the main chain at plastoquinone, translocating one H(+) per electron completing the cycle. Such a scheme had to be modified, however, following the discovery of a further charge translocation that is observed, following a single turnover flash, as a slow rise in the electric field indicating bandshift termed P518. DOE

N81-19754# Florida State Univ., Tallahassee.
RADIATION INDUCED EFFECTS IN ORGANIC SYSTEMS Progress Report, 1 Dec. 1979 - 1 Dec. 1980

Russell H. Johnson 1980 13 p refs
(Contracts DE-AS05-78ER-02001; EY-78-5-05-2001)
(DOE/EV-02001/1) Avail: NTIS HC A02/MF A01

The nature of the decay kinetics in systems yielding geminate radical pairs upon irradiation was investigated as well as OH reactions with aromatic hydrocarbons. Particular emphasis was placed on the p,p' azoxy phenetole molecule, studied at low temperatures using both polycrystalline and single crystal systems. The gas phase OH reactions were modified to produce reproducible results which can be interpreted as occurring in the bulk rather than as surface modified. The most surprising result was the

observation of relatively large amounts of biphenyl produced from benzene by OH radical attack. DOE

N81-19755# Brandeis Univ., Waltham, Mass.
EFFECTS OF LIGHT ON RESPIRATION AND DEVELOPMENT OF PHOTOSYNTHETIC CELLS Progress Report, 1 Mar. - 1 Nov. 1980

Martin Gibbs 20 Nov. 1980 15 p refs
 (Contract DE-AC02-76ER-03231)
 (DOE/ER-03231/5) Avail: NTIS HC A02/MF A01

The oxyhydrogen reaction in the presence and absence of CO₂ was studied in H₂ adapted *Scenedesmus obliquus* by monitoring the initial rates of H₂, O₂, and (14)CO₂ uptake and the effect of inhibitors on these rates. Glucose and acetate respiration was competitive with H₂ uptake. KCN inhibited equally respiration and the oxyhydrogen reaction in the presence and absence of CO₂. It was concluded that the oxyhydrogen reaction both in the absence and presence of CO₂ has properties in common with components of respiration and photosynthesis. Participation of these two processes in the oxyhydrogen reaction would require a closely linked shuttle between mitochondrion and chloroplast. Protoplasts and chloroplasts will be isolated from a H₂ adapted alga in order to elucidate the cooperation between the two organelles. Acetate was shown to stimulate H₂ photoproduction in H₂ adapted algae even more so than an uncoupler of electron transport. DOE

N81-19756# Royal Aircraft Establishment, Farnborough (England).

RELATIONSHIP BETWEEN STRESS DUE TO PHYSICAL ENVIRONMENTAL FACTORS AND HUMAN RELIABILITY
 A. M. Metz and A. Meister Oct. 1980 17 p refs Transl. into ENGLISH from Z. Psychol. (Germany) vol. 184, no. 1, 1976 p 51-62

(RAE-LIB-Trans-2049; BR77344) Avail: NTIS HC A02/MF A01

Physical disturbance tests are used to demonstrate an application of the analysis of reliability with reference to experimental data. During 30 and 120 minute stressing by whole body exposure to vibrations of different frequency, acceleration, and type, subjects were required to muster all their powers of mental concentration (modified clock test of Mackworth and audible signal detection experiments). Data analysis of reliability of response proves to be a suitable means of describing performance. The following are the factors affecting reliability of performance: (1) condition of training of the subject; (2) time of activity; (3) time density of assignment; and (4) degree of stressing by exposure to vibrations. An attempt is made to correlate performance, physical disturbance, and central nervous system activation. S.F.

N81-19757*# National Aeronautics and Space Administration, Washington, D. C.

DEPENDENCE OF VESTIBULAR REACTIONS ON FREQUENCY OF ACTION OF SIGN-VARIABLE ACCELERATIONS

E. V. Lapayev, O. A. Vorob'yev, and V. V. Ivanov Oct. 1980 10 p refs Transl. into ENGLISH from Zh. Ushnykh Nosovykh Gorlovykh i Bolez. (USSR), no. 5, Sep. - Oct. 1979 p 333-337 Transl. by Scientific Translation Service, Santa Barbara, Calif. (Contract NASw-3198)

(NASA-TM-76410) Avail: NTIS HC A02/MF A01 CSCL 06P

It was revealed that during the tests with continuous action of sign variable Coriolis acceleration the development of kinetosis was proportionate to the time of head inclinations in the range of 1 to 4 seconds while illusions of rocking in sagittal plane was more expressed in fast inclinations. The obtained data provided the evidence of sufficient dependence of vestibulovegetative and vestibulosensory reactions on the period of repetition of sign variable Coriolis acceleration. Author

N81-19758*# National Aeronautics and Space Administration, Washington, D. C.

IDIOPATHIC ORTHOSTATIC HYPOTENSION: RECENT DATA (ELEVEN CASES) AND REVIEW OF THE LITERA-

TURE

J. Ninet, G. Annat, D. Boisson, L. Holzhapfel, M. Vincent, L. Peyrin, D. Michel, B. Schott, M. Devic, and R. Levrat Feb. 1981 36 p Transl. into ENGLISH from Lyon Med. (France), v. 244, no. 13, 1980 p 11-24 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)
 (NASA-TM-75890) Avail: NTIS HC A03/MF A01 CSCL 06P

Eight cases of Shy-Drager syndrome and three of Bradbury-Eggleston idiopathic orthostatic hypotension were examined. In all cases, examination of circulatory reflexes showed major dysfunction of the sympathetic vasoconstrictor system. Anomalies in the vagal cardiomodulator system were less constant. Normal urinary elimination of catecholamines was recorded daily. Characteristically, no elevation of blood or urine norepinephrine levels were found in orthostatism. Insulin hypoglycemia normally raised urinary adrenalin elimination in three of ten patients. Plasma dopa-beta-hydroxylase activity was normal. Renin-angiotensin-aldosterone system showed variable activity at basal state but usually rose during orthostatism. On the average, very low homovanillic acid levels were found in cerebrospinal fluid before and after probenecid; hydroxyindolacetic acid was normal. Cerebral autoregulation had deteriorated in two of four cases. Physiopathologically the two clinical types are indistinguishable with or without central neurological signs. M.G.

N81-19759# Enviro Control, Inc., Rockville, Md.
BIOLOGICAL EFFECTS OF SHORT, HIGH-LEVEL EXPOSURE TO GASES; CARBON MONOXIDE Phase Report, May 1979 - May 1980

Thomas E. Nightingale Jun. 1980 120 p refs
 (Contract DAMD17-79-C-9086; DA Proj. 3E1-62777-A-846)
 (AD-A094503) Avail: NTIS HC A06/MF A01 CSCL 06/20

This report presents an analysis and synthesis of the available literature describing health and performance effects of exposure to carbon monoxide (CO). The US Army's concern is with high-level, short-term exposures that may exceed present threshold limit values of the American Conference of Governmental Industrial Hygienists (50 ppm as a TWA and a ceiling of 400 ppm for 15 minutes). The organs primarily affected by exposure to CO are the heart and brain, with effects caused by impaired oxygen delivery. During brief exposures to concentrations of up to 35,600 ppm, there was an electrocardiographic change suggestive of myocardial ischemia within 15 seconds after the start of exposure, although there were no changes in heart rate, blood pressure or blood chemistry values in young healthy subjects. The first subjective sign of CO toxicity will probably be a headache followed by a awareness of a pounding heartbeat; however, the great variation in tolerance precludes establishment of threshold values per se, although a carboxyhemoglobin (COHb) of 15 percent would probably not elicit these symptoms in most healthy subjects. Laboratory studies have shown a reduction in work capacity following CO exposure in humans. The basis for this lower work capacity has been investigated in both humans and animal models, which is compensated for by an increase in coronary blood flow in healthy subjects up to 9% COHb in man and 30% COHb in dogs. GRA

N81-19760# Office of Naval Research, London (England).
CURRENT PERSPECTIVES IN HYPERBARIC PHYSIOLOGY, ULTRASONIC DOPPLER BUBBLE DETECTION, AND MASS SPECTROMETRY

B. G. DAoust (Virginia Mason Research Center, Seattle) 28 Dec. 1979 15 p
 (AD-A082519; ORNL-R-5-79) Avail: NTIS HC A02/MF A01 CSCL 06/19

Two important analytical techniques in biomedical research have been increasingly utilized in hyperbaric physiology over the past 12 years. Doppler ultrasonic bubble detection on the one hand and mass spectrometry on the other have been used to demonstrate responses to both elevated pressure and decompression which have previously been only conjecture. Both techniques have raised controversies, yet both, properly used, are capable not only of resolving them but also resolving many of the questions

which have remained unanswered. The article discusses the 'state of the art' of these two techniques in hyperbaric medicine and some of the more promising areas for the future. GRA

N81-19761# Army Medical Research Inst. of Infectious Diseases, Frederick, Md. Pathology Div.
THE ACTION OF BOTULINUM TOXIN AT THE NEUROMUSCULAR JUNCTION

Lawrence C. Sellin 22 Dec. 1980 36 p refs Submitted for publication
 (AD-A094643) Avail: NTIS HC A03/MF A01 CSCL 06/5

Botulism results from the action of a protein neurotoxin (MW approx. 150,000) produced by the bacterium *Clostridium botulinum*, of which there are eight known strains. Botulinum neurotoxin is the most potent biological toxin known, having a median lethal dose of 5-50 ng/kg body weight. The primary site of action of botulinum toxin is the cholinergic nerve terminal, where it blocks the release of the neurotransmitter acetylcholine. Death usually results from respiratory failure. Nonlethal doses of botulinum toxin can induce sprouting of the nerve terminal and have significant postsynaptic effects, including muscle atrophy and alterations in the membrane electrical properties of the muscle fiber. There is no universally available treatment for botulinum intoxication. However, immunotherapeutic and chemotherapeutic procedures are now being developed and will be discussed. GRA

N81-19762# Naval Ocean Systems Center, San Diego, Calif.
REMOTE MEDICAL DIAGNOSIS SYSTEM (RMDS): EVALUATION OF THE AN/FYA-28 TELEPHONE TERMINAL INTERFACE Final Report, Apr. - Jul. 1978

W. T. Rasmussen, I. Stevens, and J. West (WESTEC Services) 1 Dec. 1980 21 p refs
 (Contract N00123-77-D-0458)
 (AD-A094831; NOSC/TR-631) Avail: NTIS HC A02/MF A01 CSCL 06/14

The mission of the Remote Medical Diagnosis System (RMDS) is to improve medical diagnosis at remote sites. This is accomplished by transmitting medical data and diagnostic information between remote ship or shore sites and full capability medical centers. The RMDS will enable the medical personnel at a remote site to contact a physician at a diagnostic center (ashore or shipboard) and transmit a visual and auditory presentation of the medical data needed for diagnosis, such as patient history, laboratory tests, ECG tracings, X-ray images, images of a patient injury, heart-lung sounds, and verbal descriptions. By return link, the physician will be able to send diagnosis and treatment information. The communication requirements for this are satisfied by any two way, voice grade, narrowband communication channel such as telephone line, HF or UHF radio, or satellite links. The system as a whole consists essentially of the Remote Medical Diagnosis Terminals (RMDTs), user personnel, and existing voice grade communication links which can be used to interconnect the terminals. All the hardware which is unique to the system is contained in the terminals, including a TV camera, TV monitor, X-ray light box, electronic stethoscope, ECG monitor, audio tape recorder, and audio handsets; and the electronics package, consisting of signal modulator, demodulator, and modems. Shipboard feasibility tests of an early RMDS were completed during FY 75/76. GRA

N81-19763# Oak Ridge National Lab., Tenn. Health and Environmental Studies Program.

CHEMICALS IDENTIFIED IN HUMAN BIOLOGICAL MEDIA, A DATA BASE Annual Report

M. Virginia Cone, comp., Margaret F. Baldauf, comp., Fay M. Martin, comp., and John T. Ensminger, comp. Jan. 1981 494 p refs Sponsored in part by National Cancer Inst.
 (Contract W-7405-eng-36)

(ORNL/EIS-163/V2-P1; AR-2) Avail: NTIS HC A21/MF A01

A comprehensive data base of chemicals identified in human biological media (tissues and body fluids) was established. Data were primarily from the open literature through manual searches of the journals listed in Appendix A. The data base now contains information on over 500 different substances. Chemicals are listed by Chemical Abstracts Service (CAS) registry numbers and preferred names in Appendix B. For the user's convenience,

cross-referenced chemical lists of CAS names are provided in Appendix C. The human tissues and body fluids found to be contaminated by these chemicals are listed in Appendix D. The data base is published annually in two parts. Part 1 contains introductory materials, references, appendices, indices, and a chemical directory. Information in Part 1 is cumulative, thus allowing the user access to information in the previous edition of Part 2. DOE

N81-19764# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

A VISCOELASTIC FINITE ELEMENT MODEL OF THE HUMAN INTERVERTEBRAL JOINT M.S. Thesis

Ronald L. Hinrichsen Dec. 1980 107 p refs
 (AD-A094774; AFIT/GAE/AA/80D-11) Avail: NTIS HC A06/MF A01 CSCL 06/16

The combined mechanical stresses on aircrewmembers have become increasingly acute as technological developments extend the flight envelopes of our high performance aircraft. Limitations on the design of this type of aircraft are frequently dictated by human tolerance. The concept of an analytical model to evaluate the biomechanical response of the human intervertebral joint, under the influence of long term axial compressive loading, is important in assessing the load carrying capability of normal and diseased vertebral segments. It has been experimentally demonstrated that healthy intervertebral joints are composed of materials which exhibit creep characteristics. This investigation is significant because it presents a study of the time dependent behavior involved. An axisymmetric finite element model is employed which incorporates a linear viscoelastic constitutive relation for the intervertebral disc. Viscoelastic material constants are found by matching one dimensional data with the two dimensional model. Results are presented depicting displacement profiles and stress redistributions occurring as a consequence of the inclusion of these viscoelastic parameters which, for the first time, simulate the actual human response to high compressive loads over a specific time span. GRA

N81-19765# California Univ., Berkeley. Lawrence Berkeley Lab. Biology and Medicine Div.

THEORETICAL AND OBSERVATIONAL ANALYSIS OF INDIVIDUAL IONIZING PARTICLE EFFECTS IN BIOLOGICAL TISSUE Ph.D. Thesis

Alan Carl Nelson Nov. 1980 166 p refs
 (Contract W-7405-eng-48)
 (LBL-11147) Avail: NTIS HC A08/MF A01

The microstructural damage to living tissue caused by heavy ion radiation was studied. Preliminary tests on rat corneal tissue, rat cerebellar tissue grown in culture, and rat retinal tissue indicated that the best assay for heavy ion damage is the rat cornea. The corneal tissue of the living rat was exposed to beams of carbon at 474 MeV/amu, neon at 8.5 MeV/amu, argon at 8.5 MeV/amu, silicon at 530 MeV/amu, iron at 500 MeV/amu, and iron at 600 MeV/amu. The X-rays were also used on corneas to compare with the heavy ion irradiated corneas. Scanning electron microscopy revealed lesions with circular symmetry on the external plasma membranes of corneal epithelium which were irradiated with heavy ions, but similar lesions were not observed on the plasma membranes of X-ray irradiated or nonirradiated control samples. These data verify the special way in which heavy ions interact with matter: each ion interacts coulombically with electrons all along its trajectory to generate a track. The dose from heavy ion radiation is not distributed homogeneously on a tissue microstructural scale but is concentrated along the individual particle track. DOE

N81-19766# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
COMPUTER-BASED INTERACTIVE FLIGHT TRAINING Final Report, Apr. 1977 - Aug. 1980

Wallace Feurzeig, George Lukas, and Dan Stefanescu Nov. 1980 45 p refs

(Contract F49620-78-C-0066; AF Proj. 2313)
 (AD-A094808; BBN-4530; AFOSR-81-0088TR) Avail: NTIS HC A03/MF A01 CSCL 05/9

Computer based methods were developed for describing the salient features of pilot performance on complex flight tasks.

These methods extend and generalize a new approach to performance analysis expressly designed to mirror the procedures used by expert instructors in analyzing simulator flight data and diagnosing trainee errors. A data base for guiding the development of this instructor model of performance analysis was provided by a set of ILS approach tasks flown on the ORLY simulator.

GRA

N81-19767# California Univ., Santa Barbara. Dept. of Psychology.

ON THE ESTIMATION OF MENTAL WORKLOAD Final Scientific Report

John W. Senders (Toronto Univ., Ontario) and Robert M. Gottsdanker Nov. 1980 60 p refs
(Grant AF-AFOSR-0133-79; AF Proj. 2313)
(AD-A094783; AFOSR-81-0087TR) Avail: NTIS HC A04/MF A01 CSCL 05/8

The only practical way to attack the problems of mission delimitation, machine improvement, and operator specification in respect to mental workload appears to be computer simulations of both man and system performing a well-specified mission. As real systems afford the operator relative freedom of choice, the simulation of the human operator must possess intelligence. Unfortunately the data gathered in the laboratory on human performance are highly synthetic and concern the lowest elements of behavior. Uncritical use of these data to solve problems of mental workload cannot be justified. The utilization of methods of artificial intelligence to bear upon the intelligent restructuring of tasks appears feasible at the present time. It will probably suffice to include rational decision making and a capacity to solve certain classes of games.

GRA

N81-19768# Letterman Army Inst. of Research, San Francisco, Calif. Div. of Biorheology.

CHROMATIC STROBE FLASH DISRUPTION OF PURSUIT TRACKING PERFORMANCE Final Report, Feb. - Apr. 1980

Peter A. OMara, David A. Stamper, David J. Lund, and Edwin S. Beatrice Nov. 1980 23 p refs
(DA Proj. 3M1-61102-BS-01)
(AD-A094911; LAIR-88) Avail: NTIS HC A02/MF A01

Ten men used a viscous damped mount optical tracking system during a study of the effects of strobe flashes and ambient lighting on pursuit tracking performance. The volunteers tracked a 0.5 mrad target moving to the left or right for 15 s at a constant angular velocity of 5.0 mrad/s. A single 170 micron 0.053 sr, 538 nm strobe flash was presented at random at the rate of one flash for each five trials. The flashes produced significant increases in the standard deviations of the horizontal and vertical aiming errors under both ambient light conditions. The average maximum aiming error was 0.6 mrad during bright ambient light trials. Approximately 2 s were required to return to normal control error rates.

GRA

N81-19769# New Mexico State Univ., Las Cruces. Behavioral Engineering Lab.

GROUND-REFERENCED VISUAL ORIENTATION WITH IMAGING DISPLAYS Final Report, Oct. 1979 - Sep. 1980

Stanley N. Roscoe Nov. 1980 11 p refs
(Grant AF-AFOSR-0024-80; AF Proj. 2312)
(AD-A094662; BEL-80-3/AFOSR-80-3; AFOSR-81-0080TR)
Avail: NTIS HC A02/MF A01 CSCL 05/10

Judgements of size, and by inference the distance, of objects in natural outdoor vistas are strongly dependent on the distance to which the eyes are focused (r approx 0.9); the exact functional relationship is confounded by the grossly progressive psychophysical inequality of units of the dioptic scale. Accommodation to natural vistas depends in a complicated way on the dark focus of the individual, the retinal locus and spatial frequency of visible texture, and the sharpness of focus needed for the desired discrimination of object identity, for example, reading a sign. Individual differences in dark focus range from perhaps 15 D in extremely myopic people to as distant as -4 D in the extremely hyperopic; the more distant the individual's dark focus, the greater the individual's tendency to focus beyond an acuity target to

maximize apparent size for the discrimination of detail. Some individuals can be trained more readily than others to control the focal distance of their eyes voluntarily; there is some evidence that such trainability depends in part on the individual's dark focus and that both the selection and training of combat pilots should take such characteristics into account.

GRA

N81-19770# Pittsburgh Univ., Pa. Learning Research and Development Center.

[PROCESSES OF INFORMAL REASONING AND RELATIONSHIPS BETWEEN INFORMAL AND FORMAL REASONING IN PROBLEM SOLVING] Final Report, 1 Oct. 1977 - 30 Sep. 1980

James G. Greeno 26 Jan. 1981 32 p refs
(Contract N00014-78-C-0022; RRO4206)
(AD-A095138; TR-7) Avail: NTIS HC A03/MF A01 CSCL 05/10

Processes of informal reasoning and relationships between informal and formal reasoning in problem solving were examined. One set of studies focused on relationships between knowledge of problem solving procedures and knowledge of general conceptual relationships. The ways are specified in which problem solving performance can be influenced and problem solving procedures can be understood, because of their relationships to conceptual knowledge in the form of schemata. The second set of studies was concerned with relationships between general formal principles and cognitive procedures. Contributions included a method for formally analyzing relationships between procedures and constraints and a theoretical and empirical analysis of understanding the principle of formal deductive consequence in the context of geometry proof problems.

E.D.K.

N81-19771# Naval Training Analysis and Evaluation Group, Orlando, Fla.

COMPUTER AIDED TRAINING EVALUATION AND SCHEDULING (CATES) SYSTEM ASSESSING FLIGHT TASK PROFICIENCY

William C. Rankin and William C. McDaniel Dec. 1980 28 p refs
(AD-A095007; TAEG-TR-94) Avail: NTIS HC A03/MF A01 CSCL 05/9

This report proposes a method for achieving improvements in the precision of determining Fleet Replacement Squadron student aviator proficiency. The proposed method is the Computer Aided Training Evaluation and Scheduling system. It provides a computer managed, prescriptive training program based on individual student performance.

GRA

N81-19772# School of Aerospace Medicine, Brooks AFB, Tex. Laser Effects Branch.

EVALUATION OF PLZT GOGGLES Final Report, Jun. 1978 - Apr. 1979

Everett O. Richey, James L. Bower, and Ralph G. Allen Dec. 1980 41 p refs
(AF Proj. 7757)

(AD-A094898; SAM-TR-80-17) Avail: NTIS HC A03/MF A01 CSCL 18/6

Air Force Prototype Thermal Flash Protective Device (TFPD) Goggles were furnished to USAFSAM by the Life Support System Program Office, Aeronautical Systems Division, for determination and evaluation of their eye-type goggles caused stressed areas. The bonding used in the production model eliminated the stressed areas, resulting in increased closed state optical density, particularly in the upper nasal area of the lens.

GRA

N81-19773# California Univ., Berkeley. Lawrence Berkeley Lab. Passive Solar Group.

HUMAN COMFORT AND AUXILIARY CONTROL CONSIDERATIONS IN PASSIVE SOLAR STRUCTURES

W. Place, R. Kammerud, B. Anderson, B. Curtis, W. Carroll, C. Christensen, and M. Hannifan Oct. 1980 21 p refs Prepared in cooperation with Midwest Research Inst., Golden, Colo.
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(SERI/TR-721-823) Avail: NTIS HC A02/MF A01

Energy consumption and human comfort implications of various passive solar and energy conservation strategies were

investigated for single family, one story, slab on grade residences in Albuquerque, NM and Washington, DC. The building energy analysis computer program BLAST was used to perform annual dynamic heating and cooling load calculations for a building in which the glazing area, glazing location, and thermal mass were varied systematically. The impacts on building performance of forced flow ventilative cooling and nighttime and weekday thermostat setpoint adjustments were investigated. The results indicate that the annual heating and cooling loads are highly sensitive to glazing area, glazing location, and thermostatic controls. Annual cooling loads are substantially reduced by increased thermal mass in the walls. DOE

was to verify (or modify) the upper pressure criterion limit derived in the original study, using a larger sample of test subjects. The results essentially confirmed those of the original study. The purpose of the shoulder belt pullout force portion of the study was to develop a criterion value for inclusion in the comfort rulings if this appeared desirable. The value found proved to be essentially the same as one developed in an earlier study of active belt system comfort. GRA

N81-19774# Atomic Energy Commission Research Establishment, Riso (Denmark). Electronics Dept.

ON THE STRUCTURE OF KNOWLEDGE. A MORPHOLOGY OF MENTAL MODELS IN A MAN-MACHINE SYSTEM CONTENT

Jean Rasmussen Nov. 1979 49 p refs
(RISOE-M-2192; ISBN-87-550-0618-3; ISSN-0418-6435)
Avail: NTIS HC A03/MF A01

Forms of mental representations of the functional properties of a physical system as found in a man-machine system context are described and illustrated. A morphology of such models is discussed in terms of different levels of abstraction related to: physical form; physical function; functional structure; abstract function; and functional meaning or purpose. The distinction between deterministic quantitative models based on variables and relation and causal qualitative models based on objects or functions which have properties and interact by events is discussed. The dependency of the different levels of abstraction upon representation of aspects of the material basis of the system versus aspects of human reasons for the existence of the system is described. Finally, the different strategies of humans to cope with complexity is briefly discussed in the context of the morphology. Author (ESA)

N81-19775# Atomic Energy Commission Research Establishment, Riso (Denmark). Electronics Dept.

THE ROLE OF CONCEPTUAL STRUCTURES IN ANALYZING OPERATOR BEHAVIOR

Erik Hollnagel Feb. 1980 33 p refs
(RISOE-M-2217; ISBN-87-550-0521-7; ISSN-0418-6435)
Avail: NTIS HC A03/MF A01

A consistent description and explanation of operator behavior must be based on the conceptual structures of the operator, his mental models and representation of knowledge, which can be inferred from an analysis of behavioral data. Three major problems in this analysis presented are: (1) the level or abstractness of the language used in the description of operator behavior, e.g., natural language versus a theoretically loaded terminology; (2) the degree of concreteness of the conceptual structure and the depth of explanation, i.e., the criteria by which the explanation is considered sufficient; and (3) the relation between competence and performance, in particular the role of performance criteria and the role of a demand resource fit. The relation between strategies and models and a description of the essential concepts in the conceptual structure are discussed. Author (ESA)

N81-19776# Man Factors, Inc., San Diego, Calif.

COMFORT AND CONVENIENCE SPECIFICATIONS FOR SAFETY BELTS: SHOULDER BELT FIT, PRESSURE AND PULLOUT FORCES Final Report, Oct. 1979 - Apr. 1980

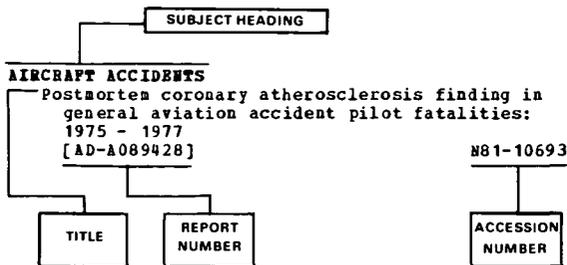
W. E. Woodson, P. H. Selby, and R. Coburn 30 Apr. 1980
69 p refs
(Contract DOT-HS-7-01617)

(PB81-122152; MFI-78-109B(R); DOT-HS-805-597) Avail:
NTIS HC A04/MF A01 CSCL 13L

The objective of the belt fit portion of the study was to determine how much an originally proposed shoulder belt crossing specification could be modified (to make it less restrictive on the vehicle designer) if a somewhat smaller segment of the user population was accepted as the criterion for design. As a result, a compliance envelope was developed and is proposed. The objective of the shoulder belt pressure portion of the study

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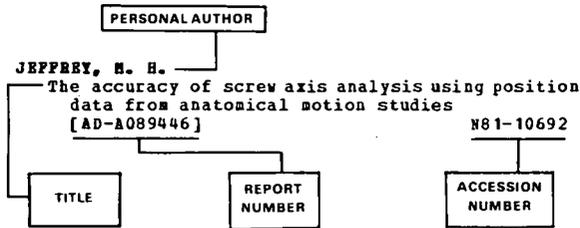
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