



Aerospace Medicine
and Biology
A Continuing
Bibliography
with Indexes

NASA SP-7011 (184)
September 1978

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ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges:

STAR (N-10000 Series) N78-24042—N78-26046

IAA (A-10000 Series) A78-36170—A78-39782

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NASA SP-7011 (184)

AEROSPACE MEDICINE AND BIOLOGY

**A CONTINUING BIBLIOGRAPHY
WITH INDEXES**

(Supplement 184)

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 August 1978 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 139 reports, articles and other documents announced during August 1978 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.

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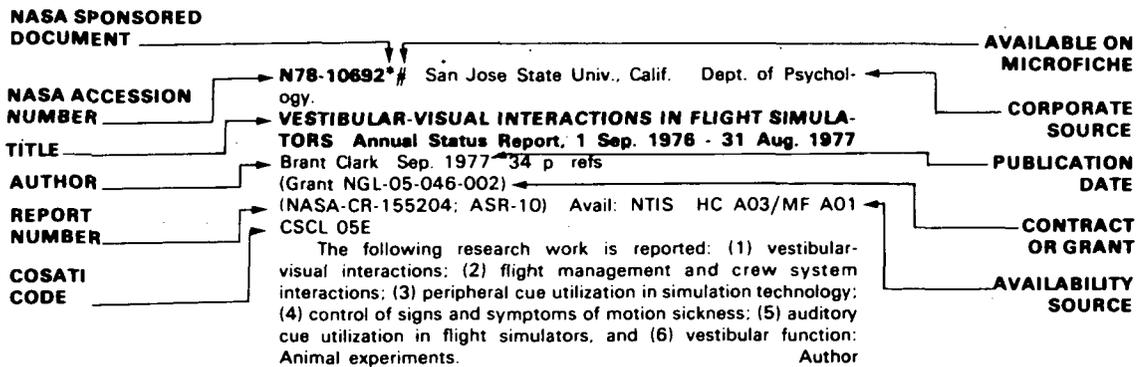
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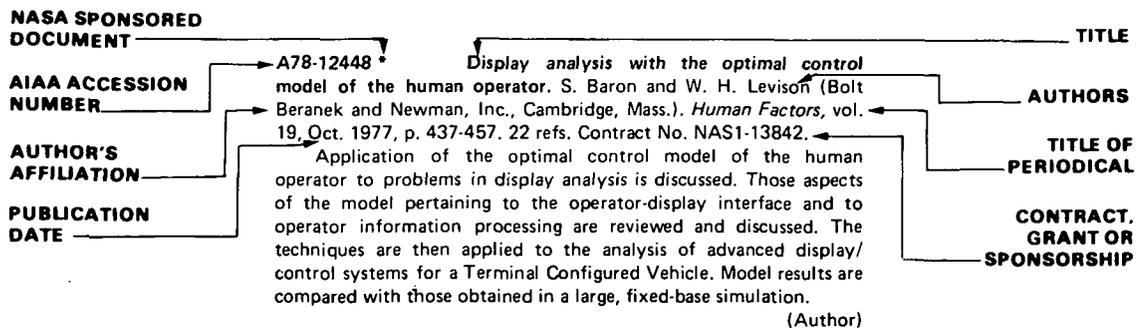
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TYPICAL CITATION AND ABSTRACT FROM IAA



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 184)

SEPTEMBER 1978

IAA ENTRIES

A78-36326 # Quality of pilot landing performance and visual information about altitude and distance. K. Mizumoto, O. Fujiwara, and N. Utsuki (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 18, Sept. 1977, p. 71-82. 15 refs. In Japanese, with abstract in English.

Seventy two glide paths of four types of aircraft (T-34, T-33A, F-86F, C-1) were evaluated during final approach and landing to provide information on pilot performance. Attention is given to glide path angle and perception of aircraft-runway alignment. It is noted that both runway ends were considered as the base of a trapezoid, with the aircraft altitude considered as its height, in an effort to model the landing approach. Round-out time was estimated by the perspective of the runway, the relation of the nose to the runway, and the sink rate, as well as by aircraft instruments. D.M.W.

A78-36327 # Personality characteristics of pilots on EPPS, MP I and DOSEFU test. I. M. Okaue, M. Nakamura, and K. Niwa (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 18, Sept. 1977, p. 83-93. 10 refs. In Japanese, with abstract in English.

Three personality tests (EPPS, MPI, and DOSEFU) were administered to a group of 36 fighter pilots and 39 transport pilots in the Japanese Self Defense Forces. Criteria for the evaluation included academic inclination, aggressiveness, deference, sociability, and neuroticism. In comparisons with Japanese university males, and with similar tests conducted in the U.S., significant differences were found in extroversion and neuroticism (the pilots scored higher and lower, respectively, than the control group), but no significant differences were found in overall life values, i.e., spiritual and material goals considered to be important for a good life. It is noted that differences between the fighter and transport pilots were found only in the MPI, in which the latter group indicated a greater tendency toward neuroticism. D.M.W.

A78-36328 # Auditory evoked potentials elicited by tones and voice as the alarm signal. N. Utsuki, Y. Nagasawa, S. Aramaki, and H. Hagihara (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports*, vol. 18, Sept. 1977, p. 101-111. 20 refs. In Japanese, with abstract in English.

Three alarm signals (buzzer, pure tone, and female voice) at 70 dB were evaluated in terms of listener response. Results show that

the amplitude of response is greatest for the pure tone, but that error rates are not significantly different for any particular mode. It is noted, however, that cortical evoked responses to the voice signal do show some differences when compared to pure tone and buzzer.

D.M.W.

A78-36550 Adaptation, afterimages and cone saturation. W. S. Geisler (Texas, University, Austin, Tex.). *Vision Research*, vol. 18, no. 3, 1978, p. 279-289. 24 refs.

At low background intensities foveal increment thresholds obtained against briefly presented backgrounds are mediated by the initial appearance of the background and increment fields, and at high intensities by a short-term homochromatic afterimage. Masking the afterimages shows that the thresholds mediated by the initial image are a continuously accelerating function of background intensity, whereas afterimage thresholds follow a power function with an exponent of around 0.9. This pattern of results is obtained whether the eye is dark-adapted or light-adapted to a fixed level; however, on a log-log plot, the increment-threshold functions obtained in the light-adapted eye are shifted along a 45 deg line with respect to those obtained in the dark-adapted eye. This suggests that adaptation reduces neural response to lights as if multiplying their intensities by a factor between 0 and 1. A final experiment allows rejection of the hypothesis that decision factors (rather than adaptation processes) are responsible for the transient changes in thresholds observed immediately after the onset of intense backgrounds. (Author)

A78-36599 * Reproducibility of toxicity test data as a function of mouse strain, animal lot, and operator. C. J. Hilado and A. Furst (San Francisco, University, San Francisco, Calif.). *Journal of Combustion Toxicology*, vol. 5, Feb. 1978, p. 75-80. 5 refs. Grant No. NsG-2039.

The toxicity screening test method developed at the University of San Francisco was evaluated for reproducibility. The variables addressed were strain of mouse, lot of animals, and operator. There was a significant difference in response between Swiss Webster mice and ICR mice, with the latter exhibiting greater resistance. These two strains of mice are not interchangeable in this procedure. Variation between individual animals was significant and unavoidable. In view of this variation, between-lot and between-operator variations appear to have no practical significance. The significant variation between individual animals stresses the need for average values based on at least four animals, and preferably values based on at least two experiments and eight animals. Efforts to compare materials should be based on the evaluation of relatively simple responses using substantial numbers of animals, rather than on elaborate evaluation of single animals. (Author)

A78-36601 Mechanism of the attenuated cardiac response to beta-adrenergic stimulation in chronic hypoxia. J. T. Maher, J. C. Denniston, D. L. Wolfe, and A. Cymerman (U.S. Army, Research

Institute of Environmental Medicine, Natick, Mass.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 44, May 1978, p. 647-651. 21 refs.

Twelve healthy domestic goats, conditioned for three months and weighing 25-30 kg, were studied in two groups of six each at sea level and in a hypobaric chamber at 445 torr (about 4300 m) for 10 days. Catheters were implanted surgically in the carotid artery and jugular vein to facilitate pressure recordings, blood sampling, and intravenous drug administration. Following hemodynamic studies in each environmental condition, left thoracotomies were performed and full-thickness biopsies were obtained from the atria, ventricles, and apex of the heart for estimating norepinephrine levels, and monoamine oxidase and catechol O-methyltransferase activities. It is found that (1) no significant group differences in heart rate and various indices of myocardial performance are observed either before or after cholinergic blockade with intravenous atropine methyl bromide and (2) a twofold increase in catechol O-methyltransferase activity above sea-level values exists in both the atria and ventricles of the hypoxic animals. It is concluded that the attenuated cardiac response to beta-adrenergic stimulation in chronic hypoxia appears unrelated to the vagal-activity level but may be attributed to enhanced enzymatic inactivation of catecholamines. S.D.

A78-36602 * Fluid-electrolyte shifts and maximal oxygen uptake in man at simulated altitude /2,287 m/. J. E. Greenleaf, E. M. Bernauer, W. C. Adams, and L. Juhos (NASA, Ames Research Center, Laboratory of Human Environmental Physiology, Moffett Field; California, University, Davis, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 44, May 1978, p. 652-658. 33 refs.

Experiments were conducted on six trained distance runners (21-23 yr) subjected to an eight-day dietary control at sea level, followed by an eight-day stay in an altitude chamber (2287-m altitude) and a four-day recovery at sea level. Fluid and electrolyte shifts during exercise at altitude were evaluated to gain insight into the mechanism of reduction in working capacity. The results are discussed in terms of resting fluid volumes and blood constituents, maximal exercise variables, and maximal exercise fluid-electrolyte shifts. Since there are no significant changes in fluid balance or resting plasma volume (PV) at altitude, it is concluded that neither these nor the excessive PV shifts with exercise contribute to the reduction in maximal oxygen uptake at altitude. During altitude exposure the percent loss in PV is found to follow the percent reduction in maximal oxygen uptake; however, on the first day of recovery the percent change in PV remains depressed while maximal oxygen uptake returns to control levels. S.D.

A78-36603 Lung volumes in man immersed to the neck - Dilution and plethysmographic techniques. C. H. Robertson, Jr., C. M. Engle, and M. E. Bradley (U.S. Navy, Medical Research Institute, Bethesda, Md.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 44, May 1978, p. 679-682. 35 refs. Navy-supported research.

A78-36604 Effects of respiration on cardiac performance. J. L. Robotham, W. Lixfeld, L. Holland, D. MacGregor, A. C. Bryan, and J. Rabson (Hospital for Sick Children; Banting Institute, Toronto, Canada; Johns Hopkins University, Baltimore, Md.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 44, May 1978, p. 703-709. 32 refs. Research supported by the Hospital for Consumptives of Maryland and Medical Research Council of Canada; Grant No. NIH-HL-10342.

The conventional explanation for the fall in left ventricular stroke volume (LVSV) with inspiration is that blood pools in the lungs, thereby decreasing pulmonary venous return. In anesthetized dogs, we have found an increase in left ventricular filling pressure (LVFP) with both constant and increasing lung volume during an inspiratory effort. Transmural aortic diastolic pressure rises as LVSV falls and LVFP rises consistent with the hypothesis that a fall in pleural pressure afterloads the left ventricle. Additionally the

increase found in right ventricular filling pressure with inspiration may adversely affect LV performance by decreasing LV compliance and/or contractility. Our findings are incompatible with pooling of blood in the lungs being the primary determinant of the fall in LVSV with inspiration. (Author)

A78-36605 * Response of the iron-deficient erythrocyte in the rat to hyperoxia. E. C. Larkin (California, University, Davis, Calif.), S. L. Kimzey (U.S. Veterans Administration Hospital, Martinez, Calif.), and K. Siler (NASA, Johnson Space Center, Houston, Tex.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 44, May 1978, p. 710-717. 24 refs. Grants No. PHS-RR-00169; No. PHS-ESHL-00628-06; No. PHS-HL-17957-03. NASA Order T5289D.

Normal and iron-deficient rats were exposed to 90% O₂ at 760 Torr for 24 or 48 h. Erythrocyte response to hyperoxia was monitored by potassium (rubidium) influx studies, by storage stress, and by ultrastructural studies. Normal rat erythrocytes exhibited morphological changes and decrease of ouabain-sensitive potassium influx compared to unexposed controls. Both components of erythrocyte potassium influx were affected by iron deficiency. Erythrocytes from unexposed iron-deficient rats showed a 50% increase in ouabain-sensitive potassium influx compared to controls. Iron-deficient rats exposed to hyperoxia for 24 or 48 h, had erythrocytes with morphological changes. Erythrocytes of iron-deficient rats exposed for 24 h showed no influx change; those exposed for 48 h showed a decrease of ouabain-sensitive influx compared to erythrocytes of controls. (Author)

A78-36606 Urinary catecholamine excretion in temporary residents of high altitude. S. C. Sharma, R. S. Hoon, V. Balasubramanian, and K. S. Chadha (Army Hospital, Delhi, India). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 44, May 1978, p. 725-727. 13 refs.

Urinary catecholamine excretion was estimated in 50 lowlanders temporarily staying at altitudes above 3000 m. They were divided in subgroups according to the length of their continuous stay. For comparison, 25 highlanders who were born and brought up at high altitude and 50 lowlanders who had never been to altitudes of more than 1000 m were also studied. High catecholamine excretion was noted in temporary residents staying at high altitude for up to 30 days as compared to that in lowlanders (P less than 0.01). The excretion rate gradually returned to basal values thereafter. Catecholamines were essentially similar in lowlanders and highlanders. The significance of these findings is discussed regarding the possible pathogenetic role of the sympathoadrenal system in the development of ill effects in response to high-altitude exposure. (Author)

A78-36607 Rat as a model for humanlike ventilatory adaptation to chronic hypoxia. E. B. Olson, Jr. and J. A. Dempsey (Wisconsin, University, Madison, Wis.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 44, May 1978, p. 763-769. 35 refs. Grants No. NIH-HL-15469; No. DAMD17-77-C-7006.

Experiments were performed on awake unrestrained male albino rats (3-6 months, 190-356 g) to test the suitability of the rat as a model for human ventilatory acclimatization to long-term hypoxia. The variables measured were oxygen uptake, expired volume, and arterial blood gases under conditions of up to 14 days of hypoxia (4300-m altitude) and return to acute normoxia. The progressive and sustained hypocapnia during hypoxic exposure and the continued hyperventilation with acute normoxia indicate that the rat may be the model of preference for studies of human ventilatory acclimatization. However, the rat's marked ventilatory response and changing oxygen uptake during acute hypoxia differ distinctly from the human response to sojourn at 4300 m. S.D.

A78-36608 Analysis of postcapillary pH changes in blood in vivo after gas exchange. A. Bidani, E. D. Crandall, and R. E. Forster (Pennsylvania, University, Philadelphia, Pa.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology*, vol. 44, May 1978, p. 770-781. 38 refs. Grants No. PHS-HL-19737; No. PHS-AHA-75-992; No. PHS-RR-15.

A computational model of the expected in vivo postcapillary pH changes in blood after gas exchange is developed which includes ion fluxes across the red blood cell membrane down their electrochemical gradients, Hb-CO₂ and Hb-H(+) interactions. The model is based on recently reported results that take into account the presence of 2,3-diphosphoglycerate in the erythrocyte, and changes in volume of the erythrocytes as a result of osmotic water flow. The model is applied to explaining recently published data (Crandall et al., 1977) on slow postcapillary plasma pH changes in vivo, and is extended to examine the effects of the slow pH changes on the 'closed-loop' circulation in man. The results depend on the assumption that carbonic anhydrase activity is not available to plasma. S.D.

A78-36626 Space flights on Soyuz spacecraft: Biomedical studies (Kosmicheskie polety na korabliakh 'Soyuz': Biomeditsinskie issledovaniia). Edited by O. G. Gazonko, L. I. Kakurina, and A. G. Kuznetsova. Moscow, Izdatel'stvo Nauka, 1976. 416 p. 680 refs. In Russian.

Medicobiological problems associated with spaceflight are examined, and physiological changes caused by space flight factors are discussed. Medicobiological topics include the selection and training of cosmonauts, hygiene, food preparation and dispensing means, protection from radiation, medical monitoring and prognosis, and the organization of work and rest periods. Physiological systems studied include statokinetic responses, blood circulation and gas exchange, metabolic endocrine processes, hematological studies, the digestive system, and skin microflora. Inflight biological experiments are described. M.L.

A78-36627 # Purpose of the piloted Soyuz spacecraft and medical-biological investigations (Naznachenie pilotiruemykh kosmicheskikh korablei 'Soyuz' i zadachi mediko-biologicheskikh issledovaniy). L. I. Kakurin. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 7-19. In Russian.

Knowledge of spacecraft and physiological functioning gained from each Soyuz mission is surveyed for the 19 Soyuz missions during 1967-1975. Medical and biological investigations are described. Topics include the selection and training of cosmonauts, adaptation to weightlessness, and the problems of providing medical care. The determination of appropriate atmospheric conditions for the spacecraft cabin is considered. M.L.

A78-36628 # Selection and training of cosmonauts for flights in Soyuz spacecraft (Otbor i podgotovka kosmonavtov dlia poletov na kosmicheskikh korabliakh 'Soyuz'). N. N. Gurovskii, A. V. Eremin, T. N. Krupina, R. B. Bogdashevskii, G. P. Mikhailovskii, M. M. Korotaev, I. Ia. Iakovleva, V. I. Miasnikov, E. I. Matsnev, and O. P. Kozerenko. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 20-40. In Russian.

The selection of cosmonauts is considered with attention to response to weightlessness, visual perception, and brain function. The evaluation of psychological and psychophysiological traits is surveyed, and training programs concerning Soyuz operation and the improvement of physiological functioning in unfavorable conditions are discussed. Medical monitoring results are presented for subjects floating in water at slightly reduced atmospheric pressures. M.L.

A78-36629 # Physiological hygiene studies (Fiziologigigienicheskie issledovaniia). Iu. G. Nefedov, V. P. Dzedzichek, M. A. Vytchikova, N. E. Pamferova, and V. V. Borshchenko. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 41-64. In Russian.

Data from studies of physiological and hygiene characteristics of trainees in ground-based life-support systems are reported. The studies show changes over time in physiological indices including changes in circulatory system indices and heart function. The properties of materials considered for use as personal cleaning aids are described, and the effect of textile materials on the skin is studied. M.L.

A78-36630 # Onboard food rations and a system for providing water (Bortovoi ratsion pitaniia i sistema vodoobespecheniia). V. P. Bychkov, S. V. Chizhov, Z. P. Pak, N. N. Sitnikova, and Iu. S. Koloskova. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 65-88. In Russian.

Factors in the preparation of food for space flights are examined with attention to nutrition, preservation, and dispensing means. Data on weight loss during space flight are provided. Systems for maintaining water are considered, and characteristics of recycled water are described. The relation between food and metabolism during space flights and the design of foods suitable for life-support systems are discussed. M.L.

A78-36631 # Radiation protection for Soyuz crews (Radiatsionnaia bezopasnost' ekipazhei korablei 'Soyuz'). Iu. G. Grigor'ev, E. E. Kovalev, V. N. Petrov, V. I. Efimov, V. V. Markelov, Iu. A. Akatov, M. V. Tel'tsov, and A. V. Sedov. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 89-116. In Russian.

The exposure to and biological effects of radiation received by satellite crews are described, and procedures for protecting crew members from radiation are discussed. The efficacy of protective measures is examined, data on radiation exposure are provided, and standards for acceptable levels of radiation are considered. The roles of the earth's radiation belt and solar flares are evaluated, and pharmacological means of protection and other individual or whole-ship protective measures are indicated. M.L.

A78-36632 # Medical monitoring and prognosis of cosmonauts during flight (Meditsinskii kontrol' i prognozirovanie sostoianiia kosmonavtov vo vremia poletov). L. I. Kakurin, A. D. Egorov, A. G. Zerenin, and R. M. Baevskii. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 117-160. In Russian.

The equipment used for the medical monitoring of cosmonauts is described, and changes in physiological indices during space flight are reported. The interpretation of physiological data is discussed. The organization of the prognostic procedure is explained; three stages, retrospection, diagnosis, and prognosis, are distinguished, and sources of information for each stage are indicated. The testing of prognostic approaches used during space flight is discussed. M.L.

A78-36633 # The organization of work and rest for Soyuz crew members (Organizatsiia truda i otdykha chlenov ekipazhei korablei 'Soyuz'). B. S. Aliakrinskii and S. I. Stepanova. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 161-183. In Russian.

Changes in sleep-wakefulness rhythms of cosmonauts are reported and discussed. The loss of synchronization of biorhythms is considered with attention to the use of physiological indicators to monitor biorhythms during space flight. The development of a work and rest schedule for long flights is discussed. If changes in

sleep-wakefulness rhythms are required, the training of cosmonauts for this situation should be planned. The constraints of short flights often necessitate deviations from normal sleep-wakefulness rhythms. M.L.

A78-36634 # Medical observations and investigations (Meditsinskie nabludeniia i issledovaniia). A. V. Beregovkin, M. M. Korotaev, I. I. Brianov, T. N. Krupina, I. N. Arzhanov, M. A. Kuklin, I. Ia. Iakovleva, V. S. Znamenskii, V. A. Kir'ianov, and V. V. Nistratov. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 184-194. In Russian.

The clinical examination of cosmonauts is discussed, and the changes with time after flight of physiological characteristics of two cosmonauts are indicated. Weight changes of several cosmonauts are reported, and body composition and musculature indicators are considered. Ophthalmological, otorhinolaryngological, neurological, and cytogenetic examinations are described. M.L.

A78-36635 # Features of statokinetic reactions (Osobnosti stato-kineticheskikh reaktsii). I. I. Brianov, M. D. Emel'ianov, A. D. Matveev, E. I. Matsnev, I. K. Tarasov, I. Ia. Iakovleva, L. I. Kakurin, O. P. Kozerenko, V. I. Miasnikov, and A. V. Eremin. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 195-229. In Russian.

The inflight and postflight effects of space flight on postural and locomotive activity are studied. The state of the neuromuscular system is discussed, and vestibular responses are examined. Conditions after different times in flight are compared, and the specific features of space flight responsible for physiological changes are considered. Factors affecting differences in recovery time are indicated. M.L.

A78-36636 # Effect of space flights on blood circulation and gas exchange during functional loading (Vlianie kosmicheskikh poletov na krovoobrashchenie i gazoobmen pri funktsional'nykh nagruzkakh). L. I. Kakurin, B. S. Katkovskii, V. M. Mikhailov, T. D. Vasil'eva, G. V. Machinskii, Iu. D. Pometov, V. V. Kalinichenko, V. V. Shchigolev, Kh. Kh. Iarullin, and A. V. Beregovkin. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 230-265. In Russian.

The cardiovascular and respiratory systems were investigated during rest and during physical activity to determine the effects of space flight on these systems. Basic metabolism studies of hemodynamics, gas exchange, and lung ventilation were performed, and bicycle ergometer studies of cardiovascular and respiratory indicators are described. Orthostatic and antiorthostatic studies are discussed. M.L.

A78-36637 # Exchange-endocrine processes (Obmenno-endokrinnye protsessy). A. I. Grigor'ev, G. I. Kozyrevskaia, Iu. V. Natchin, R. A. Tigranian, I. S. Balakhovskii, N. I. Beliakova, N. F. Kalita, I. G. Dlusskaia, and R. K. Kiselev. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 266-303. In Russian.

The effects of space flight on water-salt exchange and kidney function are discussed. Water intake, serum electrolyte levels and osmotic concentrations, and kidney excretion of ions are reported for individual cosmonauts. The relation between diuresis and osmotic concentration in the urine is examined, and data on several other indicators of kidney function are provided. Aldosterone secretion and its effects are studied. The general metabolic condition of cosmonauts and the effects of weightlessness are discussed. M.L.

A78-36638 # Hematological investigations (Gematologicheskie issledovaniia). V. I. Legen'kov and Iu. N. Tokarev. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 304-319. In Russian.

Peripheral blood changes occurring in cosmonauts during training, short flights, and long flights are described, and hematological index norms concerning blood cell types are reported. The changes over time of the blood features are related to changes in general body state. Causes of changes in blood composition are discussed, and deviations from standard values are analyzed by a statistical procedure. Data on 17-oxycorticosteroid and 17-ketosteroid excretion, numbers of different kinds of blood cells, changes in the hematocrit, and changes in hemoglobin levels are presented. M.L.

A78-36639 # Reaction of the digestive system to the effect of spaceflight factors (Reaktsiia pishchevaritel'noi sistemy na vozdeistvie faktorov kosmicheskogo poleta). K. V. Smirnov, A. M. Ugolev, L. G. Goland, and V. V. Murashko. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 320-334. In Russian.

Secretion and peristalsis in the digestive tracts of cosmonauts before and after flight are described, and data on postflight electrogastrograms and postflight intestinal enzyme activities are presented. The relation between length of flight and magnitude of changes is examined, the length of time after flight required for return to approximate preflight characteristics is studied, and the effects of weightlessness are considered. M.L.

A78-36640 # Study of cosmonaut integument microflora (Issledovanie avtomikroflory pokrovnykh tkanei kosmonavtov). S. N. Zaloguev and M. M. Shinkareva. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 335-349. In Russian.

Preflight and postflight microflora counts for skin, throat, armpit, mouth, and nostrils are reported for individual cosmonauts. The categories of bacteria identified include staphylococci, diptheroids, and hemolytic and nonhemolytic Gram positive and Gram negative rods. The resistance of the staphylococci to antibiotics is determined. The relation between the increases in the number of bacteria found on body surfaces after flight and the bacteria present on body coverings before flight is considered. M.L.

A78-36641 # Results of biological experiments performed during flights (Rezultaty biologicheskikh eksperimentov, vypolnennykh vo vremia poletov). G. P. Parfenov and A. A. Lukin. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 350-380. In Russian.

The effects of space flight factors on bacteria, sperm cells, chromosomes, and other biological entities were studied, and data on differences between experimental and control cells and organic substances are presented. The combined effect of space flight factors and a mutagen was investigated. The growth of cultures of intestinal bacteria was determined, and the influence of weightlessness on bacteria is discounted. Fertilized eggs were withdrawn and stained at various stages of development. M.L.

A78-36642 # Preliminary results of medicobiological studies performed during Soyuz-19 and Apollo flights (Predvaritel'nye rezultaty mediko-biologicheskikh issledovaniia, vypolnennykh vo vremia poleta korablei 'Soyuz-19' i 'Apollon'). N. N. Gurovskii, O. G. Gazenko, B. B. Egorov, Iu. G. Nefedov, I. I. Brianov, A. D. Egorov, A. V. Eremin, L. I. Kakurin, P. M. Gramenitskii, and R. A. Tigranian. In: Space flights on Soyuz spacecraft: Biomedical studies. Moscow, Izdatel'stvo Nauka, 1976, p. 381-398. In Russian.

Preflight, inflight, and postflight physiological characteristics of spaceflight personnel are surveyed. The space flight environment is

characterized, test programs are briefly described, and the evaluation of changes in physiological indexes is considered. Summary information is provided on orthostatic stability, cardiorespiratory system, water-salt exchange, vestibular traits, and microbial growth. M.L.

A78-36676 **Noise exposure, monitoring and tracking performance as a function of signal bias and task priority.** M. Loeb and P. D. Jones (Louisville, University, Louisville, Ky.). *Ergonomics*, vol. 21, Apr. 1978, p. 265-272. 8 refs.

An experimental study was carried out on human subjects to generalize some findings by Hockey (1970) on noise effects as related to primary tracking and secondary monitoring (watch-keeping) task. For the separate groups of subjects tested, either watchkeeping or tracking was primary and the other task secondary. Performance measures for the tracking task were time on target and integrated distance error; for monitoring the measures were latency of detection, erroneous responses and missed signals (the latter being negligible). The monitoring data showed no appreciable effect of noise and no effect indicative of a predisposition for noise-exposed subjects to detect fewer peripheral signals on a secondary watch-keeping task, even when such signals were less frequent at the periphery. The results suggest that in a dual task situation, subjects may opt for meeting the demands of the simpler task at the expense of performance on the more complex task. There is no evidence that impairment in tracking performance by noise is greater when tracking is a lower priority task. S.D.

A78-36677 **Air ions and human performance.** L. H. Hawkins and T. Barker (Surrey, University, Guildford, England). *Ergonomics*, vol. 21, Apr. 1978, p. 273-278. 24 refs.

The effects of artificial negative or positive ionisation of the air on the performance of a number of psychomotor tasks was studied on 45 human subjects. The results indicate that negative ionization is associated with a significant increment in performance as compared to controls whilst positive ionization appears not to have any effect. Additionally it is noted that both positive and negative ionization appears to influence the amplitude of the normal circadian rhythm of performance. The possible mechanisms by which ionization might exert an influence on performance and the possible practical importance of the circadian rhythm effect are discussed. (Author)

A78-36724 **Technology requirements for closed-ecology life support systems applicable to space habitats.** J. M. Spurlock (Georgia Institute of Technology, Atlanta, Ga.) and M. Modell (MIT, Cambridge, Mass.). In: *The industrialization of space; Proceedings of the Twenty-third Annual Meeting, San Francisco, Calif., October 18-20, 1977. Part 1.* San Diego, Calif., American Astronautical Society; Univelt, Inc., 1978, p. 527-543. 10 refs. (AAS 77-273)

Waste conversion and resource recovery, food synthesis, aquaculture, land agriculture and diet planning for a closed-ecology life-support system in a space habitat are discussed. A principal feature of closed ecological systems is the production of food from carbon that is contained in wastes and metabolic carbon dioxide. Waste-water conversion, selection of an atmosphere and illumination system for the habitat, the effects of nonterrestrial gravitation on plants and animals, and the problem of ionizing radiation from space receive attention. J.M.B.

A78-36730 * **Isolation and confinement - Considerations for colonization.** F. R. Akins (NASA, Ames Research Center, Moffett Field, Calif.). In: *The industrialization of space; Proceedings of the Twenty-third Annual Meeting, San Francisco, Calif., October 18-20, 1977. Part 2.* San Diego, Calif., American Astronautical Society; Univelt, Inc., 1978, p. 731-749. 44 refs. NASA-supported research. (AAS 77-245)

This paper discusses three types of isolation (sensory/perceptual, temporal, and social) that could adversely affect mankind in space. The literature dealing with laboratory and field experiments relevant to these areas is summarized and suggestions are given for dealing with these problems within the space colony community. Also, consideration is given to the potential effects of physical confinement and the need for usable space. Finally, a modification of Maslow's hierarchy of needs is proposed as a theoretical framework to understand and investigate mankind's psychological needs in space. (Author)

A78-36773 **The hydrophobic effect and the organization of living matter.** C. Tanford (Duke University, Medical Center, Durham, N.C.). *Science*, vol. 200, June 2, 1978, p. 1012-1018. 45 refs. NSF-supported research.

The condition of thermochemical equilibrium in living organisms is examined with reference to the hydrophobic effect. It is noted that hydrophobic forces can be instrumental in biological assembly by instigating a repulsion by the solvent (rather than attractive forces at the assembly site). The necessary fluidity of intracellular membranes, and the subdivision of cells into specific functional compartments is considered a result of hydrophobic interactions. The basic physical principles of hydrophobic forces are reviewed, using micelle formation and the assembly of phospholipid moieties as examples. Finally, the hypothesis is advanced that hydrophobic interaction allows the formation of aqueous channels across the phospholipid bilayer, which is essential for the passage of hydrophilic substances across cell membranes. D.M.W.

A78-36816 **The effect of the position of the axis of rotation on the discomfort caused by whole-body roll and pitch vibrations of seated persons.** K. C. Parsons and M. J. Griffin (Southampton, University, Southampton, England). *Journal of Sound and Vibration*, vol. 58, May 8, 1978, p. 127-141. 7 refs.

A78-37129 **Prediction of pilot-aircraft stability boundaries and performance contours.** R. F. Stengel (Princeton University, Princeton, N.J.) and J. R. Broussard (Analytic Sciences Corp., Reading, Mass.). (*Annual Conference on Manual Control, 13th, Cambridge, Mass., June 15-17, 1977.*) *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-8, May 1978, p. 349-356. 11 refs. Contract No. N00014-75-C-0432.

Control-theoretic pilot models can provide important new insights regarding the stability and performance characteristics of the pilot-aircraft system. Optimal-control pilot models can be formed for a wide range of flight conditions, suggesting that the human pilot can maintain stability if he adapts his control strategy to the aircraft's changing dynamics. Of particular concern is the effect of suboptimal pilot adaptation as an aircraft makes transitions from low to high angles of attack during rapid maneuvering, as the changes in aircraft stability and control response can be extreme. The effects of optimal and suboptimal effort during a typical 'high-g' maneuver are examined, and the concept of minimum-control effort (MCE) adaptation is introduced. Limited experimental results tend to support the MCE adaptation concept. (Author)

A78-37130 * **A model of human decisionmaking in a fault diagnosis task.** W. B. Rouse (Illinois, University, Urbana, Ill.). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-8, May 1978, p. 357-362. Grant No. NsG-2119.

Utilizing elementary concepts from the theory of fuzzy sets as well as several nonfuzzy heuristics, a model is presented of human decisionmaking in the task of troubleshooting graphically displayed networks. The performance of the model is compared to the results of two previously reported experimental studies. The ability of the model to represent human decisionmaking as a function of network size, forced-pacing, and computer aiding is considered. (Author)

A78-37152 Relationships among Green's theorem, Helmholtz' theorem, and integral equation methods of solving the forward ECG problem. S. Rush (Vermont, University, Burlington, Vt.). *IEEE Transactions on Biomedical Engineering*, vol. BME-25, May 1978, p. 283-287. 11 refs. Grant No. PHS-HL-09831.

With relation to the forward problem of electrocardiography, it is shown that the boundary value problem associated with Green's theorem can be simply duplicated utilizing the static equivalence principle derived from Helmholtz's theorem. The vortex surface sources in the equivalence principle are then shown to be, in general, replaceable by a series of surface dipole distributions. Precise evaluations of the net dipole distributions are further proved to be equal to a scalar potential for the current density; this potential is identical with that appearing in Green's theorem. The equivalence of the two approaches is further emphasized by completion of Geselowitz's derivation of the Gelernter-Swihart method from Green's theorem and by showing, conversely, that the Green's theorem double-layer scheme can be derived directly by a physical approach similar to that of Gelernter and Swihart utilizing surface charge densities. (Author)

A78-37175 Roles of psychologic stress and autonomic nervous system changes in provocation of ventricular premature complexes. B. Lown, R. A. DeSilva, and R. Lenson (Peter Bent Brigham Hospital; Harvard University, Boston, Mass.). *American Journal of Cardiology*, vol. 41, May 22, 1978, p. 979-985. 29 refs. Grants No. NIH-HL-18783; No. NIH-MH-21384.

Neural and psychologic factors have been implicated as risk factors for ventricular arrhythmias and sudden death in man. However, the relation between these factors and arrhythmia has hitherto not been systematically explored. The effect of psychologic stress testing in 19 patients with advanced grades of ventricular arrhythmias is examined. Psychologic stress consisted of mental arithmetic, reading from colored cards and recounting emotionally charged experiences. Such testing induced a significant increase in ventricular premature beat frequency in 11 of 19 patients (P less than 0.05). One patient experienced paroxysms of ventricular tachycardia. In 14 of these 19 patients elicitation of vagal or sympathetic autonomic reflexes failed to induce significant arrhythmia in all but one patient. It is concluded that (1) objective psychologic tests may precipitate ventricular arrhythmia in susceptible patients, and (2) evocation of peripheral autonomic reflexes is an insufficient trigger for enhanced ventricular ectopic activity. (Author)

A78-37235 Portable heart rate recorder with PLL circuit (Tragbarer Herzfrequenzspeicher mit PLL-Schaltung). H. v. Nettelhorst (Berlin, Technische Universität, Berlin, West Germany) and W. Rossdeutscher. *Elektronik*, vol. 27, May 1978, p. 75-80. 7 refs. In German.

A device for recording and storing the recorded heart rate as function of time of a human subject not confined to a hospital but engaged in normal activity is described. A phase-locked loop multiplies the heart rate, picked up by two ECG electrodes, by a factor of 60, so that the heart rate can be counted in beats per minute within a sec of integration time. A CMPS element constitutes the PLL. A computer-optimized lag element is included in the PLL. An example of the recorded heart rate as function of time for a man in normal activity over 3 hr 5 min, integrated in 32 seconds, is shown. P.T.H.

A78-37531 * # Required attention for synthesized speech perception for three levels of linguistic redundancy. C. A. Simpson and S. G. Hart (NASA, Ames Research Center, Moffett Field, Calif.). *Acoustical Society of America, Meeting, 93rd, State College, Pa., June 6-10, 1977, Paper.* 12 p. 5 refs. Research supported by the San Jose State University Foundation; Grant No. NGL-05-046-002.

The study evaluates the attention required for synthesized

speech perception with reference to three levels of linguistic redundancy. Twelve commercial airline pilots were individually tested for 16 cockpit warning messages eight of which consisted of two monosyllabic key words and eight of which consisted of two polysyllabic key words. Three levels of linguistic redundancy were identified: monosyllabic words, polysyllabic words, and sentences. The experiment contained a message familiarization phase and a message recognition phase. It was found that: (1) when the messages are part of a previously learned and recently heard set, and the subject is familiar with the phrasing, the attention needed to recognize the message is not a function of the level of linguistic redundancy, and (2) there is a quantitative and qualitative difference between recognition and comprehension processes; only in the case of active comprehension does additional redundancy reduce attention requirements. S.C.S.

A78-37535 * # Annoyance by aircraft noise and fear of overflying aircraft in relation to attitudes toward the environment and community. M. Loeb and S. V. Moran (Rensselaer Polytechnic Institute, Troy, N.Y.). *Acoustical Society of American, Meeting, 93rd, State College, Pa., June 6-10, 1977, Paper.* 43 p. 7 refs. Grant No. NSG-1220.

It has been suggested that expressions of annoyance attributable to aircraft noise may reflect in part fear of aircraft overflights and possible crashes. If this is true, then residents of areas where crashes have occurred should express more annoyance. To test this hypothesis, 50 residents of an Albany, New York area where an aircraft crash producing fatalities recently occurred and 50 residents of a comparable nearby area without such a history, were asked to respond to a 'Quality of Life Questionnaire.' Among the items were some designed to test annoyance by noise and fear of aircraft overflights. It was predicted that those in the crash area would express more fear and would more often identify aircraft as a noise source. These hypotheses were sustained. A near-replication was carried out in Louisville, Kentucky; results were much the same. Analyses indicated that for the crash-area groups, there was associating of aircraft fear and noise annoyance responses; this was true to an apparently lesser extent for non-crash groups. The greater annoyance of crash groups by aircraft community noise apparently does not carry over to situations in which aircraft noise is assessed in the laboratory. (Author)

A78-37745 # Temporal limitations of processing of visual information by a human operator (Vremennyye ogranicheniia pererabotki zritel'noi informatsii chelovekom-operatorom). V. A. Meshcheriakov and I. A. Kazanovskaia (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Fiziologiya Cheloveka*, vol. 4, Mar.-Apr. 1978, p. 238-244. 21 refs. In Russian.

A total of 107 experiments were conducted on male and female subjects (19-29 yr), professionally engaged in mental work, in order to assess the temporal limitations of visual-information processing in situations modeling the activity of a human operator in perceiving and processing digital symbols. A hypothesis is advanced that the increase in the number of incorrect decoding responses with increasing information load may be due to the psychological refractory period. It is shown that there are different temporal limitations for the period of learning and for the period of acquisition of the decoding algorithm. In particular, for an increasing information load the activity of the tested subjects proceeds against a background of pronounced emotional stress and is accompanied by a reduction in performance efficiency. The self-regulatory activity of the brain is directed toward eliminating the time deficit related to information processing. S.D.

A78-37746 # Influence of angular measures, duration, and shape of stimuli on detecting the order of tracking visual signals (Vliianie uglovykh razmerov, dlitel'nosti i formy stimulov na obnaruzhenie poriadka sledovaniia zritel'nykh signalov). E. P. Shaitor and R. G. Zainullin (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Fiziologiya Cheloveka*, vol. 4, Mar.-Apr. 1978, p. 245-251. 5 refs. In Russian.

A78-37747 # Some mechanisms of visual masking (Nekotorye mekhanizmy zritel'noi maskirovki). A. I. Gantman and L. I. Tanengol'ts (Institut Problem Upravleniia, Moscow, USSR). *Fiziologiya Cheloveka*, vol. 4, Mar.-Apr. 1978, p. 262-266. 7 refs. In Russian.

Results are presented for an experimental study regarding the qualitative dependence of masking intensity on the type of mask used and on the distance between the mask and the stimulus. Two point masks and two linear masks are considered. Arguments are presented in favor of a hypothesis on the peripheral location of the action of the point mask and the central location of the action of the linear mask. S.D.

A78-37748 # Cortical evoked potentials during successive visual masking (Korkovye vyzvannye potentsialy pri posledovatel'noi zritel'noi maskirovke). L. A. Samoilovich (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) and V. D. Trush (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Tekhnicheskoi Estetiki, Moscow, USSR). *Fiziologiya Cheloveka*, vol. 4, Mar.-Apr. 1978, p. 267-274. 23 refs. In Russian.

An attempt is made to analyze the variations of short-latency components of evoked potentials under conditions of successive visual masking. It is found that when presenting a subject with a sequence of visual stimuli, the degradation of the perception of the sequence elements is accompanied by suppression of short-latency (less than 100 msec) components of the evoked potentials. In particular, suppression of evoked potentials and degradation of perception are maximum for the middle elements of the sequence and minimum for the end elements. The results suggest that the analysis of visual-masking mechanisms necessitates consideration of the development of excitation and successive inhibition of activity at all levels of the visual analyzer. Visual masking is significantly dependent of processes taking place in the cortical end of the visual system. S.D.

A78-37749 # Investigation of vestibular reactions during binaural equal calorization of the labyrinths (Izuchenie vestibulyarnykh reaktzii pri binaural'noi ekval'noi kaloriatsii labirintov). G. I. Gorgiladze. *Fiziologiya Cheloveka*, vol. 4, Mar.-Apr. 1978, p. 278-283. 12 refs. In Russian.

Experiments were performed on eight male volunteers (18-23 yr) in order to study the characteristics of the nystagmic response of the eyes and the nature of illusory sensations to simultaneous calorization of both labyrinths at the same temperature (binaural equal calorization), along with their variability upon repeated exposure to the given stimulus. It is shown that binaural equal calorization of both labyrinths leads to illusions and nystagmus of the eyes, which points to a predominant stimulation of the vertical semicircular canals. Repeated equal calorization of both labyrinths results in a gradual extinction of aural nystagmus and illusory sensations. Habituation to binaural equal calorization is not transferred to reactions elicited upon exposure to repeated calorific stimuli of one labyrinth alone. S.D.

A78-37750 # Characteristics of voluntary control of respiratory movements in man during muscular work of varying power (Osobennosti proizvol'nogo upravleniia dykhatel'nymi dvizheniiami cheloveka v usloviakh myshechnoi raboty s razlichnoi moshchnost'iu). V. I. Miniaev (Kalininskii Gosudarstvennyi Universitet, Kalinin; Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologiya Cheloveka*, vol. 4, Mar.-Apr. 1978, p. 328-334. 10 refs. In Russian.

A78-37760 # Study of mutagenic stimulation in chlorella (Izuchenie mutagennoi stimulatsii na khlorelle). S. I. Demchenko, M. N. Ovsianikova, and A. Ia. Osetrova (Akademiia Nauk SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 239, Mar. 21, 1978, p. 709-712. 8 refs. In Russian.

A78-37856 # Pathways participating in conducting osteoreceptive signals to the Deiters vestibular nucleus (Puti, uchastvuushchie v provedenii osteoretseptivnoi signalizatsii v vestibuliarnoe iadro Deitersa). V. P. Orlov, A. A. Merten, G. A. Iankovskii, and I. L. Taivan (Ministerstvo Zdravookhraneniia Latviiskoi SSR, Latviiskii Nauchno-Issledovatel'skii Institut Eksperimental'noi i Klinicheskoi Meditsiny, Riga, Latvian SSR). *Fiziologicheskii Zhurnal SSSR*, vol. 64, Mar. 1978, p. 271-278. 19 refs. In Russian.

Based on a study of 30 cats under hexenal anesthesia, the pathways that conduct osteoreceptive signals to the Deiters vestibular nucleus are investigated. The results show that both muscular and cutaneous osteoreceptive signals enter the Deiters vestibular nucleus in a series of tracts passing through the lateral and ventral sections of the spinal cord. Afferent signals from the osteoreceptors and from muscular and cutaneous nerves reach the vestibular nucleus via direct spinovestibular pathways and multisynaptic nonspecific systems and reverberations. S.C.S.

A78-37857 # The osmoregulating function of the kidneys during immersion (Osmoreguliruiushchaia funktsiia pochek pri immersii). A. I. Grigor'ev (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 64, Mar. 1978, p. 389-397. 18 refs. In Russian.

The kidney functions of three healthy subjects were examined during and following a three-day immersion in water. Evaluations were made of variations in the water-salt exchange during the first 24-hour period as a function of the prior hydratization status of the organism. The condition of the osmo- and volume-regulation during the immersion and the recovery period were studied as well as the adequacy of the hydroionic homeostasis under these conditions. The mechanisms for the shifts in the renal functional state and the water-salt exchange under altered cardiac flow were considered. S.C.S.

A78-37884 # Hypodynamia and the cardiovascular system (Gipodinamiia i serdechno-sosudistaia sistema). N. E. Panferova. Moscow, Izdatel'stvo Nauka, 1977. 260 p. 574 refs. In Russian.

The work is concerned with investigations of the state of the cardiovascular system in man under conditions of restrained motor activity. The dependence of changes in the myocardium on the duration and severity of hypodynamia is analyzed on the basis of available information from the literature.

A78-38009 Effective compliance of the circulation in the upright sitting posture. H.-J. Koubenec, W. D. Risch, and O. H. Gauer (Berlin, Freie Universität, Berlin, West Germany). *Pflügers Archiv*, vol. 374, May 1978, p. 121-124. 11 refs.

The effective compliance is defined as the relation of change in blood volume to change in central venous pressure. It was measured in 8 upright sitting male subjects and amounted to 3.3 ml/(mm Hg x kg BW). It is, therefore, by about 50%, greater than the effective compliance in the supine subject, which amounts to 2.3 ml/(mm Hg x kg BW). The difference is probably due to the posture dependent blood volume distribution in the low pressure system whose upper and lower sections have nonlinear pressure-volume characteristics. Immersion to the neck reduces the effective compliance to about half the control value (1.9 ml/(mm Hg x kg BW) which probably constitutes the effective compliance of the intrathoracic circulatory compartment. (Author)

A78-38053 Exercise in cardiovascular health and disease. Edited by E. A. Amsterdam (California, University, Davis, Calif.), J. H. Wilmore (Arizona, University, Tucson, Ariz.), and A. N. DeMaria (California, University, Davis, Calif.). New York, Yorke Medical Books, 1977. 402 p. \$33.

The epidemiology of coronary heart disease is considered along with aspects of pathophysiology and clinical correlations in the case of coronary artery disease, the relation between physical activity and fatal heart attack, the physiological aspects of exercise, the methodological and interpretive aspects of coronary heart disease diagnosis, preventive aspects of coronary heart disease, and exercise in coronary heart disease rehabilitation. Attention is given to acute and chronic physiological responses to exercise, the adaptations in human skeletal muscle as a result of training, myocardial adaptations to physical conditioning, the effect of exercise on hemostatic mechanisms, a computer analysis of the exercise electrocardiogram, the use of the exercise electrocardiogram to identify latent coronary atherosclerotic heart disease, exercise testing in patients with valvular heart disease, the detection of myocardial ischemia by rest and exercise thallium-201 scintigraphy, individualized exercise prescription, coronary risk factor modification by chronic physical exercise, and the control and modification of stress emotions through chronic exercise. G.R.

A78-38062 # Robot stereognosis - Application to object recognition (La stéréognosie en robotique - Application au tri de solides). M. Briot. Toulouse III, Université, Docteur d'Etat Thesis, 1977. 195 p. 82 refs. In French.

The theory of stereognosis (tactile discrimination of the shape or weight of solid bodies) is discussed and applied to such pattern-recognition tasks performed by robots as object separation and prehension. Attention is given to: (1) the identification of solid objects by means of artificial-skin sensors and (2) solids identification by means of various prehensile organs. The theory of stereognosis is applied to the separation of two-dimensional objects by nonanthropomorphic manipulators and the separation of three-dimensional objects by anthropomorphic manipulators. B.J.

A78-38448 The origin of life. I - The pre-biotic era. II - Monomers to polymers. M. A. Bodin. *British Interplanetary Society, Journal (Planets and Life)*, vol. 31, Apr. 1978, p. 129-146.

The origin of life on earth is discussed in a two part study. The first part deals with what is called the pre-biotic era, a period defined by the transition of simple organic elements into more complex compounds, e.g., elemental carbon and oxygen into carbon dioxide. It is assumed that the elements which today exhibit large galactic abundances (C, H, O, N, etc.) were also in abundance on the early earth. The pre-biotic atmosphere of the earth is hypothesized, together with energy sources (solar, lightning/electrical, volcanic, shock waves, heat) which were available at the time. Attention is given to photochemical processes, e.g., CO₂ + H₂O into carbohydrates (sugars) and molecular oxygen, and it is noted that the early atmosphere may have been a reducing one, supporting the idea that the first life forms were anaerobic. Principles governing the synthesis of basic nutrients for, and building blocks of life (amino and nucleic acids) are reviewed with reference to chemical interactions in the pre-biotic soup. The second part of the study deals with the conversion of monomers to polypeptides, e.g., amino acids into proteins, and eventually to the synthesis of replicating molecules such as DNA. The evidence presented is considered to support the hypothesis that nucleotides were formed in a building-up process from polypeptides, rather than the other way around, in which polypeptide construction would have been directed by existing nucleotides. The question as to whether life developed by accident or by design is still, however, a complete riddle. D.M.W.

A78-38449 Polymers to living cells - Molecules against entropy. P. M. Molton. *British Interplanetary Society, Journal (Planets and Life)*, vol. 31, Apr. 1978, p. 147-155. 20 refs.

The question of how life originated on earth is examined using the simplest nonrandom, local hypothesis, i.e., life originated through the organization and assembly of proteins already existing in the primitive earth environment. The problem of the origin of the first procaryotic cells is approached using current knowledge of a modern cell's biochemical dynamics. Attention is given to the active sites of complex proteins, e.g., pituitary beta-lipoprotein, insulin,

DNA, etc., noting that the long protein chains observed today could have been much simpler when they were first formed in the seas of the early earth. In other words, only a few active sites were needed to coordinate the beginning of cellular activity, and the present complex protein structures could have been added on over the course of billions of years of evolving life forms. Finally, the question of the origin of human intelligence is dealt with in terms of increasing social organization, and the maintenance of childhood curiosity (common to most young animals) into human adulthood. D.M.W.

A78-38751 # Physiological effects of varying gravity (Fiziologicheskie efekty izmenennoi gravitatsii). D. G. Gizenko and E. B. Shul'zhenko (Ministerstvo Zdravookhraneniia SSSR, Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 9, Apr.-June 1978, p. 8-20. 30 refs. In Russian.

The paper is concerned with the development of Parin's concepts on space physiology. The experimental data are obtained from investigations of human subjects relating to ground-based simulation of varied gravity levels. The discussion focuses on different aspects of gravipreferendum, man's sensitivity to gravity, and his stability to increased gravity level after modeling the physiological effects typical of weightlessness conditions. The data presented contribute to the development of Parin's concepts on the adaptive-adjusting responses of the human organism under gravity influences. S.D.

A78-38752 # Modern concepts on the contraction-relaxation mechanism of the myocardium (Sovremennye predstavleniia o mekhanizme sokrashcheniia i rasslableniia serdechnoi myshtsy). F. Z. Meerson and V. I. Kapel'ko (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 9, Apr.-June 1978, p. 21-41. 49 refs. In Russian.

Information on the structure of myofibrils and the role of calcium ions in their activation is used to show that the basic inotropic effects, ensuring the activation of the cardiac function under natural conditions, may be achieved by two different mechanisms. Contributing inotropic effects operate owing to an increase in the zone and contact time between the myosin and actin protofibrils. However, two other contributing factors - high frequency of contractions and catecholamines - manifest their effect through the membrane of myocardial cells by an increase in the calcium supplied to the myofibrils. It is shown how the regulatory mechanisms of the myocardium enhance the relaxation rate and maintain the diastolic pause during the occurrence of the basic inotropic effects. S.D.

A78-38753 # Some aspects and achievements of the application of mathematical analysis to cardiac rhythmology (Nekotorye aspekty i uspekhi primeneniia matematicheskogo analiza v kardiologii). D. N. Menitskii, A. M. Zingerman, and E. G. Vashchillo (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 9, Apr.-June 1978, p. 42-60. 55 refs. In Russian.

The research work carried out by Parin and his followers is used to define cardiac rhythmology as an independent discipline intended for studying the self-regulatory mechanisms of the cardiovascular system with a view toward evaluating and predicting the general functional state and emotional stress of a human operator in a control system upon exposure to extremal factors. Results are presented for the mathematical (statistical) analysis of the cardiac rhythm, which are validated under laboratory conditions and in actual flights on large transportation aircraft according to a special-purpose program with extremal loads. S.D.

A78-38754 # Some problems regarding the participation of the cerebral cortex in the regulation of the cardiovascular system (Nekotorye voprosy uchastiia kory bol'shikh polusharii v reguliatsii serdechno-sosudistoi sistemy). G. E. Samonina, T. B. Aleksandrova, and M. G. Udel'nov. *Uspekhi Fiziologicheskikh Nauk*, vol. 9, Apr.-June 1978, p. 61-75. 12 refs. In Russian.

Experimental data on the participation of the cerebral cortex in the regulation of cardiac activity reveal that during electrical stimulation of the cortex the resulting effects on the heart are nonuniform and variable. The presence of regulatory influences of the cerebral cortex on the heart is most distinctly detected against the background of reflexes on the heart. It is shown that these influences may be of both inhibiting and facilitating character. Bidirectional changes of cardiac reflexes are detected even after disconnection of the cerebral cortex. The major role in the interaction of central influences and reflex responses is attributed to the nucleus of a single pathway, which belongs to the afferent portion of the cardiac center in the medulla oblongata. However, the efferent portion of the cardiac center is not directly affected by the superior sections of the brain. S.D.

A78-38755 # Functional system of antigravity and modeling of physiological effects of decreased gravity (Funktional'naia sistema antigravitatsii i modelirovanie fiziologicheskikh effektiv ponizhennoi gravitatsii). G. S. Belkaniia (Akademii Meditsinskikh Nauk SSSR, Sukhumi, Georgian SSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 9, Apr.-June 1978, p. 103-128. 115 refs. In Russian.

Some problems of the interaction of the body with a gravity environment are examined, and a concept of organizing this interaction on the basis of systems approach is outlined. Modeling of the physiological effects of decreased gravity is discussed in terms of the concept of the functional system of antigravity and the particular role of body-support reaction in the organization of this system. Experiments on monkeys involved the modeling of the following basic biological effects of weightlessness: variation of muscle bulk, statokinetic disorders, functional cardiovascular disorders manifested during readaptation as orthostatic hypotonia and collapse, and changes in the fluid-electrolyte balance. The adequacy of the developed model of 'antigravity syndrome' to account for the effects observed under weightlessness conditions is demonstrated. S.D.

A78-38787 Predictions of thermal transients and thermal damage resulting from laser irradiation of tissue. A. N. Takata (IIT Research Institute, Chicago, Ill.) and D. E. Egbert (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Summer Computer Simulation Conference, Chicago, Ill., July 18-20, 1977, Proceedings. Montvale, N.J., AFIPS Press, 1977, p. 461-464. 11 refs. Contracts No. F41609-74-C-0005; No. F33615-76-C-0608.

The Peaceman-Rachford finite difference method is applied to cylindrically symmetric transient heat conduction problems involving inhomogeneous biological media. Computed temperatures are used to predict the extent of cornea burns caused by lasers. Comparisons are made with experimental laser powers causing lesions. Computational times on a 1108 computer are approximately 0.5 msec per grid point per time step. (Author)

A78-38796 Automated instructional system for advanced simulation in undergraduate pilot training /ASUPT/. R. Epps (Singer Co., Link Div., Binghamton, N.Y.). In: Summer Computer Simulation Conference, Chicago, Ill., July 18-20, 1977, Proceedings. Montvale, N.J., AFIPS Press, 1977, p. 875-881.

The article discusses the *Advanced Simulation in Undergraduate Pilot Training* facility which has been developed for the U.S. Air Force. Particular attention is given to: (1) the hardware systems, including alphanumeric CRT display, graphic display, audio feedback, and computer-controlled audio tapes, (2) the software systems, including researcher display/control software, alphanumeric display, CRT plot, graphic CRT display, malfunction insertion features, procedure monitoring, performance feedback, and data recording, and (3) the preprogramming system. S.C.S.

A78-38797 U.S. coast guard variable cockpit training system - Our first four years with a modern simulator. H. K. Povenmire, P. D. Russell, and D. R. Schmidt (U.S. Coast Guard, Aviation Training Center, Mobile, Ala.). In: Summer Computer Simulation Conference, Chicago, Ill., July 18-20, 1977, Proceedings. Montvale, N.J., AFIPS Press, 1977, p. 882-886. 7 refs.

The paper describes the U.S. Coast Guard variable cockpit training system. The concept of proficiency based on advancement is outlined along with training manager selection procedures. The simulator features are reviewed including performance playback, automated demonstration, and automated performance scoring. The use of the simulator equipment is considered with reference to savings in training time and costs. S.C.S.

A78-38981 # Human factors and aerodrome air traffic control /Revised edition/. R. B. Stammers (Aston, University, Birmingham, England). Birmingham, England, University of Aston (University of Aston, AP Report 58), 1977. 18 p. 72 refs.

Methods of studying human factors in airport ATC systems are discussed. These techniques include examination of accident or incident reports, observation of air traffic controllers at work, and analysis of ATC radiotelephone transcripts. Attention is also given to human factors problems which may arise in viewing the airport from ATC towers under various meteorological conditions, interpreting radar images, light-gun communications with aircraft, controlling airport lighting control panels, and man-computer interactions. J.M.B.

A78-39117 Some biological effects of high intensity, low frequency /60 Hz/ electric fields on small birds and mammals. H. B. Graves (Pennsylvania State University, University Park, Pa.). In: Electromagnetic compatibility; Proceedings of the Second Symposium and Technical Exhibition, Montreux, Switzerland, June 28-30, 1977. New York, Institute of Electrical and Electronics Engineers, Inc., 1977, p. 465-468. 12 refs. Research supported by the Electric Power Research Institute.

A78-39184 * # Dual-loop model of the human controller. R. A. Hess (NASA, Ames Research Center, Moffett Field, Calif.). *Journal of Guidance and Control*, vol. 1, July-Aug. 1978, p. 254-260. 12 refs.

A dual-loop model of the human controller in single-axis compensatory tracking tasks is introduced. This model possesses an inner-loop closure that involves feeding back that portion of controlled element output rate that is due to control activity. A novel feature of the model is the explicit appearance of the human's internal representation of the manipulator-controlled element dynamics in the inner loop. The sensor inputs to the human controller are assumed to be system error and control force. The former can be sensed via visual, aural, or tactile displays, whereas the latter is assumed to be sensed in kinesthetic fashion. A set of general adaptive characteristics for the model is hypothesized, including a method for selecting simplified internal models of the manipulator-controlled element dynamics. It is demonstrated that the model can produce controller describing functions that closely approximate those measured in four laboratory tracking tasks in which the controlled element dynamics vary considerably in terms of ease of control. An empirically derived expression for the normalized injected error remnant spectrum is introduced. (Author)

A78-39198 # Detection of initial stages of overstrain in aircrew members (Vyivlenie nachal'nykh stepenei pereutomleniia u letnogo sostava). A. N. Gurov. *Voenna-Meditsinskii Zhurnal*, Mar. 1978, p. 51-53. 7 refs. In Russian.

Results are presented for an experimental study on fit-to-fly pilots (21-30 yr) with various functional cardiovascular disorders, using psychophysiological tests and other techniques of assessing the autonomic nervous system in order to detect the initial symptoms of overstrain as a function of changes in personality characteristics during preflight and postflight testing. It is found that during the development of overstrain in aircrew members with functional cardiovascular disorders, the central nervous system is the first to manifest functional disorders. Changes in the autonomic nervous system and in the hemodynamic indicators under physical stress in the initial stages of overstrain are negligible and depend more on the type of the underlying disorder. The combination of the presented battery of tests with conventional preflight medical examination is suggested to be suitable for detecting the initial symptoms of overstrain in pilots with a view toward making a timely decision for prevention of overstrain. S.D.

A78-39199 # Functional state of external respiration in flight-crew members with compensated atherosclerotic cardiovascular sclerosis (Sostoianie funktsii vneshnego dykhaniia u lits letnogo sostava pri kompensirovannom ateroskleroticheskom kardioskleroze). V. M. Kondrakov. *Voенно-Meditsinskii Zhurnal*, Mar. 1978, p. 53-56. 6 refs. In Russian.

A78-39345 Individual variability and its effect on subjective and biodynamic response to whole-body vibration. M. J. Griffin and E. M. Whitham (Southampton, University, Southampton, England). *Journal of Sound and Vibration*, vol. 58, May 22, 1978, p. 239-250. 10 refs.

A study has been made of the intersubject variability in the comparative discomfort produced by two frequencies of vertical sinusoidal whole-body vibration. The vibration levels investigated (4 and 16 Hz) represent those found in many ground transportation systems. It was found that for the 28 women, 56 men, and 28 children studied, log-normal distributions may be used to approximate the levels of 16 Hz whole-body vibration producing a discomfort level equal to 5 seconds of 1.0 m/sq s rms of 4 Hz sinusoidal vibration. The average levels of 16 Hz were 0.88 m/sq s rms for women, 1.15 m/sq s rms for men, and 1.25 m/sq s rms for children. Average transmissibilities were about 1.4 at 4 Hz and 0.5-0.7 at 16 Hz. S.C.S.

A78-39346 The influence of the acoustic reflex on the loudness of pulsed pure tones. M. E. Lutman and A. M. Martin (Southampton, University, Southampton, England). *Journal of Sound and Vibration*, vol. 58, May 22, 1978, p. 273-284. 36 refs. Medical Research Council Grant No. 970/512/C.

A monaural loudness balance technique is employed to assess the influence of contralateral acoustic stimulation on the loudness of pulsed pure tones in the 0.25-2.0 kHz frequency range. The method minimizes psychological interactions which may confuse the experimental results. It is found that the acoustic reflex contraction of the trapezius muscle results in a reduced level of sound stimulation reaching the cochlea. This however is not always accompanied by a reduction in perceived loudness, but may cause an increase in loudness. S.C.S.

A78-39347 Experiments on the noise heard by human beings when exposed to atmospheric winds. U. R. Kristiansen and O. K. O. Pettersen (Norges Tekniske Hogskole, Trondheim, Norway). *Journal of Sound and Vibration*, vol. 58, May 22, 1978, p. 285-291.

By placing subjects in front of a wind tunnel opening it has been possible to measure the noise heard by human beings exposed to atmospheric winds under controlled conditions. The influence of wind velocity and angle of incidence is shown. Flow visualization and aerodynamic pressure measurements show that the relatively high noise heard when looking directly into a wind has its origin in fluctuations in the wake created by flow separation at about the position of the cheekbone. (Author)

A78-39500 Isolated retinas synthesize visual pigments from retinal congeners delivered by liposomes. S. Yoshikami and G. N. Noll (National Institutes of Health, National Eye Institute, Bethesda, Md.). *Science*, vol. 200, June 23, 1978, p. 1393-1395. 19 refs.

A78-39581 # Thermal characterization of superficial living tissues which have undergone different types of trauma (Caractérisation thermique des tissus vivants superficiels ayant subi différents types d'agression). D. Balageas, D. Ory (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France), A. Dittmar (Lyon, Université, Lyons, France), R. Gongora (Fondation Curie, Paris, France), P. Jockey (Commissariat à l'Energie Atomique, Institut de Protection et Sureté Nucléaire, Fontenay-aux-Roses, Hauts-de-Seine, France), and J. Marichy (Hôpital Edouard Herriot, Lyons, France). (*Société Française de Radioprotection, Congrès International, 9th, Nainville-les-Roches, Essonne, France, May 22-26, 1978.*) ONERA, TP no. 1978-35, 1978. 14 p. 5 refs. In French.

A nontraumatizing probe measuring the thermal effusivity of cutaneous and subcutaneous regions has been developed to investigate burns due to conduction, convection and electric current, as well as ionizing radiation trauma in superficial living tissues. The thermal probe requires about 30 to 120 sec to obtain readings, and is capable of assessing the properties of tissues to a depth of 5 to 10 mm. Sample analyses of second- and third-degree burns are described. The probe appears useful in distinguishing the effects of nonionizing radiation on superficial tissues before symptoms become readily discernible. J.M.B.

A78-39648 A queuing analysis of the air traffic controller's work load. D. K. Schmidt (Purdue University, West Lafayette, Ind.). *IEEE Transactions on Systems, Man and Cybernetics*, vol. SMC-8, June 1978, p. 492-498. 26 refs.

In an effort to increase air traffic control (ATC) system performance, various controller aids (e.g., automation) are constantly being developed. Not only understanding but also quantifying and predicting the work-load factors affecting human performance are critical for the concept definition, design, and evaluation of future controller aids. The qualitative relations between work-load measures (or stressors), strain, fatigue, and the performance of the man in the system are reviewed. A number of stressors, including the work-load magnitude (i.e., minimum utilization time per unit time), delay in ATC task execution due to excessive activity, and mental-image updating requirements are identified and discussed. With the various ATC tasks competing for the man's attention and under the single-channel hypothesis of man's information-processing activity, a queuing model is presented. Calibrated with field data, a computer simulation of the model was used to numerically obtain trends in the above stressors versus traffic demand for two enroute sectors. Preliminary estimates of maximum allowable thresholds for these stressors are used to infer the controller's traffic-handling capacities. (Author)

A78-39649 A mathematical theory for sequential input adaptive systems with applications to man-machine tracking systems. D. E. Greene. (*Institute of Electrical and Electronics Engineers, International Conference on Cybernetics and Society, Washington, D.C., Sept. 19-21, 1977.*) *IEEE Transactions on Systems, Man and Cybernetics*, vol. SMC-8, June 1978, p. 498-507. 12 refs.

A theory is presented for input adaptive systems in which the controller scans the system error, predicts the input at instants by linear functions, and effects systematic open-loop control over intervals to reduce the error relative to the predicted input. This sequential prediction-control process is represented mathematically by the adaptive program in which a basic optimal process is applied at discrete times. The sequential theory is shown to describe and predict manual control tracking behavior in an antiaircraft artillery system. For this system, the theory produces a description of mean tracking behavior which has a closer correlation with the experimental data than does the optimal control model. (Author)

A78-39650 Effect of preview on digital pursuit control performance. T. O. Kvalseth (Trondheim, Universitetet, Trondheim, Norway). *Human Factors*, vol. 20, June 1978, p. 371-377. 24 refs.

The effect of preview on human performance during a digital pursuit control task was analyzed for different preview spans and different characteristics of the reference input. The data from eight subjects revealed that the RMS error performance improved substantially from the case of no preview to that of one preview point, while the use of additional preview points did not result in any further significant performance improvement. The benefit of preview was most clearly established when the reference input was generated by a purely random process as opposed to a first-order autoregressive process (with the parameter $\alpha = 0.95$). The RMS error increased when the variance of the reference input increased. The error appeared to be normally distributed with a tendency toward a negative bias. (Author)

A78-39673 Breathing effects of a parachute harness secured over an inflated lifejacket. N. C. Ellis (Texas A & M University, College Park, Tex.) and R. A. Jordan (Aerospace Engineering Test Establishment, Ottawa, Canada). *SAFE Journal*, vol. 8, Summer 1978, p. 18, 19. 5 refs.

Standard aircrew lifejackets charged with 25 grams of CO₂ were inflated beneath parachute harnesses worn by test participants under conditions of simulated descent. Breathing costs, measured by O₂ consumption, were determined and compared with conditions in which lifejackets were not inflated. Results showed an average increase of 26% in O₂ consumption implying that critical trade-offs must be examined when considering automatic inflation devices. (Author)

A78-39700 * Depth-dose relations for heavy ion beams. J. W. Wilson (NASA, Langley Research Center, Hampton; Old Dominion University, Norfolk, Va.). (*American Physical Society, Meeting, Virginia Beach, Va., Nov. 11-13, 1976.*) *Virginia Journal of Science*, vol. 28, no. 3, 1977, p. 136-138. 9 refs.

Radiation transport of heavy ions in matter is of interest to radiological protection in space and high-altitude aircraft. In addition, heavy ion beams are expected to be of advantage in radiotherapy since their characteristic Bragg curve allows a relative reduction of the dose in reaching a tumor site and the near elimination of exposure beyond the tumor region as the beam exits the body. Furthermore, the radioresistance of tumorous cells due to their hypoxic state may be reduced or eliminated by the high specific ionization of heavy ion beams. The depth-dose distribution of heavy ion beams consists of energy deposited by the attenuated primary beam with its characteristic Bragg curve and a relatively unstructured background due to secondary radiations produced in nuclear reactions. As the ion mass increases, the secondary contribution becomes more structured and may add significantly to the Bragg peak of the primary ions. The result for heavy ions (z greater than 20) is a greatly broadened Bragg peak region, especially in comparison to straggling effects, which may prove to be of importance in radiotherapy and biomedical research. (Author)

A78-39746 * The Viking biological experiments on Mars. H. P. Klein (NASA, Ames Research Center, Moffett Field, Calif.). *Icarus*, vol. 34, June 1978, p. 666-674. 24 refs.

The three biological experiments on board the Viking Mars Landers are discussed. The gas exchange experiment provided periodic measurements of the composition and quantity of gases from Martian surface material, either in a humid or a wet nutrient sampling mode. The labeled release experiment demonstrated that adding an aqueous solution of dilute radioactive compounds to Martian material caused a rapid release of labeled gas. The results of the pyrolytic release experiment remain difficult to interpret. Data from the first two experiments suggest that oxidants (including H₂O₂ and iron oxide) rather than biota may account for all the observed reactions. J.M.B.

A78-39747 Differences in cardio-respiratory responses to exhaustive exercise between athletes and non-athletes. K. Yamaji (Toyama University, Toyama, Japan) and M. Miyashita (Tokyo, University, Tokyo, Japan). *European Journal of Applied Physiology*, vol. 38, no. 4, 1978, p. 233-238. 17 refs.

A78-39748 Heat loss from the skin surface of the human body - Deductions from a symmetry of constant mean surface curvature (Die Wärmeabgabe von der Hautoberfläche des menschlichen Körpers - Herleitung aus einer Symmetrie konstanter mittlerer Gesamtkrümmung). B. Theves (Kiel, Neue Universität, Kiel, West Germany). *European Journal of Applied Physiology*, vol. 38, no. 4, 1978, p. 239-259. 12 refs. In German.

The following factors are parameterized as they pertain to body heat loss: body surface area, mean surface curvature, thickness of clothing, thickness of boundary layer, air temperature, water vapor pressure in the air, radiation temperature of the environment, air pressure, wetness degree of skin surface, direct sunlight incidence, and diffuse sky radiation of heat. A simplified formula for heat loss is presented, whereby all the factors mentioned above are taken into consideration by the inclusion of partial climatic complex temperature variable $\theta_{sub 0}$, which in principle, permits the application of the formula to all mammals in a similar environment. D.M.W.

A78-39749 Reactivity of normal airways to short-term exercise. W. Y. Chen (National Jewish Hospital, National Asthma Center, Denver, Colo.). *European Journal of Applied Physiology*, vol. 38, no. 4, 1978, p. 277-280. 15 refs.

Reactivity of airways to short-term exercise was tested once in 15 healthy subjects and repeated on eight of the group using Stead-Wells and Wedge spirometers and body plethysmograph. The pulmonary function tests were performed at rest and shortly after exercise, and the data were studied by means of a randomized block analysis of variance. It was demonstrated that overall post-exercise pulmonary functions were not statistically different from the pre-exercise baseline. (Author)

A78-39750 Total and alactic oxygen debts after supra-maximal work. A. D. Roberts and A. R. Morton (Western Australia, University, Nedlands, Australia). *European Journal of Applied Physiology*, vol. 38, no. 4, 1978, p. 281-289. 20 refs.

The total and alactic oxygen debts were measured in eight subjects following supramaximal treadmill running (14.5-16.1 km/h, 20% grade) to exhaustion, on two duplicate tests separated by 48 h. Mean total oxygen debts on the two trials were 5.28 plus or minus 0.42 l and 4.57 plus or minus 0.46 l, ($r = 0.34$). Mean alactic oxygen debts were 2.81 plus or minus 0.21 l and 2.74 plus or minus 0.12 l ($r = 0.89$). Values for maximal total and alactic oxygen debts in this study were in close agreement to those found in the literature. The inability of the subjects to adequately reproduce an exhausting supramaximal effort was the major factor preventing reliable measurement of total oxygen debt. It is concluded that the method developed for the measurement of oxygen debt is both reliable and valid for the alactic portion of the debt. (Author)

STAR ENTRIES

N78-24781*# National Aeronautics and Space Administration, Washington, D. C.

BEFORE THE LONG JOURNEY

Oleg Georgiyevich Gazenko May 1978 20 p Transl. into ENGLISH from Nauka Zhizn (USSR), no. 11, Nov. 1977 p 33-39 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Inst. of Med. Biol. Probl. of the Min. of Public Health USSR

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One of the leading specialists in space biology and medicine Oleg Georgiyevich Gazenko discusses the development of space biology and medicine and the problems which its specialists solve. The application of space medicine discoveries to terrestrial medicine is also discussed. Author

N78-24782*# National Aeronautics and Space Administration, Washington, D. C.

BEFORE THE LONG JOURNEY: DEVELOPMENT OF SOVIET SPACE BIOLOGY AND MEDICINE

Oleg Georgiyevich Gazenko May 1978 18 p Transl. into ENGLISH from Nauka Zhizn (USSR), no. 11, Nov. 1977 p 33-39 Transl. by Sci. Transl. Serv., Santa Barbara, Calif. Original doc. prep. by Inst. of Med. and Bio. Probl. of the USSR Min. of Public Health

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Academician O. Gazenko, Chief of the Institute of Biomedical Problems, USSR Ministry of Public Health, reviewed the short but intense history of Soviet research in space biology and medicine. The solid academic approach of the Soviet Academy of Sciences in giving a good start at the very beginning of the space age is stressed and key people and institutions who initiated these studies are named. The basic feature of the first period of space biology is seen as the search for answers to a few fundamental questions of survival in space. It is pointed out that the initiated investigations were replaced by refined, in-depth studies of the biological, biophysical, and biochemical processes in human organism in the space environment and the search for methods which should enable cosmonaut crews to live in space for several years during interplanetary journeys. Discussing the typical problems of this effort, Gazenko each time showed how they benefit medical science and practice in general. Author

N78-24783*# Houston Univ., Tex. Dept. of Biology.
THE ROLE OF CELL MEMBRANES IN THE REGULATION OF LIGNIFICATION IN PINE CELLS Research Progress Report

Donald L. Hendrix Feb. 1978 12 p

(Grant NsG-7300)

(NASA-CR-157156) Avail: NTIS HC A02/MF A01 CSCL 06C

The identity of pine cell membranes bearing PAL enzyme activity, the isolation of a plasma membrane preparation from pine cells for testing as a regulatory barrier in lignification, and the measurement of the geopotential effect in pine stems are presented. A model to describe and predict the interaction of gravity and lignification of higher plants was developed. Author

N78-24784*# California Univ., Berkeley. Environmental Physiology Lab.

METABOLIC AND CARDIOVASCULAR ADAPTATION, MONKEY. NASA SMD 3, PROJECT 76, EXPERIMENT 44 CONDUCTED AT NASA/JSC, 14-25 MAY 1977 Final Report

Nello Pace, Donald F. Rahlmann, Richard C. Mains, Arthur M. Kodama, and Ernest P. McCutcheon 30 Oct. 1977 42 p refs

(Grant NsG-7262)

(NASA-CR-157159; EPL-77-2) Avail: NTIS HC A03/MF A01 CSCL 06C

The biomedical results from an experiment on a monkey subjected to space flight conditions are reported. A background history of the development and testing of an experiment system designed to permit measurement of physiological parameters in subhuman primates during continuous, comfortable, couch restraint for periods of up to 30 days is reviewed. Of major importance in the experimental design of the system was the use of a fiberglass pod, which could be sealed and subdivided into upper and lower parts, to monitor and control the physiological responses for various parts of the animal's body. The experiment was conducted within the Spacelab Simulator for a period of 11 days. Data recorded includes: Spacelab Simulator cabin temperature; ventilation rate; pod internal temperature; fraction percent oxygen; fraction percent carbon dioxide; oxygen consumption rate; carbon dioxide production rate; respiratory quotient; intrathoracic temperature; heart rate; mean aortic pressure; mean ventricular pressure; diurnal variation of parameters measured; comparison of mean preflight, flight, and postflight values of the parameters measured; and correlation matrix for the parameters measured. G.Y.

N78-24785# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

GEOPHYSICAL PHONONIC ENERGY AS A SOURCE OF BIOPHYSICAL EFFECTS

Zenon Urbanski 26 Sep. 1977 18 p refs Transl. into ENGLISH of the Conf. paper from the 3rd Intern. Congr. on Psychotronic Res. (Poland), Pt. 1, 27 Jun. - 2 Jul. 1977 p 373-382 Conf. held at Tokyo, 27 Jun. - 2 Jul. 1977

(AD-A051386; FTD-ID(RS)T-1596-77) Avail: NTIS HC A02/MF A01 CSCL 06/3

The intensified energy exchange band, and the differences of the gradients of the component level of the geomagnetic field on the surface of the ground, and the associated phenomena of pathology in living matter, as well as the disturbance in inanimate matter, arise especially in underflow of deep sub-surface water. They are known as the source of biophysical effects, whereas the mechanics of this phenomena, its analyzed observation and measurement constitute the subject of this article. GRA

N78-24786# National Technical Information Service, Springfield, Va.

BIOLOGICAL PRODUCTIVITY IN FRESH WATER ENVIRONMENTS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Feb. 1976 - Mar. 1978

Elizabeth A. Harrison Mar. 1978 193 p Supersedes NTIS/PS-77/0267; NTIS/PS-76/0056

(NTIS/PS-78/0293; NTIS/PS-77/0267; NTIS/PS-76/0056) Copyright. Avail: NTIS HC \$28.00/MF \$28.00 CSCL 06C

Water pollution effects, ecology, ecosystems, seasonal variations, nutrients, eutrophication, food chains and limnology, as related to fresh water biological productivity, are the subjects covered by the selected abstracts of research reports in the bibliography. GRA

N78-24787# Yugoslav Academy of Sciences and Arts, Zagreb.
BIOLOGICAL EFFECTS OF MANGANESE

Marko Saric Jan. 1978 169 p refs

(PB-277169; EPA-600/1-78-001) Avail: NTIS HC A08/MF A01 CSCL 06C

The effects of manganese on the central nervous system and on blood pressure as well as a possible catalytic effect of dust containing manganese on the conversion of sulfur dioxide in the air was considered. The results obtained show that the rate of pneumonia is influenced by the exposure to manganese at the level of occupational exposure in the production of manganese alloys. The study also indicated that a higher rate of chronic nonspecific lung disease can be expected in occupational exposure at this level. At the level of occupational exposure a hypotonic effect on systolic blood pressure was observed. GRA

N78-24788# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.

OCCUPATIONAL EXPOSURE TO DECOMPOSITION PRODUCTS OF FLUOROCARBON POLYMERS. CRITERIA FOR A RECOMMENDED STANDARD

Sep. 1977 121 p refs
(Contract CDC-99-74-31)
(DHEW/Pub/NIOSH-77/193) Avail: NTIS MF A01; HC SOD

The standard is designed to protect the health and provide for the safety of employees for up to a 10 hour work shift, 40 hour workweek, over a working lifetime. The recommended standard for the decomposition products of fluorocarbon polymers emphasizes good work practices and engineering controls and medical management. Since no measurable environmental level of any single decomposition product of fluorocarbon polymers, can ensure complete protection of worker health, no occupational exposure limit is recommended in this document. Author

N78-24789# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.

OCCUPATIONAL EXPOSURE TO POLYCHLORINATED BIPHENYLS (PCBS). CRITERIA FOR A RECOMMENDED STANDARD

Sep. 1977 233 p refs
(DHEW/Pub/NIOSH-77/225) Avail: NTIS MF A01; HC SOD

The National Institute for Occupational Safety and Health (NIOSH) recommends that employee exposure to polychlorinated biphenyls (PCBs) in the workplace be controlled by adherence to certain guidelines. The standard used is designed to protect the health and provide for the safety of employees for up to a 10 hour workday, 40 hour workweek, over a normal working lifetime. The standard is measurable by techniques that are valid, reproducible, and available to industry and governmental agencies. Compliance with the standard should substantially reduce any risk of reproductive or tumorigenic effects of PCBs and prevent other adverse effects of exposure in the workplace. Employees should regard the recommended workplace environmental limit as the upper boundary for exposure and make every effort to keep exposure as low as possible. Author

N78-24790# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.

OCCUPATIONAL EXPOSURE TO REFINED PETROLEUM SOLVENTS. CRITERIA FOR A RECOMMENDED STANDARD

Jul. 1977 256 p refs
(Contract CDC-99-74-31)
(DHEW/Pub/NIOSH-77/192) Avail: NTIS MF A01; HC SOD

The National Institute for Occupational Safety and Health recommends standards to protect employees from exposure to petroleum ether, rubber solvent, varnish makers' and painters' naphtha, mineral spirits, Stoddard solvents and kerosene in the workplace. The standards are designed to protect the health and provide for the safety of employees for up to a 10 hour work shift, 40 hour workweek, over a working life. Compliance with all sections of the standards should prevent adverse effects of these chemicals on the health of employees and provide for their safety. Techniques recommended are valid, reproducible, and available to industry and government agencies. Sufficient technology exists to permit compliance with the recommended

standards. Although the environmental limits for the workplace are considered to be safe levels based on current information, the employer should regard these as the upper boundary of exposure and every effort should be made to keep the exposure as low as is technically feasible. Author

N78-24791# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.

OCCUPATIONAL EXPOSURE TO VANADIUM. CRITERIA FOR A RECOMMENDED STANDARD

Aug. 1977 151 p refs
(Contract CDC-99-74-31)
(DHEW/Pub/NIOSH-77/222) Avail: NTIS MF A01; HC SOD

The National Institute for Occupational Safety and Health (NIOSH) recommends, standards to protect employer from exposure to vanadium and its compounds in the workplace. The standard is designed to protect the health and provide for the safety of employees for up to a 10 hour work shift, 40 hour workweek, over a working lifetime. Compliance with all sections of the standard should prevent adverse effects of vanadium and its compounds on the health of workers and provide for their safety. Sufficient technology exists to permit compliance with the recommended standard. Although NIOSH considers the workplace environmental limit to be a safe level based on current information, the employer should regard it as the upper boundary of exposure and make every effort to maintain the exposure as low as is technically feasible. Author

N78-24792# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.

OCCUPATIONAL EXPOSURE TO TUNGSTEN AND CEMENTED TUNGSTEN CARBIDE

Sep. 1977 182 p refs
(DHEW/Pub/NIOSH-77/127) Avail: NTIS MF A01; HC SOD

The criteria and the recommended standard based thereon that were prepared to meet the need for preventing occupational disease or injury arising from exposure to tungsten, tungsten compounds, and cemented tungsten carbide are presented. Compounds, or cemented tungsten carbide is the potential for transient or permanent pulmonary damage. Irritation of the skin and upper and lower respiratory tract has also been associated with inhalation of, or skin contact with, these materials and should be considered in any work practices program. Author

N78-24793# Battelle Pacific Northwest Labs., Richland, Wash.
BIOLOGICAL EFFECTS OF STATIC AND LOW-FREQUENCY ELECTROMAGNETIC FIELDS: AN OVERVIEW OF UNITED STATES LITERATURE

R. D. Phillips and W. T. Kaune Jul. 1977 37 p refs
(Contract EY-76-C-06-1830)
(EPRI-EA-490-SR) Avail: NTIS HC A03/MF A01

Data are reviewed from past and ongoing research in the United States concerned with the biological effects of static and low-frequency electromagnetic fields produced by power transmission systems and low frequency communication systems. ERA

N78-24794# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

THE PSYCHOLOGICAL SIGNIFICANCE OF THE ELECTRO-ENCEPHALOGRAM [DE PSYCHOLOGISCHE BETEKENIS VAN HET EEG]

A. W. K. Gaillard 1977 33 p refs In DUTCH Submitted for publication
(IZF-1977-6; TDCK-69120) Avail: NTIS HC A03/MF A01

The possibility of investigating the relationship between brain activity and the psychological functioning of a subject by analyzing the systematic changes in the EEG during the performance of the task is discussed. Topics dealt with include spontaneous brain activity, alpha rhythm, evoked potentials, motor potentials, slow brain potentials, EEG and psychological information processing, selection attention, and stimulus anticipation versus motoric preparation. ESA

N78-24795 South African Bureau of Standards, Pretoria.
STANDARD SPECIFICATION FOR THE PRODUCTION OF MEN'S DERBY TYPE SAFETY BOOTS (SEWN, RIVETED, SCREWED, AND STITCHED)

Nov. 1977 47 p Revised Supersedes SABS-437-1953 (SABS-437-1977; ISBN-0-626-04474-X; SABS-437-1953) Copyright. Avail: Issuing Activity

Specifications are given for six types of men's derby type safety boots that are made according to combinations of the sewn, riveted, screwed, and stitched principles. Specifications include: type and method of construction; materials and components; constructional requirements; workmanship and finish; and sampling to comply with the specification. Author

N78-24796 South African Bureau of Standards, Pretoria.
STANDARD SPECIFICATION FOR SAFETY BELT ASSEMBLIES, HARNESSSES, AND LAP BELTS FOR USE IN MOTOR VEHICLES

Jun. 1977 45 p In ENGLISH and AFRIKAANS Revised Supersedes SABS-724-1962 (SABS-724-1977; ISBN-0-626-04342-5; SABS-724-1962) Copyright. Avail: Issuing Activity

Requirements are given for the general design, quality of components, and performance of restraining devices for occupants of motor vehicles. The devices may include emergency and automatic retracting and locking retractors. Author

N78-24797# Civil Aeromedical Inst., Oklahoma City, Okla.
PASSENGER FLOW RATES BETWEEN COMPARTMENTS: STRAIGHT-SEGMENTED STAIRWAYS, SPIRAL STAIRWAYS, AND PASSAGEWAYS WITH RESTRICTED VISION AND CHANGES OF ATTITUDE

D. W. Pollard, J. D. Garner, J. G. Blethrow, and D. L. Lowrey Jan. 1978 55 p ref (AD-A051485; FAA-AM-78-3) Avail: NTIS HC A04/MF A01 CSCL 01/2

Movement was compared up and down spiral and straight segmented stairways simulating the stairs in multideck transport aircraft, up and down spiral and straight-segmented industrial-type stairways, fore and aft through a passageway enclosed on one side, and fore and aft through a passageway enclosed on both sides. An evacuation simulator was positioned to represent degrees of pitch and roll similar to those encountered in accidents as a result of landing gear failure. Tests were conducted in regular cabin lighting, reduced cabin lighting, reduced cabin lighting with subjects wearing goggles simulating smoke conditions, and artificial smoke conditions. Results indicate that an enclosed passageway enables more rapid movement from one compartment to another than does a passageway enclosed on only one side. Straight-segmented stairways allowed more efficient movement from one level to another than did spiral stairs. Author

N78-24798# Civil Aeromedical Inst., Oklahoma City, Okla.
EVALUATION OF SEATING AND RESTRAINT SYSTEMS AND ANTHROPOMORPHIC DUMMIES CONDUCTED DURING FISCAL YEAR 1976

Richard F. Chandler and Edwin M. Trout Feb. 1978 44 p (AD-A051691; FAA-AM-78-6) Avail: NTIS HC A03/MF A01 CSCL 05/5

The results of test programs conducted by the Protection and Survival Laboratory to investigate the performance of prototype or operational seating and restraint systems relative to their ability to provide protection against crash injury and to investigate the performance of anthropomorphic dummies in the dynamic environment are reported. Author

N78-24799# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.

PROCEEDINGS OF THE INTERNATIONAL OCCUPATIONAL HAND-ARM VIBRATION CONFERENCE

D. E. Wasserman, ed. and W. Taylor, ed. Apr. 1977 261 p refs Proc. held in Cincinnati, 28-31 Oct. 1975 (DHEW/Pub/NIOSH-77/170) Avail: NTIS MF A01; SOD HC

Presentations encompassed the medical, physiological, epidemiological, engineering, and monitoring aspects of the hand-arm vibration problem. Presentations clarified the general hand-arm vibration problem, relating it, but not limiting it, to workers using chain saws. Author

N78-24800# Essex Corp., Alexandria, Va.
HUMAN FACTORS ENGINEERING. PART 1: TEST PROCEDURES Final Report

James C. Perkins, George C. Maxey, Thomas B. Malone, Sheldon W. Shenk, and Mark Kirkpatrick, III 20 Dec. 1977 354 p refs

(Contract DAAD05-76-C-0787) (AD-A051481; TECOM-TOP-1-2-610-Pt-1) Avail: NTIS HC A16/MF A01 CSCL 05/5

The material in this Test Operations Procedure (TOP) is intended to be used for the Human Factors Engineering (HFE) assessment of all types of materiel and systems tested by TECOM. Supplementary sources of guidance are indicated when required. It encompasses the HFE procedures for the testing of design, functional performance, and environmental considerations for the major test functions (operability, maintainability, transportability, portability/usability, erectability, and habitability) applicable to the HFE assessment. Part 1 of this TOP provides guidance on how to plan and conduct an HFE test. This part also includes specific test procedures and sample data collection forms, such as checklists, questionnaire/interview sheets and other data collection forms. Part 2, the Human Factors Engineering Data Guide for Evaluation (HEDGE) provides planning guidance concerning what to test and includes guidance in the selection of applicable test functions, test conditions, performance tasks, and detailed design criteria. GRA

N78-24801# Essex Corp., Alexandria, Va.
HUMAN FACTORS ENGINEERING. PART 2: HEDGE Final Report

James C. Perkins, George C. Maxey, Thomas B. Malone, Sheldon W. Shenk, and Mark Kirkpatrick, III 20 Dec. 1977 134 p

(Contract DAAD05-76-C-0787) (AD-A051482; TECOM-TOP-1-2-610-Pt-2) Avail: NTIS HC A07/MF A01 CSCL 05/5

Partial contents: How to Use HEDGE (Human Factors Engineering Data Guide for Evaluation); Operability--Vehicles; Weapons; Materiel handlers; Electronics/Signals; Operational support; and Troop support equipment; Maintainability--Vehicles; Weapons; Materiel handlers; Electronics/Signals; and Operational Support; Transportability; Portability/Usability; Erectability; and Habitability. GRA

N78-24802# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
PIVIB: A COMPUTER PROGRAM FOR ANALYSIS OF PILOT BIODYNAMIC AND TRACKING RESPONSE TO VIBRATION

Jeffrey E. Berliner and William E. Levison Sep. 1977 93 p refs

(Contract F33615-76-C-5015; AF Proj. 7231) (AD-A052361; BBN-3457; AMRL-TR-77-72) Avail: NTIS HC A05/MF A01 CSCL 05/8

PIVIB (Pilot Response to Vibration) is a digital computer program that predicts both the biodynamic response of a pilot, and the resultant tracking behavior in a single-axis and multiple-axis whole-body vibration environments. The program is written in FORTRAN-IV-EXTENDED computer programming language and is designed for efficient batch operation on a Control Data CDC-6600 computer. The purpose of this report is to acquaint the user with the program and how to operate it. Author (GRA)

N78-24803# Army Research Inst. of Environmental Medicine, Natick, Mass. Military Ergonomics Div.

THE ROLE OF CLOTHING IN ACHIEVING ACCEPTABILITY OF ENVIRONMENTAL TEMPERATURES BETWEEN 65 F AND 85 F (18 C AND 30 C)

Ralph F. Goldman Feb. 1978 22 p refs
(DA Proj. 3E7-62777-A-845)

(AD-A052563; USARIEM-M-13/78) Avail: NTIS
HC A02/MF A01 CSCL 15/5

It seems clear that the trend, since the 1920's, to lighter weight and less clothing will have to be reversed completely in the winter if thermal comfort is to be achieved at the present Federal Energy Agency guidelines of 68 to 70 F for winter thermostat settings, and because of the problem of the hands thermal comfort may not be achievable to allow for sedentary office work at temperatures below that level. The present summertime guidelines of 78 to 80 F can be achieved with conventional summer clothing, and even the proposed extended guidelines of 80 to 82 F could be made thermally comfortable if bathing suits become acceptable as office wear. GRA

N78-24804# Navy Experimental Diving Unit, Panama City, Fla.
A COMPARISON OF THE RELATIVE MERITS OF BARALYME AND SODASORB

James R. Middleton 14 Feb. 1978 21 p

(AD-A052559; NEDU-1-78) Avail: NTIS HC A02/MF A01
CSCL 06/11

As a result of an NEDU study into the relative merits of Baralyme, manufactured by Chemetron Corp., and Sodasorb, manufactured by W.R. Grace Co., it is recommended that Type A and High Performance grades of Sodasorb be approved for use as CO₂-absorbents in all Navy diving equipment. GRA

N78-24805# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

REQUIREMENTS FOR GOGGLES USED IN TRAINING TO FLY INSTRUMENTS

J. J. Vos 1977 8 p refs In DUTCH; ENGLISH summary
(Contract A75/KM/127)

(IZF-1977-4; TDCK-69057) Avail: NTIS HC A02/MF A01

The principle of the common blue and amber method of training to fly instruments is that, by complementary transmittance of the amber screens and the blue glasses the view outside is impeded while instrument reading remains possible. As it appears impossible to obtain a virtually zero transmittance that way, the question comes up which value can be considered acceptable. The upper limit appears to be appr. 0.00001 and this limit is determined by the fact that below it the still penetrating light is sufficiently masked by the reflected ambient light against the cabin windows. An absolute condition is that the amber screens only partly cover the cabin windows. Author (ESA)

N78-25744# National Inst. of Dental Research, Bethesda, Md.
STUDIES ON THE ISOLATION AND IDENTIFICATION OF HEPATITIS VIRUSES IN WATER

W. O. K. Grabow and O. W. Prozesky (Natl. Inst. for Virology, Johannesburg) [1977] 9 p refs Presented at the Intern. Conf. on Advan. Treat. and Reclamation of Wastewater

Avail: NTIS HC A02/MF A01

Antigens associated with hepatitis viruses were successfully isolated from seeded water samples by means of affinity chromatography. The antibodies trap the virus particles, while non-specific material passes through. After washing, the antigens were released for identification in purified and concentrated form. The hepatitis B associated antigen was identified by means of radioimmunoassay and electron microscopy. Application of the procedure to waste water indicated that the hepatitis B virus is rarely present in polluted water. The hepatitis A associated agent was identified by infectivity tests using *Saguinus nigricollis*-marmosets. Author

N78-25745# Newcastle-upon-Tyne Univ. (England).
INACTIVATION OF ENTEROVIRUSES AND COLIPHAGES WITH OZONE IN WATERS AND WASTE WATERS

Lilian M. Evison [1977] 12 p refs Presented at the Intern. Conf. on Advanced Treatment and Reclamation of Wastewater
Avail: NTIS HC A02/MF A01

The relative resistance of enteroviruses, coliphages and *E. coli* was studied in laboratory experiments. Coxsackie B3 and Polio 3 were the most resistant strains. Coxsackie B5 and Polio 2 were the least resistant. Coliphages and *E. coli* were less resistant than any of the viruses. The effect on ozone disinfection of a range of organic and inorganic chemicals and waste water effluents was investigated. Author

N78-25746# Hebrew Univ., Jerusalem (Israel). School of Applied Science and Technology.

VIRUS CONCENTRATION BY HOLLOW FIBER MEMBRANES: WHERE TO NOW?

Georges Belfort, Yael Rotem-Borensztajn, and Elie Katzenelson [1977] 11 p refs Presented at the Intern. Conf. on Advan. Treat. and Reclamation of Wastewater

Avail: NTIS HC A02/MF A01

An asymmetric polyamide capillary membrane ultrafiltration permeator was used to concentrate polio virus I from 100 l of tap water. Results of virus recovery through ultrafiltration, backwashing and second step concentration by organic flocculation are presented and represent a significant improvement over those previously reported. The importance of hydrodynamics is emphasized and used to compare the performance of the capillary module with that of two hollow fiber modules previously tested. Author

N78-25747# National Inst. for Water Research, Pretoria (South Africa).

BIOLOGICAL TESTING OF WATER RECLAIMED FROM PURIFIED SEWAGE EFFLUENTS

S. J. VanRensburg (Natl. Res. Inst. for Nutr. Diseases of the S. Africa Med. Res. Council, Tygerberg), W. H. J. Hattingh, M. L. Siebert, and N. P. J. Kriek [1977] 15 p refs Presented at the Intern. Conf. of Advan. Treat. and Reclamation of Wastewater

Avail: NTIS HC A02/MF A01

Four different waters (reclaimed, humus tank effluent, distilled and tap water) were subjected to biological assay, using rats. In addition spent and new active carbon was also included in the diets of the rats to investigate the oral route. All animals were autopsied and the liver, kidneys, lungs, heart, spleen, pancreas, gonads, oesophagus, stomach, intestine and other abnormal tissues were fixed, stained and microscopically examined. Results indicate that the feed water to the reclamation plant (humus tank effluent) was the only water which exerted obvious deleterious effects on the test animals. Author

N78-25748# Technion - Israel Inst. of Tech., Haifa. Environmental Engineering Labs.

COLIPHAGES SURVIVAL AS VIRAL INDICATOR IN VARIOUS WASTEWATER QUALITY EFFLUENTS

Yehuda Kott, Hanna Ben-Ari, and Lina Vinokur [1977] 12 p refs Presented at the Intern. Conf. on Advan. Treat. and Reclamation of Wastewater (Grant EPA-801950)

Avail: NTIS HC A02/MF A01

The use of coliphages as a viral model in waste and other waters was investigated. Results and survival of coliphage after chlorination, suggest strongly that coliphage capable to attack *E. coli B* can be used as virus indicator in various wastewaters. Using coliphage as a viral indicator will save time, and is economically feasible. Author

N78-25749# National Inst. for Water Research, Pretoria (South Africa).

MICROBIOLOGICAL QUALITY AND EPIDEMIOLOGICAL ASPECTS OF RECLAIMED WATER

W. O. K. Grabow and Margaretha Isaacson (South African Inst. for Med. Res., Johannesburg) [1977] 11 p refs Presented at the Intern. Conf. on Advan. Treat. and Reclamation of Wastewater

Avail: NTIS HC A02/MF A01

Potable waters obtained by conventional methods or by reclamation of wastewater, as well as their sources, were analysed for total bacterial plate count, total coliform bacteria, fecal coliforms, enteric viruses and parasite ova. The quality of the reclaimed water consistently compared favourably with those produced by conventional methods, and was substantially superior to that of many conventional supplies. These findings were supported by epidemiological data, which failed to reveal any adverse health effects on consumers of reclaimed or conventional supplies that conformed to the proposed standard. Author

N78-25750# Technion - Israel Inst. of Tech., Haifa. Sherman Environmental Engineering Research Center.

PHYSICO-CHEMICAL TREATMENT OF POND EFFLUENTS FOR UNRESTRICTED AGRICULTURAL REUSE WITH RECOVERY OF ALGAE AS PROTEIN SOURCE: PILOT AND FIELD SCALE EXPERIMENTS

G. Shelef, R. Moraine, and E. Sandbank [1977] 17 p refs Presented at the Intern. Conf. on Advan. Treat. and Reclamation of Wastewater

Avail: NTIS HC A02/MF A01

Alum flocculation coupled with flotation was found to upgrade stabilization pond effluents to quality permitting reuse for unrestricted irrigation. Removal of phosphate by the alum permits seasonal impoundment of the clarified effluent with minimal eutrophication. The byproduct algal sludge can serve as a high quality protein source for poultry and fish, replacing over a quarter of the soy meal in broiler rations as well as over three-quarters of the fish meal in carp rations. The combined values of waste disposal, renovated water, and feed protein make the system highly economical. Author

N78-25751# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario).

RELATIONS BETWEEN LIGHT-INDUCED XANTHOPHYLL CONVERSION AND THE HILL REACTION

A. Hager 1978 19 p refs Transl. into ENGLISH from Ber. Deut. Bot. Ges. (West Germany), v. 79, no. 11, 1966 p 94-107

(NRC/CNR-TT-1921; ISSN-0077-5606) Avail: NTIS HC A02/MF A01

The investigations were based on thin-layer chromatography, whereby even structure isomeric carotenoids, which vary only in the position of one double bond, can be separated from one another, such as lutein from zeaxanthin. The latter pigment, together with violaxanthin and antheraxanthin, plays an important role in such quantitative changes. The biosynthesis of carotenoids involves these three xanthophylls (violaxanthin, antheraxanthin and zeaxanthin) as end products. Whereas the concentrations of carotenes and of xanthophylls derived from alpha-carotene change only slowly and over long time intervals during plant ontogeny, it is possible to observe light induced, quantitative changes of the xanthophylls mentioned in a matter of minutes. Author

N78-25752*# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

AUTOMATED TRACKING OF THE FLORIDA MANATEE (TRICHECHUS MANATUS) Final Report, Mar. 1977 - Jun. 1978

Robert C. Michelson, Jean Breedlove, and Herndon H. Jenkins Jun. 1978 172 p refs (Contract NAS10-9097)

(NASA-CR-157040) Avail: NTIS HC A08/MF A01 CSCL 06C

The electronic, physical, biological and environmental factors involved in the automated remote tracking of the Florida manatee (*Trichechus manatus*) are identified. The current status of the manatee as an endangered species is provided. Brief descriptions of existing tracking and position locating systems are presented to identify the state of the art in these fields. An analysis of energy media is conducted to identify those with the highest probability of success for this application. Logistic questions such as the means of attachment and position of any equipment to be placed on the manatee are also investigated. Power sources and manateeborne electronics encapsulation techniques are studied and the results of a computer generated DF network analysis are summarized. Author

N78-25753# Johns Hopkins Univ., Baltimore, Md. **CHEMICAL PRODUCTION OF EXCITED STATES IN BIOLOGY: MECHANISM, REGULATION AND FUNCTION, RENEWAL PROPOSAL Tri-Annual Summary Report, 1 Jul. 1974 - 30 Jun. 1977**

H. H. Seliger 1977 56 p (Contract EY-76-S-02-3277)

(COO-3277-47) Avail: NTIS HC A04/MF A01

Molecular mechanisms studies are reported in bioluminescent reactions of fireflies, in purified calcium-activated photoproteins from marine microorganisms, and in marine dinoflagellates. The role of luciferase binding protein mechanisms in photon-stimulated bioluminescence is discussed. The use of chemiluminescence as an assay technique for nicotine in tobacco smoke and carcinogenic hydrocarbons in environmental samples is proposed and the requirements for such an assay system are reviewed. ERA

N78-25756# National Inst. for Personnel Research, Johannesburg (South Africa).

THE ELECTROENCEPHALOGRAM IN AIRCREW SELECTION AND AVIATION MEDICINE: A SURVEY OF LITERATURE

B. D. Murdoch Jul. 1977 47 p refs

(CSIR-SR-PERS-268) Avail: NTIS HC A03/MF A01

The results of investigations and the contents of reports dealing with the utilisation of the EEG in aircrew selection and aviation medicine are considered under the following headings: the incidence of EEG abnormalities in normal candidates for flying training and in normal flying personnel; the relationship between the EEG and criteria based on the selection, training, and performance of flying personnel; altered states of consciousness related to epilepsy and other disorders; flicker and helicopter pilots; and the EEG monitoring of in-flight pilot stress. Conclusions based on the relevant literature are drawn at the end of each section. Author

N78-25757*# Southwest Research Inst., San Antonio, Tex. Electromagnetics Div.

EQUIPMENT DEVELOPMENT FOR AUTOMATIC ANTHROPOMETRIC MEASUREMENTS Final Report

J. P. Cater and W. E. Oakey 31 Mar. 1978 53 p

(Contract NAS9-15038; SwRI Proj. 16-4630) (NASA-CR-151723) Avail: NTIS HC A04/MF A01 CSCL 06B

An automated procedure for measuring and recording the anthropometric active angles is presented. The small portable system consists of a microprocessor controlled video data acquisition system which measures single plane active angles using television video techniques and provides the measured data on sponsored-specified preformatted data sheets. This system, using only a single video camera, observes the end limits of the movement of a pair of separated lamps and calculates the vector angle between the extreme positions. Author

N78-25758*# West Florida Univ., Pensacola. Faculty of Physics.

A NOTE ON THE TISSUE STAR DOSE IN PERSONNEL RADIATION MONITORING IN SPACE

Hermann J. Schaefer Apr. 1978 17 p refs
(Contract NAS9-15417)
(NASA-CR-151724) Avail: NTIS HC A02/MF A01 CSCL 06R

Secondaries from nuclear interactions of high energy primaries in the body tissues themselves contribute substantially to the astronaut's radiation exposure in space. The so-called tissue star dose is assessed from the prong number distribution of disintegration stars in emulsion. Prong counts of 1,000 emulsion stars from the Apollo-Soyuz mission reported earlier were re-evaluated. The original scores were divided into sets of 250, 500, 750, and 1,000 emulsion stars and the respective prong number distributions established. The statistical error of the gelatin star number for the four consecutively larger was found to vary, on the 67 percent confidence level, from + or - 25 percent for the count of 250 emulsion stars to + or - 11 percent for 1,000 stars. Seen in the context of the other limitations of the experimental design, the lowest effort of prong-counting 250 stars appears entirely appropriate. Author

N78-25759*# Texas Inst. for Rehabilitation and Research, Houston. Biostereometrics Lab.

DEVELOPMENT OF BIOSTEREOMETRIC EXPERIMENTS Final Report, 1 Jan. - 31 Dec. 1977

R. E. Herron May 1978 73 p
(Contract NAS9-14562)
(NASA-CR-151726) Avail: NTIS HC A04/MF A01 CSCL 06B

The stereometric camera was designed for close-range techniques in biostereometrics. The camera focusing distance of 360 mm to infinity covers a broad field of close-range photogrammetry. The design provides for a separate unit for the lens system and interchangeable backs on the camera for the use of single frame film exposure, roll-type film cassettes, or glass plates. The system incorporates the use of a surface contrast optical projector. Author

N78-25760*# National Aeronautics and Space Administration, Pasadena Office, Calif.

BAG FOR STORING WHOLE BLOOD Patent Application

Herman Bank (JPL) and Edward L. Cleland, inventors (to NASA) (JPL) Filed 26 Jun. 1976 10 p
(Contract NAS7-100)
(NASA-Case-NPO-13930-1; US-Patent-Appl-SN-700467) Avail: NTIS HC A02/MF A01 CSCL 06B

The shelf life of stored whole blood may be doubled by adding a buffer which maintains a desired pH level. However, this buffer causes CO₂ to be generated, which, if not removed at a controlled rate will shorten the life of the stored blood. A blood storage container was provided which will permit the CO₂ to diffuse into the atmosphere, at a controlled rate, thereby maintaining the desired pH value while providing a bag strong enough to permit handling. NASA

N78-25761*# National Aeronautics and Space Administration, Pasadena Office, Calif.

COUPLING APPARATUS FOR ULTRASONIC MEDICAL DIAGNOSTIC SYSTEM Patent Application

Robert E. Frazer, inventor (to NASA) (JPL) Filed 15 Nov. 1976 10 p
(Contract NAS7-100)
(NASA-Case-NPO-13935-1; NASA-Case-NPO-13944-1; US-Patent-Appl-SN-741749) Avail: NTIS HC A02/MF A01 CSCL 06B

An apparatus is provided for assuring sonic coupling between transducers and a tissue to be ultrasonically diagnosed, without requiring the tissue to be immersed in a fluid or to be directly contacted by the transducers. The apparatus allows transducers to be moved relative to the tissue being scanned by utilizing a cavity with solid walls to receive the tissue, and by utilizing a vacuum to draw the tissue into intimate contact with the cavity walls. NASA

N78-25762*# National Aeronautics and Space Administration, Pasadena Office, Calif.

PROCESS FOR MANUFACTURING CANNULA Patent Application

Howard F. Broyles (JPL), Edward F. Cuddihy (JPL), and Jovan Moacanin, inventors (to NASA) (JPL) Filed 11 Jul. 1977 11 p
Sponsored by NASA
(NASA-Case-NPO-14073-1; US-Patent-Appl-SN-814384) Avail: NTIS HC A02/MF A01 CSCL 06B

Manufacturing of a T shaped cannula is described. The tube was formed of dip-molded materials so that the opposite ends of the cross of the T taper to the smallest diameter. The process included dipping a tapered mandrel into dip-molding material and later removing the coating from the mandrel by dipping it into a swelling fluid which is absorbed by the coating material. A stub with a small diameter was inserted into the short end of the swelled coating; as the swelling agent evaporated, the short end of the coating shrank tightly around the stub to form a leak-tight seal. NASA

N78-25763# Wisconsin Univ., Madison. Dept. of Industrial Engineering.

DYNAMICS OF THE EYE AND HEAD DURING MOVEMENT BETWEEN DISPLAYS: A QUALITATIVE AND QUANTITATIVE GUIDE FOR DESIGNERS

Gordon H. Robinson Feb. 1978 33 p refs
(Contract N00014-75-C-0364; NR Proj. 197-028)
(AD-A052753; TR-78-2) Avail: NTIS HC A03/MF A01 CSCL 05/8

The purpose of this paper is to provide a designer or systems analyst as a guide to human performance limitations in vision when fixation must be redirected from one display to another. The focus is on large angular separation (greater than 20 degrees) and on tasks wherein speed is of importance. Patterns of eye and head movements are shown; as well as quantitative data on saccades, periods of eye/head compensation, and head movement. Independent variables include inter-display angle, display visibility, operator's knowledge of display location, and some relevant characteristics of a possible task which must be interrupted for the refixation. Inter and intra subject variability is also presented. Author (GRA)

N78-25764 South African Bureau of Standards, Pretoria.
STANDARD SPECIFICATION FOR THE PRODUCTION OF MEN'S PROTECTIVE SHOES WITH STUCK-ON PRE-MOLDED UNIT SOLES AND HEELS

Nov. 1977 42 p In AFRIKAANS and ENGLISH
(SABS-1167-1977; ISBN-0-626-04469-3) Copyright. Avail: Issuing Activity

Specifications are given for two types of men's protective shoes, made according to the stuck-on principle. Criteria for acceptance include chromic oxide content, pH, impact strength, bursting strength, wet stitch tear strength, and adhesion between layers. Sampling and inspection methods are given. M.V.

N78-25765 South African Bureau of Standards, Pretoria.
STANDARD SPECIFICATION FOR THE PRODUCTION OF MEN'S PROTECTIVE SHOES WITH DIRECT VULCANIZED SOLES AND HEELS

Nov. 1977 42 p In AFRIKAANS and ENGLISH
(SABS-1168-1977; ISBN-0-626-04470-7) Copyright. Avail: Issuing Activity

Specifications are given for two types of men's protective shoes, made according to the direct vulcanized principle. Criteria for acceptance include: pH, chromic oxide content, impact strength, bursting strength, wet stitch tear strength, and adhesion between layers. Sampling and inspection methods are also given. P.R.A.

N78-25766*# Texas A&M Univ., College Station, Dept. of Horticultural Sciences.

COMPRESSION OF REHYDRATABLE VEGETABLES AND CEREALS Annual Report, Feb. 1977 - Jan. 1978

E. E. Burns Jan. 1978 66 p refs

(Contract NAS9-12434)

(NASA-CR-151727) Avail: NTIS HC A04/MF A01 CSCL 06H

Characteristics of freeze-dried compressed carrots, such as rehydration, volatile retention, and texture, were studied by relating histological changes to textural quality evaluation, and by determining the effects of storage temperature on freeze-dried compressed carrot bars. Results show that samples compressed with a high moisture content undergo only slight structural damage and rehydrate quickly. Cellular disruption as a result of compression at low moisture levels was the main reason for rehydration and texture differences. Products prepared from carrot cubes having 48% moisture compared favorably with a freshly cooked product in cohesiveness and elasticity, but were found slightly harder and more chewy. G.G.

N78-25767*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

AN INVESTIGATION OF THE REDUCTION OF CARBON DIOXIDE IN A SILENT ELECTRIC DISCHARGE Final Report

Robert S. Luce and Barbara Greenough, ed. Jun. 1978 63 p refs

(Contract NAS2-9551)

(NASA-CR-152146; LMSC-D626407)

Avail: NTIS

HC A04/MF A01 CSCL 06K

The reduction of CO₂ to O₂ and CO in a silent electric discharge was studied. It was found that current alone (in the ionized plasma induced by the silent electric discharge) was responsible for the CO₂ reduction process. Voltage and frequency were important only in so far as they induced current in the plasma. Pressure and temperature were of minimum influence in the process. The large power consumption in the process was recognized as resulting from the low power factor of the reactor vessel which electrically behaved like a capacitor. The power factor was subsequently improved by adding an inductive element to make the reactor vessel capacitance part of a resonant circuit. It was found that the CO₂ reduction process was most efficient in terms of power vs reduction rate when a voltage was employed that was only slightly higher than that needed to induce the plasma. Author

N78-25768# Ohio State Univ. Research Foundation, Columbus. **IDENTIFICATION OF FINITE STATE MODELS OF A HUMAN OPERATOR**

Richard A. Miller, Ingjaldur Hannibalsson, and Samuel C. McNamee Dec. 1977 114 p

(Contract AF-AFOSR-3152-77; OSN Proj. 4556A1)

(AD-A053017; Rept-760518(MPN-784556);

AFOSR-78-0617TR) Avail: NTIS HC A06/MF A01 CSCL 05/8

The abstract structure of the discrete control problem as it relates to manned systems has been refined and clarified. It has been shown that input-output data (information inputs to the operator, decision outputs from him) are representable by stochastic automata, a special type of discrete parameter, discrete state stochastic process. Further, the detailed structure of these systems has been examined and it has been shown that automata based on lth order state spaces (i.e., states are sequences of outputs including the present and preceding 1-1 outputs) serve as excellent surrogates for more general systems. The results are a set of state transition matrices and probability distributions which stochastically characterize, as a function of the input when the operator will switch the mode of operation or configuration of the system and what the new configuration will be. The results show that finite state models of the human operator performing discrete control tasks can be developed and identified from data. They further verify the feasibility of using a hierarchical structure to avoid combinatorial problems and maintain identifiability. GRA

N78-25769# Gentex Corp., Carbondale, Pa.

OPTIMIZATION OF THE MATERIAL FOR CONSTRUCTION OF THE NEW PROTECTIVE MASK Final Report, 1 Jul. 1975 - 13 Jul. 1976

John P. Daugherty Sep. 1977 49 p

(Contract DAAA15-75-C-0175)

(AD-A053331; ARCSL-CR-77046)

Avail: NTIS

HC A03/MF A01 CSCL 06/17

Dow Corning's X4-2665 Silicone material provides an optical and physical-property-wise satisfactory material for face masks. Production must observe critical processing and eliminate contaminants to provide a cost acceptable product. Prior to incorporation of this material into a full face mask, a lens design modification is required to provide optical clarity in the as-worn position. Author (GRA)

N78-25770# Applied Psychological Services, Wayne, Pa. Science Center.

HUMAN PERFORMANCE TRADEOFF CURVES FOR USE IN THE DESIGN OF NAVY SYSTEMS Final Report

Arthur I. Siegel, William Rick Leahy, and J. Jay Wolf Apr. 1978 59 p refs

(Contract N00024-76-C-6126)

(AD-A053332) Avail: NTIS HC A04/MF A01 CSCL 05/5

A series of human operator-system interdependencies is presented in the form of tradeoff curves. These curves were derived from computer simulation of a representative Navy mission. Performance at four work stations was simulated. The resulting tradeoff curves present the relative impact of human oriented variables on system performance. Such curves possess merit as an aid to the equipment system designers who possess an interest in improving both overall system reliability, maintainability, and availability. Author (GRA)

N78-25771# Webb Associates, Yellow Springs, Ohio. **COMPARATIVE ANTHROPOMETRY OF AIR STANDARDIZATION COORDINATING COMMITTEE PERSONNEL FOR EQUIPMENT DESIGN: HELMETS**

John T. McConville and Charles E. Clauser (AMRL) Wright-Patterson AFB, Ohio AMRL Nov. 1977 17 p refs

(Contract F33615-76-C-5007; AF Proj. 7184)

(AD-A052893; AMRL-TR-77-77)

Avail: NTIS

HC A02/MF A01 CSCL 06/14

The objective of this report is to demonstrate that the comparability of body-size distributions of aircrew personnel of Air Standardization Coordinating Committee ASCC member nations is such that protective equipment sized and designed to fit personnel of one member nation will fit personnel of all member nations as well. The research reported in this publication compares the available anthropometry of the head and face of member ASCC nations, demonstrates their similarities, and tests the theoretical suitability of a Royal Aircraft Establishment RAE sizing program for helmets to accommodate U.S. Air Force USAF personnel. Author (GRA)

N78-25772# Michigan Univ., Ann Arbor. Highway Safety Research Institute.

SAFETY HELMET-HEAD INTERACTION STUDY USING HIGH-SPEED CINERADIOGRAPHY Final Report, 29 Aug. - 31 Oct. 1977

R. L. Stalnaker, M. Bender, and J. W. Melvin 31 Oct. 1977 42 p refs Sponsored by NIOSH

(PB-277289; UM-HSRI-77-48) Avail: NTIS HC A03/MF A02 CSCL 05H

Industrial safety helmets were subjected to impact force by an 8 lb spherical mass, dropped from a vertical height of 5 ft, while worn on the head of a seated dummy. The helmet head dynamic performance was evaluated by means of information obtained from 1000 frame per-second X-ray cinematography, and impactor and dummy head acceleration instrumentation. Peak and average forces, force durations, component and average resultant head accelerations were reported for each helmet type. GRA

N78-25773

N78-25773*# National Aeronautics and Space Administration,
Washington, D. C.

**PUBLICATIONS OF THE PLANETARY BIOLOGY PROGRAM
FOR 1976: A SPECIAL BIBLIOGRAPHY**

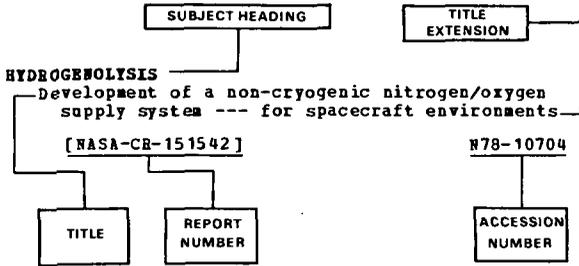
F. D. Bradley, comp. and R. S. Young, comp. 1977 40 p
refs

(NASA-TM-75017) Avail: NTIS HC A03/MF A01 CSCL 03B

An annual listing of current publications resulting from research pursued under the auspices of NASA's Planetary Biology Program is presented. To stimulate the exchange of information and ideas among scientists working in the different areas of the program. To facilitate the exchange process. The author of each publication who is presently participating in the program is identified by asterisk. Current addresses for all principal investigators are given in the appendix. Author

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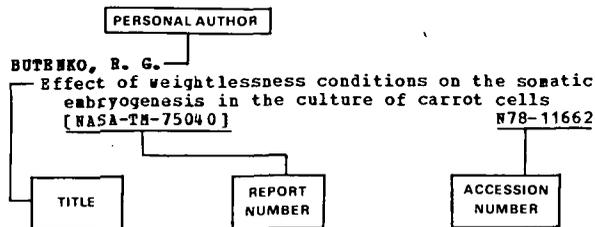
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