NASA SP-7011 (172)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 172)

OCTOBER 1977

NATIONAL AEROSPACE ADMINISTRATION

ACCESSION NUMBER RANGES

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

STAR (N-10000 Series)	N77-26066—N77-28059
IAA (A-10000 Series)	A77-37061—A77-40470

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NASA SP-7011 (172)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 172)

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 September 1977 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 132 reports, articles and other documents announced during September 1977 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

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

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

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

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1977 Supplements.

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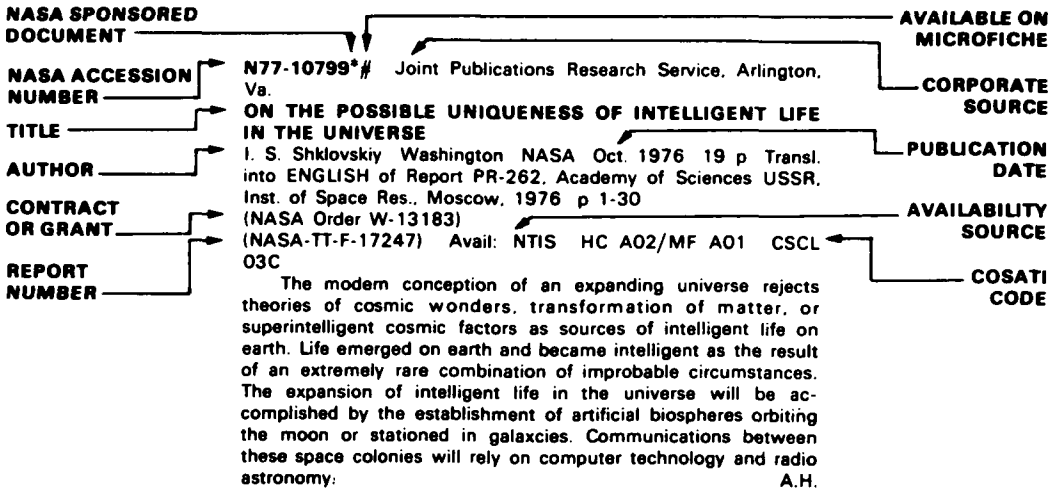

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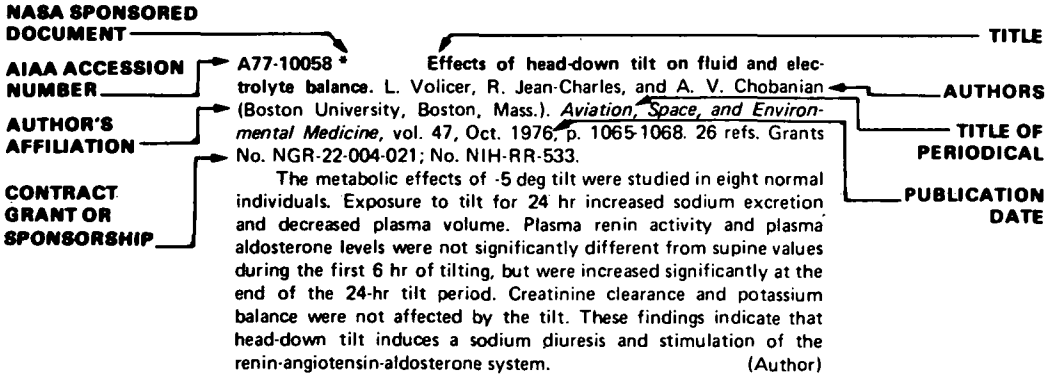

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 172)

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IAA ENTRIES

A77-37378 **Prototype development of the cardiac synchronized augmented pulsation pressure concept.** C. A. Phillips and D. B. Rogers (Wright State University, Dayton, Ohio). In: NAECON '76; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 18-20, 1976. New York, Institute of Electrical and Electronics Engineers, Inc., 1976, p. 192-199. 9 refs.

This paper describes the design and development of a cardiac synchronized augmented pulsation pressure concept. The prototype system is defined in terms of its three individual components: (1) a specially modified U.S. Air Force CSU-3/P G-suit, (2) a servo-valve controlled pressure manifold, and (3) the ECG synchronizing circuitry. The prototype system has been tested in the laboratory (one human subject) and in the environmental simulator (one human subject). The data from these tests and the reactions of the subjects are presented. Engineering and physiological conclusions are drawn based upon the acquired data. Specific recommendations for future development of the augmented pulsation pressure concept are presented. (Author)

A77-37406 * **Comparison of numeric keyboard and CRT line-labeled buttons for information access.** D. Williams (NASA, Ames Research Center, Moffett Field, Calif.). In: NAECON '76; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 18-20, 1976. New York, Institute of Electrical and Electronics Engineers, Inc., 1976, p. 419-423. 5 refs.

Test were conducted to determine whether differences in speed and accuracy are experienced when using either line-labeled index buttons or a numeric keyboard for page selection in airborne CRT-display area navigation systems. The experiment was conducted with six airline pilots, each flying the same two simulated RNAV routes. Three pilot subjects used line-labeled buttons adjacent to the CRT screen, while three used a numeric keyboard for page access. The hypothesis of no differences in response times between the two modes of access could not be rejected. B.J.

A77-37464 **Human factors analysis of symbology for ECM display.** J. D. Robinson (Boeing Aerospace Co., Seattle, Wash.). In: NAECON '76; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 18-20, 1976. New York, Institute of Electrical and Electronics Engineers, Inc., 1976, p. 882-886.

This paper presents the human factors analysis that defines the alphanumeric and special symbols to be used on the Electronic Display Units (EDU) of the B-1 defensive systems. In order to ensure rapid, accurate response to threat situations, the symbol set is required to be both easily discriminative and highly meaningful. Symbol selection resulted from the evaluation of two empirical tests. The first consisted of a static evaluation in which subjects were serially presented with test symbols in the center of a cathode ray tube. The second employed a dynamic display where symbols would pop up in a dense-moving environment. Dependent measures for both tests consisted of identification accuracy and verbal reaction time. (Author)

A77-37465 **Performance measures of human tracking utilizing PID modeling and a closed loop error metric.** D. W. Repperger and E. J. Hartzell (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: NAECON '76; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 18-20, 1976. New York, Institute of Electrical and Electronics Engineers, Inc., 1976, p. 887-893. 6 refs.

Data from an antiaircraft artillery simulator are used to validate the dependence of tracking performance measured by the closed loop error and parameters obtained from a Proportional Integral Derivative (PID) model of the man. A comparison of three tracking teams is used as the data base with an azimuth and elevation operator composing each team. Although this problem is nonstationary, precognitive (a learned tracking task), two-axis, and very difficult to model by conventional means, the PID model provides a simple approach to relate the error in the closed loop to the model parameters from each team. In order to provide adequate statistical estimates of these model parameters, identification techniques are applied to the same team (replications) tracking a similar arc tangent flyby trajectory. Statistical analysis was applied to the identified parameters between trackers to evaluate the credibility of this approach. (Author)

A77-37466 **A high resolution vision system for aircraft and trainers.** E. Lewis and B. Amos (Grumman Aerospace Corp., Bethpage, N.Y.). In: NAECON '76; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 18-20, 1976. New York, Institute of Electrical and Electronics Engineers, Inc., 1976, p. 894-902.

This new type of head-mounted vision system uses an Eye Tracking Helmet Mounted Display (ETHMD) with a high-resolution area that approximates the eye resolution and is servo controlled so that the high resolution area remains centered on the eye line-of-sight (LOS). The ETHMD input can be imagery from a servo controlled dual electro-optical (EO) sensor and/or computer-generated imagery (CGI). The High Resolution Vision System (HRVS), consisting of the ETHMD together with the servo controlled EO sensor and/or CGI, acts as though it were a part of the eye. Targets can be seen to + or - 160 degrees in azimuth and + or - 110 degrees in elevation because the display and sensors follow the LOS. The binocular and monocular instantaneous horizontal fields of view (FOV) are 40 degrees and 25 degrees respectively. Aircraft applications include computer generated displays that appear fixed in the cockpit, targets designated by 'looking' and pseudovisual ground contact for low level night flight. (Author)

A77-37594 # **Efficiency of main physiological reactions of brain adaptation to hypoxia (Effektivnost' osnovnykh fiziologicheskikh reaktsii adaptatsii mozga k gipoksii).** K. P. Ivanov (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) and Iu. Ia. Kisliakov (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 233, Apr. 11, 1977, p. 997-1000. 9 refs. In Russian.

The changes in pO2 in capillaries and tissues (nerve cells) of the brain cortex during physiological enhancement of the blood oxygen capacity, blood rate through the capillaries, and change in the curve of oxyhemoglobin dissociation under normal conditions and during hypoxemia of varying degrees were computed on the basis of physiological data and mathematic modeling. A mathematical model (Ivanov and Kisliakov, 1974) of oxygen diffusion from capillaries

into a nerve cell of the brain cortex was used. Results show that the efficiency of the main physiological reactions of adaptation to hypoxia in the brain is far from unique. Under moderate hypoxemia a sharp increase in oxygen capacity of the blood up to 30 vol.% enhances pO2 in the venous blood of a capillary by 4.3 and in the central part of a neuron by 2.4 torr. At the same time, a relatively small shift of the oxyhemoglobin dissociation curve to the right and a strengthening of the S-shaped bend result in an increase in pO2 at the venous end of the capillary by 6.5 and in the center of the neuron by 6.9 torr. P.T.H.

A77-37790 # Some psychophysiological aspects of flight in formation (Nekotorye psikhofiziologicheskie osobennosti poletov stroem). V. V. Rassvetaev, A. V. Ivanov, and N. F. Mikhailik. *Voenno-Meditsinskii Zhurnal,* Apr. 1977, p. 54-56. In Russian.

Flight in formation significantly alters the structure of in-flight routine. These changes are reflected in an increased level of emotional tension, an intensification of motor functions, distorted attention distribution, and changes in the structure of information gathering processes. It is recommended that these factors be considered when training pilots for this type of activity. The importance of adequate rest before flights in formation is stressed. C.K.D.

A77-37791 # A method for evaluating the functional condition of a pilot using chronometric simple motor reaction indices (Metodika otsenki funktsional'nogo sostoianiia organizma letchika s pomoshch'iu khronometricheskikh pokazatelei prostoi dvigatel'noi reaktsii). V. A. Sergeev and A. N. Kol'tsov. *Voenno-Meditsinskii Zhurnal,* Apr. 1977, p. 57-61. In Russian.

Different indices of simple motor reaction time in response to a sound stimulus were investigated in healthy pilots and in pilots subjected to various types of physical or mental stress (onset of angina, grip, or respiratory infections; prolonged flight). It was found that the mean square deviation of reaction time is an unreliable indicator of flight readiness, since an initial increase during the onset of an illness may disappear before recovery is complete. On the other hand, the number of instances out of a given number of trials in which reaction time greatly exceeds the norm for an individual shows a clear upswing during the onset and course of a disorder and can be used to evaluate the flight fitness of a pilot. C.K.D.

A77-37953 * Cell biology experiments conducted in space. G. R. Taylor (NASA, Johnson Space Center, Houston, Tex.). *BioScience,* vol. 27, Feb. 1977, p. 102-108. 56 refs.

A review of cell biology experiments conducted during the first two decades of space flight is provided. References are tabulated for work done with six types of living test system: isolated viruses, bacteriophage-host, bacteria, yeasts and filamentous fungi, protozoans, and small groups of cells (such as hamster cell tissue and fertilized frog eggs). The general results of studies involving the survival of cells in space, the effect of space flight on growing cultures, the biological effects of multicharged high-energy particles, and the effects of space flight on the genetic apparatus of microorganisms are summarized. It is concluded that cell systems remain sufficiently stable during space flight to permit experimentation with models requiring a fixed cell line during the space shuttle era. C.K.D.

A77-37954 * Microbiological profiles of the Viking spacecraft. J. R. Puleo, N. D. Fields, S. L. Bergstrom, G. S. Oxborrow, P. D. Stabekis, and R. C. Koukol (California Institute of Technology, Jet Propulsion Laboratory, Planetary Quarantine Laboratory, Cape Canaveral, Fla.). *Applied and Environmental Microbiology,* vol. 33, Feb. 1977, p. 379-384. 28 refs. Contract No. NAS7-100.

Planetary quarantine requirements associated with the launch of two Viking spacecraft necessitated microbiological assessment during assembly and testing at Cape Canaveral and the Kennedy Space Center. Samples were collected from the Viking Lander Capsules (VLC), Orbiters (VO), and Shrouds at predetermined intervals during assembly and testing. Levels of bacterial spores per square meter on the VLC-1 and VLC-2 were 1.6 x 10 squared and 9.7, respectively, prior to dry-heat sterilization. The ranges of aerobic mesophilic microorganisms detected on the VO-1 and VO-2 were 4.2 x 10 squared to 4.3 x 10 cubed and 2.3 x 10 squared to 8.9 x 10 cubed/sq m, respectively. Approximately 1300 colonies were picked from culture plates, identified, lyophilized, and stored for future reference. About 75% of all isolates were microorganisms considered indigenous to humans; the remaining isolates were associated with soil and dust. The percentage of microorganisms of human origin was consistent with results obtained with previous automated spacecraft but slightly lower than those observed for manned (Apollo) spacecraft. (Author)

A77-37958 * Existence and nature of band solutions to generic chemotactic transport equations. G. Rosen (Drexel University, Philadelphia, Pa.). *Journal of Theoretical Biology,* vol. 59, 1976, p. 243-246. 9 refs. Grant No. NsG-3090.

A77-37962 * Ergonomics technology. W. L. Jones (NASA, Office of Occupational Medicine, Washington, D.C.). *American Industrial Hygiene Association Journal,* vol. 38, Jan. 1977, p. 35-40.

Major areas of research and development in ergonomics technology for space environments are discussed. Attention is given to possible applications of the technology developed by NASA in industrial settings. A group of mass spectrometers for gas analysis capable of fully automatic operation has been developed for atmosphere control on spacecraft; a version for industrial use has been constructed. Advances have been made in personal cooling technology, remote monitoring of medical information, and aerosol particle control. Experience gained by NASA during the design and development of portable life support units has recently been applied to improve breathing equipment used by fire fighters. C.K.D.

A77-38031 Effects of three kinds of hypoxias on vigilance performance. C. L. Christensen, J. A. Gliner, S. M. Horvath, and J. A. Wagner (California, University, Santa Barbara, Calif.). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 491-496. 31 refs. Grants No. AF-AFOSR-73-2455; No. NIH-ES-01143.

The consequences for vigilance performance of inhaling carbon monoxide at altitude were examined. In addition, the effects of altitude and CO at an equivalent reduction in O2-carrying capacity were compared. Ten subjects performed a visual vigilance task under four atmospheric conditions. Physiological measures included heart rate, blood pressure, and ventilation. Blood hemoglobin and CO levels were measured directly from blood samples drawn after 0, 50, and 120 min of exposure. The physiological variables measured and subjective responses of subjects showed no changes attributable to the atmospheric conditions. A statistically significant change in vigilance performance, as measured by percentage of signals detected, was found between control and low oxygen; however, performance under CO and the combination of CO and low oxygen was not different from control. The lack of deterioration in performance under the combination of CO and low oxygen suggested that the increased severity of the stress resulted in activation of compensatory mechanisms which counterbalanced the decreased O2 available to the tissues. (Author)

A77-38032 Cold-induced vasodilatation and peripheral blood flow under local cold stress in man at altitude. L. Mathew, S. S. Purkayastha, W. Selvamurthy, and M. S. Malhotra (Defence Institute of Physiology and Allied Sciences, Delhi, India). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 497-500. 19 refs.

A77-38033 * Somatosensory motion after-effect following earth-horizontal rotation about the Z-axis - A new illusion. J. R. Lackner (Brandeis University, Waltham, Mass.) and A. Graybiel (U.S. Naval Aerospace Medical Center, Aerospace Medical Research Laboratory, Pensacola, Fla.). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 501, 502. 10 refs. NASA Order T-5904-B; NASA Order T-590413.

During rotation about the Z-axis while recumbent one is exposed to a changing pattern of pressure cues over the body surface. If the body is only loosely padded in the experimental apparatus, then apparent motion of part of the body surface may be experienced sometime after rotation has been terminated. This somatosensory motion aftereffect of opposite sign is temporarily abolished if one looks at the affected body area, but is again re-experienced when the gaze is shifted elsewhere. The similarity of this motion aftereffect to those contingent on vestibular and visual stimulation is discussed. (Author)

A77-38034 Characteristics in the atmosphere of long-range transport aircraft cabins. H. Vieillefond, P. Fourn, and R. Auffret (Union de Transports Aériens, Paris; Centre d'Essais en Vol, Laboratoire de Médicine Aérospatiale, Brétigny-sur-Orge, Essonne, France). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 503-507. 10 refs.

In the long run, the fatigue in aircrews performing frequent, long-range flights is linked to factors connected to the aircraft, such as noise, temperature, cabin pressure, atmosphere quality, and flight characteristics. These are the factors inherent to the aircraft which we have investigated during six long-range flights without time zone changes in DC-8 and DC-10 aircraft of the U.T.A. Cie. The results show that none of the pollutants researched reach doses considered hazardous by FAR 25 or by French legislation. This fact is due to the effective ventilation in the cabins. In flight, thermal comfort is limited by a too-low hygrometry RH equals 12 per cent. Even in a modern aircraft, the noise level remains high, but acoustical energy is spread over the less detrimental frequencies. (Author)

A77-38035 Spirometric assessment of potential respiratory impairment in general aviation airmen. M. T. Lategola, M. Flux, and P. J. Lyne (FAA, Aeronautical Center, Oklahoma City, Okla.). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 508-511. 15 refs.

A77-38036 * Left ventricular function during lower body negative pressure. M. Ahmad, C. G. Blomqvist, C. B. Mullins, and J. T. Willerson (Texas, University, Dallas, Tex.). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 512-515. 13 refs. Research supported by the Harry S. Moss Heart Fund; Grants No. NsG-9026; No. NIH-5-P50-HL-117669.

The response of the human left ventricle to lower body negative pressure (LBNP) and the relation between left ventricular function and hemodynamic response were investigated. Ventricular function curves relating stroke volume to end-diastolic volume were obtained in 12 normal men. Volume data were derived from echocardiographic measurements of left ventricular end-systolic and end-diastolic diameters at rest and during lower body negative pressure (LBNP) at minus 40 mm Hg. End-diastolic volume decreased by 19% and stroke volume by 22%. There were no significant changes in heart rate, arterial blood pressure, or end-systolic volume. Thus, moderate levels of LBNP significantly reduce preload and stroke volume without affecting contractile state. The absence of significant changes in heart rate and arterial blood pressure in the presence of a significant reduction in stroke volume is consistent with an increase in systemic peripheral resistance mediated by low-pressure baroreceptors. (Author)

A77-38037 Studies on the hematologic effects of long-term, low-dose microwave exposure. Z. Djordjevic, N. Lazarevic, and V. Djokovic (Institute of Aviation Medicine, Zemun, Yugoslavia). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 516-518. 17 refs.

A77-38038 Heat stress in an aircraft cockpit during ground standby. M. H. Harrison and C. Higenbottam (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 519-523. 11 refs.

Measurements have been made of cockpit temperatures in a Buccaneer aircraft exposed to high air temperatures and radiation loads. With the canopy open 8 cm, and with the wind direction unfavorable for convective cooling, air temperatures inside the cockpit exceeded those outside by approximately 20 deg C. This reduced to 10 deg C with a favorable wind direction. An assessment of the likely heating effect of cockpit avionic equipment indicated that the addition of 1 kW and 2 kW of heat would raise cockpit temperatures by 20 deg C and 30 deg C respectively. Prediction of the combined effect of solar and avionic heat suggests that, in hot weather conditions, cockpit temperatures will be considerably in excess of the upper limit for effective physiological temperature regulation. Therefore, if aircrews are to be required to remain on ground standby within their aircraft under such conditions, maximum use must be made of convective cooling of the cockpit by the prevailing wind, and of sun shades to eliminate the greenhouse effect completely. (Author)

A77-38039 * Diurnal rhythms of visual accommodation and blink responses - Implication for flight-deck visual standards. M. R. Murphy, R. J. Randle, and B. A. Williams (NASA, Ames Research Center, Moffett Field, Calif.). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 524-526. 9 refs.

Possible 24-h variations in accommodation responses were investigated. A recently developed servo-controlled optometer and focus stimulator were used to obtain monocular accommodation response data on four college-age subjects. No 24-h rhythm in accommodation was shown. Heart rate and blink rate also were measured and periodicity analysis showed a mean 24-h rhythm for both; however, blink rate periodograms were significant for only two of the four subjects. Thus, with the qualifications that college students were tested instead of pilots and that they performed monocular laboratory tasks instead of binocular flight-deck tasks, it is concluded that 24-h rhythms in accommodation responses need not be considered in setting visual standards for flight-deck tasks. (Author)

A77-38040 Psycho-physiological assessment of acceleration-induced changes in various seat configurations. V. M. Voge (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 527-538. 36 refs.

Ten subjects were exposed to high-G on the human centrifuge using seatback angles of 13 deg, 30 deg, 45 deg, 60 deg, and 75 deg from the vertical, and body configurations of the lower portion of the body with pelvis and legs elevated, pelvis elevated, and pelvis elevated with knees on chest. Tolerance was measured by peripheral light loss. Mental status, respirations, core and ambient temperatures, and ECG were monitored, and daily physio-chemical data were compiled. Tiredness, pressure on the chest, and general discomfort in the fetal position were reported. Physical examination demonstrated petechiae. Heart rate, respiratory rate, and temperature increased post-session. There was a significant rise in values for albumin, chloride iron, creatinine, calcium, LDH cardiac isoenzyme no. 5, blood urea nitrogen, and immature white cells; and a decrease in values for phosphorus, serum glutamic oxaloacetic-acid transaminase, serum glutamic pyruvic transaminase, protein, uric acid CO2, globulin, hematocrit, monocytes, and eosinophils. (Author)

A77-38041 Clinical medicine review - Three unique presentations of ischemic heart disease. V. F. Froelicher, Jr. (USAF, Medical Center, Lackland AFB, Tex.). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 539-545. 57 refs.

A review of current approaches to the diagnosis and treatment of unstable angina, Printzmetal variant angina, and ischemic heart disease in patients with normal coronary arteries is presented. The clinical characteristics and mortality rates for these syndromes are discussed. Summaries of significant published studies in these areas are provided. C.K.D.

A77-38042 Treatise on aeromedical evacuation. I - Administration and some medical considerations. II - Some surgical

considerations. A. Johnson, Jr. (USAF, Aeromedical Services, Scott AFB, Ill.). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 546-554. 20 refs.

Medical and administrative procedures followed in the selection and preparation of patients for aeromedical evacuation are discussed. Although there are no absolute contraindications to evacuation by air, patients with respiratory embarassment, cardiac failure, severe anemia (less than 2.5 million erythrocytes per cc or less than 7.0 g hemoglobin per 100 ml) or trapped gas in any of the body cavities require special management. Special considerations affecting the care of severely anemic and pediatric patients before and during evacuation are discussed. C.K.D.

A77-38043 Subjective stress assessment - A new, simple method to determine pilot workload. H. P. Goerres (German Air Force Institute of Aviation Medicine, Fürstenfeldbruck, West Germany). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 558-564. 6 refs.

A group comprised of 117 jet pilots, 41 multiple-engine prop pilots, 14 single-engine prop pilots, and 45 helicopter pilots was interviewed and asked to complete questionnaires to provide subjective assessments of workload. The pilots placed the effect of individual stressors and the severity of tension symptoms during different types of missions on a scale of zero to six. They were then asked to respond to the same questions from the point of view of pilots flying different types of aircraft. A combined scoring table was constructed for all inter- and intra-group assessments regarding all specific strain factors and overall workload. On a percentage scale, with 100% assigned to jet pilots, who had the highest strain and workload scores, the relative workload for instructor pilots (regardless of aircraft type) is 95%; helicopter pilots, 90%, multiple-engine prop pilots, 75%, and single-engine prop pilots, 60%. C.K.D.

A77-38044 Aeromedical considerations for flight operations from high-elevation airfields. R. L. DeHart (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Aviation, Space, and Environmental Medicine,* vol. 48, June 1977, p. 565-567. 23 refs.

High-elevation airfields are available to commercial and military aviation. Rapid ascent to locations at high elevations may result in symptoms of altitude sickness in aircrew, support personnel, and passengers. In the United States there are 302 airfields at altitudes in excess of 1,524 m (5,000 ft); in other areas of the world, field elevations can exceed 4,267 m. The symptom complex which may occur at altitude is reviewed and recommendations are offered to prevent, ameliorate, or manage the symptoms. (Author)

A77-38122 Use of a nonvisual display for improving the manual control of an unstable system. D. V. Janiga (Exxon Co., Linden, N.J.) and R. W. Mayne (New York, State University, Buffalo, N.Y.). *IEEE Transactions on Systems, Man, and Cybernetics,* vol. SMC-7, July 1977, p. 530-537. 13 refs.

An approach to aiding the operator of an unstable system by use of a nonvisual display which supplements normal visual information and guides the operator in his control actions is described. The procedure is based on the feedback of significant plant variables and the combination of these variables to continuously define the desired operator action. The nonvisual display is used to present the operator with the error between this desired control action and his current control effort. By striving to duplicate the desired action, the operator's ability to control and stabilize the system is enhanced. A specific example involving an automotive vehicle is considered, and a simulation study is described which uses an audio display and indicates the feasibility of this approach. (Author)

A77-38188 Evaluation of the motion of a mechanical arm. J. Y. S. Luh, M. W. Walker, and R. P. Voll (Purdue University, West Lafayette, Ind.). In: Modeling and simulation. Volume 7 - Proceedings of the Seventh Annual Pittsburgh Conference, Pittsburgh, Pa., April 26, 27, 1976. Part 1. Pittsburgh, Pa., Instrument Society of America, 1976, p. 220-224. 6 refs. NSF Grants No. GK-41615; No. ENG-74-17586.

A new method for calculating the trajectory of the hand and joints of a six-joint mechanical arm in the three-dimensional real-world coordinate system is proposed. The algorithm is derived from Newton's method of iteration, and requires the knowledge of velocities of motion. The calculation includes the on-line computation of moments of inertia and other physical parameters. This leads to a possible sampling rate of 60 Hz for smooth motion. The scheme of a distributed microcomputer system for closed-loop control of the arm at the level of each joint is also presented. P.T.H.

A77-38276 Stabilization of biped walking apparatus. V. B. Larin. *(Akademiia Nauk SSSR, Izvestiia, Mekhanika Tverdogo Tela,* Sept.-Oct. 1976, p. 4-13.) *Mechanics of Solids,* vol. 11, no. 5, 1976, p. 1-8. 7 refs. Translation.

The problem of vertical, longitudinal, and lateral stabilization of a simple version of a biped walking machine is discussed. It is shown that vertical stabilization can be achieved by varying the forces in the legs; while the longitudinal and lateral stabilization problems can be solved by proper selection of the point of support of the legs at each step. It is noted that the coordinates of the point of support can be determined with the aid of linear regulators. In this case, it should be possible to use the effective synthesis methods available for optimal linear systems to solve the control problem for a walking machine. Some aspects of optimizing the parameters of the synthesized regulators are examined, along with the results of a computer simulation of the motion of a biped machine along a rough surface. V.P.

A77-38302 Some thoughts on improving experiments. J. M. Reising (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio), S. L. Ward, and E. P. Rolek (Systems Research Laboratories, Inc., Dayton, Ohio). *Human Factors,* vol. 19, June 1977, p. 221-226.

Techniques for improving human factors studies are discussed with reference to deficiencies in current experimental design and to the careful choice of dependent variables, summary statistics, and statistical procedures. It is urged that the rationale for a choice of criteria and dependent variables be fully documented; that summary statistics other than amplitude measurements should sometimes be provided; and that multivariate analysis should be used when more than one dependent measure is used. Multivariate and univariate analysis of variance techniques are compared. M.L.

A77-38303 Methodology for evaluation of image enhancement techniques. W. Sidoruk (Grumman Aerospace Corp., Bethpage, N.Y.). *Human Factors,* vol. 19, June 1977, p. 263-272.

A two-phased experimental design is proposed for evaluation of Synthetic Aperture Radar (SAR) image enhancement techniques. In SAR operation crew tasks are clearly differentiated into cognitive and psychomotor behaviors. Accordingly, Phase 1 static adaptive learning experiments are designed to assess cognitive (image interpretation) behavior, and Phase 2 real-time simulation experiments assess psychomotor behaviors associated with target designation and tracking. The two-phased paradigm can be effectively applied to any electrooptical image quality/enhancement design study. The two-phases are complementary and offer an improved and more cost effective methodology as contrasted to the use of classical ANOVA (Analysis of Variance) designs for the entire procedure. (Author)

A77-38306 Correlation of general aviation accidents with the biorhythm theory. J. H. Wolcott, R. R. McMeekin (USAF, Institute of Pathology, Washington, D.C.), R. E. Burgin (National Transportation Safety Board, Human Factors Branch, Washington, D.C.), and R. E. Yanowitch (FAA, Office of Aviation Medicine, Washington, D.C.). *Human Factors,* vol. 19, June 1977, p. 283-293. 26 refs.

Biorhythms were calculated for over 4000 pilots involved in general aviation accidents in 1972. Data were obtained from the files of the National Transportation Safety Board. Exact date and time of accident were used, and 1200 hours (noon) was used as the average time of birth. Data were analyzed for correlation of aircraft-accident occurrence with both biorhythmically critical days and with in-

dividual and multiple low or negative phases of cycle. Data were calculated by both a 24- and 48-hour critical period and by all three cycles (physical, emotional, and intellectual) or only the physical and emotional cycles. Data did not deviate significantly from the random model, when analyzed by chi-square at the p = 0.1 level. No correlation was found between accident occurrence and biorhythmic criticality or low phase of cycle. This was true both for the cases in which the primary cause of the accident was attributed to pilot involvement and for those in which it was not. (Author)

A77-38307 **Stimulus presentation rate in vigilance.** E. L. Wiener (Miami, University, Coral Gables, Fla.). *Human Factors,* vol. 19, June 1977, p. 301-303. 5 refs. Grant No. PHS-R01-OH-00346.

Four groups of 12 subjects were run for two sessions to determine the influence of stimulus presentation rate in a monitoring task. Two stimulus rates were used, 12 and 60 per minute. Stimulus rate significantly affected detections on both days, but no transfer effect was found. (Author)

A77-38320 **On microwave-induced hearing sensation.** J. C. Lin (Wayne State University, Detroit, Mich.). *IEEE Transactions on Microwave Theory and Techniques,* vol. MTT-25, July 1977, p. 605-613. 28 refs. NSF Grant No. ENG-75-15227.

When a human subject is exposed to pulsed microwave radiation, an audible sound occurs which appears to originate from within or immediately behind the head. Laboratory studies have also indicated that evoked auditory activities may be recorded from cats, chinchillas, and guinea pigs. Using a spherical model of the head, this paper analyzes a process by which microwave energy may cause the observed effect. The problem is formulated in terms of thermoelasticity theory in which the absorbed microwave energy represents the volume heat source which depends on both space and time. The inhomogeneous thermoelastic motion equation is solved for the acoustic wave parameters under stress-free surface conditions using boundary value technique and Duhamel's theorem. Numerical results show that the predicted frequencies of vibration and threshold pressure amplitude agree reasonably well with experimental findings. (Author)

A77-38450 * **Effect of combined heat and radiation on microbial destruction.** D. A. Fisher and I. J. Pflug (Minnesota, University, St. Paul, Minn.). *Applied and Environmental Microbiology,* vol. 33, May 1977, p. 1170-1176. 6 refs. Grant No. NGL-24-005-160.

A series of experiments at several levels of relative humidity and radiation dose rates was carried out using spores of Bacillus subtilis var. niger to evaluate the effect of heat alone, radiation alone, and a combination of heat and radiation. Combined heat and radiation treatment of microorganisms yields a destruction rate greater than the additive rates of the independent agents. The synergistic mechanism shows a proportional dependency on radiation dose rate, an Arrhenius dependence on temperature, and a dependency on relative humidity. Maximum synergism occurs under conditions where heat and radiation individually destroy microorganisms at approximately equal rates. Larger synergistic advantage is possible at low relative humidities rather than at high relative humidities. (Author)

A77-38466 **Pulmonary valve fluttering in subpulmonic ventricular septal defect.** S. P. Glasser (South Florida, University, Tampa, Fla.) and R. W. Baucum, Jr. (Louisiana State University, Medical Center, Shreveport, La.). *American Heart Journal,* vol. 94, July 1977, p. 3-5. 6 refs.

The echo cardiographic tracings of the pulmonary valve of three patients with catheterization documented subpulmonic ventricular septal defect and no infundibular outflow obstruction were analyzed. In the three cases examined the posterior pulmonic valve leaflet opened and closed normally, but a coarse, chaotic fluttering was present when the valve was in the open position. This fluttering appears to be identical to that reported with infundibular pulmonic stenosis, and the mechanism is probably similar. C.K.D.

A77-38467 **The value and limitations of echocardiography in recording mitral valve vegetations.** C. A. Boucher, J. T. Fallon, G. S. Myers, A. M. Hutter, Jr., and M. J. Buckley (Massachusetts General Hospital; Harvard University, Boston, Mass.). *American Heart Journal,* vol. 94, July 1977, p. 37-43. 20 refs. Research supported by the Ambrose Monell Foundation; Grant No. NIH-HL-14209.

The case reports and echocardiographic findings of three patients with active endocarditis and severe congestive heart failure are presented. Although vegetations on the mitral valve were pathologically proven in all three cases, they were revealed by echocardiography only in the two cases in which calcification had occurred. Prior case histories reported in the literature are reviewed, and factors affecting the echocardiographic detection of valvular vegetation are examined. C.K.D.

A77-38468 **Systolic time intervals utilizing ear densitography - Advantages and reliability for stress testing.** V. Q. Lance (Lemuel Shattuck Hospital, Boston, Mass.) and D. H. Spodick (St. Vincent Hospital; Massachusetts, University, Worcester, Mass.). *American Heart Journal,* vol. 94, July 1977, p. 62-66. 8 refs.

Systolic time intervals were determined in 10 subjects at rest and during a variety of cardiocirculatory stresses to evaluate the ear densitogram derivative as a replacement for the carotid pulse curve. Comparisons of carotid-derived left ventricular ejection times (LVET) and pre-ejection periods (PEP) with those derived from ear densitograms showed highly statistically significant correlation coefficients with slopes demonstrating close tracking of the two methods. These results indicate that the ear densitogram provides a valid and reliable pulse measurement in determining the systolic time intervals under technically difficult conditions. C.K.D.

A77-38539 **Myocardial imaging with thallium-201 at rest and during exercise - Comparison with coronary arteriography and resting and stress electrocardiography.** J. L. Ritchie, G. B. Trobaugh, G. W. Hamilton, K. L. Gould, K. A. Narahara, J. A. Murray, and D. L. Williams (U.S. Veterans Administration Hospital, Seattle, Wash.). *Circulation,* vol. 56, July 1977, p. 66-71. 27 refs. Research supported by the U.S. Veterans Administration; Grants No. NIH-1-R01-HL-18492-01; No. NIH-1-R01-HL-18805-01.

A77-38741 # **Postexercise systolic time intervals in the midsystolic click syndrome.** A. B. Miller (Jacksonville, University Hospital, Jacksonville, Fla.) and R. C. Bahler (Cleveland Metropolitan General Hospital, Cleveland, Ohio). *Cardiology,* vol. 62, no. 1, 1977, p. 44-50. 9 refs.

Changes in the systolic time intervals in response to exercise were investigated in normal individuals and in patients with evidence of a nonejection systolic click, alone or accompanied by a late systolic apical murmur. In four patients there was evidence of prolapse of the posterior leaflet of the mitral valve. All members of the experimental group displayed prolonged corrected left ventricular ejection times, consistent with left ventricular dysfunction. Observed abnormalities of the systolic time interval response to exercise could be secondary to the localized effect of mitral prolapse on left ventricular function or a diffuse primary disorder. C.K.D.

A77-38892 # **Histological and histochemical studies of the neurosecretory system of the hypothalamus and the thyroid gland in stress situations (Badania histologiczne i histochemiczne układu neurosekrecyjnego podwzgorza i tarczycy w sytuacjach stresowych).** K. Kwarecki and E. Marks (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland). *Postepy Astronautyki,* vol. 9, no. 4, 1976, p. 63-72. 9 refs. In Polish.

In the experiments described, guinea pigs and rats were used to study the influence of vibrations, high-altitude hypoxia, and accelerations on the thyroid gland and neurosecretory system. The observed changes in localization, and content of neurosecretion in the supraoptic nucleus and the posterior lobe of the pituitary were alike for each of the stress factors. No morphological equivalents of the stress were observed in the thyroid gland. V.P.

A77-38893 # **Studies of the dynamics of the metabolism of nucleic acids in the supraoptic nucleus of animals experiencing**

high-altitude hypoxia and accelerations (Badania dynamiki metabolizmu kwasow nukleinowych w jadrze nadwrokowym zwierzat poddanych dzialaniu niedotlenienia wysokosciowego i przyspieszen). K. Kwarecki and E. Marks (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland). *Postepy Astronautyki,* vol. 9, no. 4, 1976, p. 73-81. 10 refs. In Polish.

Rats labeled with tritium nucleotide were subjected to acceleration, to high-altitude hypoxia, and to the combined action of both effects. Increased inclusion 3-H-uridine by neurons of the supraoptic nucleus, as compared to animals of the control group, was established. The absence of 3-H-timidine inclusions both in the test and control group animals points toward an increased synthesis of protein in neurons of the supraoptic nucleus, rather than its proliferation. V.P.

A77-38894 # **Influence of acute hypoxia on direct reaction time (Wplyw ostrego niedotlenienia na czas reakcji prostej).** L. Golec (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland). *Postepy Astronautyki,* vol. 9, no. 4, 1976, p. 83-91. 15 refs. In Polish.

Reaction time measurements were carried out on 39 pilots with good and excellent resistance to acute hypoxia, made to inhale a nitrogen-oxygen mixture containing 7.1% O2. The results were evaluated in the form of mean values at intervals of one minute. The results indicate that in investigations of periods of uninhibited operation by the method of inhaling oxygen-poor mixtures, the reaction time can serve as valuable parameter in the evaluation of the pilot performance. (Author)

A77-38896 # **Aspects of terrestrial and extraterrestrial biogenesis (Ziemskie i pozaziemskie aspekty biogenezy).** Z. Ilczuk (Lublin, Uniwersytet, Lublin, Poland). *(Konferencja Naukowa CETI na temat Lacznosci z Cywilizacjami Pozaziemskimi, 2nd, Katowice, Poland, Mar. 10, 1976.) Postepy Astronautyki,* vol. 10, no. 1, 1977, p. 27-42. In Polish.

Modern contributions by such investigators as Miller, Ponnamperuna, Oró, and Fox to the theory of biogenesis developed by Haldane in the 1920s are seen to support the concept of direct synthesis of organic matter from a mineral substrate. They indicate that the existence of an anaerobic atmosphere and a substrate in the form of atoms or compounds of carbon, nitrogen, water, inorganic catalysts, etc. is a primary requirement for the natural formation of simple prebiological systems and their evolution to primitive life. An obvious conclusion is that similar processes should be possible on any planet where such conditions exist. A factor in support of the theory is the chemical composition of carbonaceous chondrites, particularly, the presence of compounds of cosmic origin and petrified remnants of primitive extraterrestrial life. V.P.

A77-38899 # **Psychology of interplanetary flight (Psychologia lotow miedzyplanetarnych).** J. Terelak (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland). *Postepy Astronautyki,* vol. 10, no. 1, 1977, p. 103-115. 21 refs. In Polish.

The task of space psychology is to study the mechanisms of human behavior under new ecological conditions. The present paper deals with some specific aspects of human behavior under the influence of such factors as weightlessness, sensory deprivation, confinement, etc. The nature of various stress factors arising during prolonged missions is examined. It is seen that careful selection of space crews is insufficient to solve the psychological problems which arise in space and on which success or failure of a mission may depend. V.P.

A77-38903 * **Light energy transduction by the purple membrane of halophilic bacteria; Proceedings of the Symposium, San Francisco, Calif., June 6, 1976.** Symposium supported by NASA. *Federation Proceedings,* vol. 36, May 1977. 43 p. (For individual items see A77-38904 to A77-38912)

Several aspects of bacteriorhodopsin, the retinal protein component of the purple membranes of Halobacterium halobium, are discussed. Structural studies are presented. Photochemical properties of the protein complex and of its chromophore are described. Proton translocation of bacteriorhodopsin is compared to that of a protein from a thermophilic bacterium. Ionophore activity of bacteriorhodopsin is considered with attention to conformational changes, light dependency, and electrical potential. Amino acid transport is also examined and the light-energy budget is investigated. Bacteriorhodopsin is of interest because of its similarity to rhodopsin, which plays a major role in mammalian vision, and also because its attainability and distinctive characteristics will facilitate studies of certain bacterial physiological functions, such as ion transport and membrane organization. M.L.

A77-38904 Light energy transduction by the purple membrane of halophilic bacteria - Introduction. W. Stoeckenius (California, University, San Francisco, Calif.). *(NASA Ames Research Center, Symposium on Light Energy Transduction by the Purple Membrane of Halophilic Bacteria, San Francisco, Calif., June 6, 1976.) Federation Proceedings,* vol. 36, May 1977, p. 1797, 1798.

Bacteriorhodopsin, the purple retinal protein complex in halobacteria membranes, is a light energy transducer which, when illuminated, translocates protons from one side of the membrane to the other as a step in ATP synthesis. Rhodopsin and other visual pigments of animals are close analogs of bacteriorhodopsin not only in the structure of their chromophore but also in their photoreaction. Bacteriorhodopsin is easier to study than rhodopsin because the former occurs in a planar hexagonal lattice in the bacterial membrane, so that its structure can be determined by X-ray crystallography. Studies of this protein provide information on mammalian vision processes, the functioning of bacterial membranes and ion pumps, and possibly the evolution of prokaryotes and eukaryotes. M.L.

A77-38905 Structural studies on Halobacterium halobium bacteriorhodopsin. L. M. Keefer and R. A. Bradshaw (Washington University, St. Louis, Mo.). *(NASA Ames Research Center, Symposium on Light Energy Transduction by the Purple Membrane of Halophilic Bacteria, San Francisco, Calif., June 6, 1976.) Federation Proceedings,* vol. 36, May 1977, p. 1799-1804. 16 refs. Grant No. PHS-AM-13362.

A77-38906 * **The photochemical cycle of bacteriorhodopsin.** R. H. Lozier (NASA, Ames Research Center, Moffett Field, Calif.) and W. Niederberger (California, University, San Francisco, Calif.). *(NASA Ames Research Center, Symposium on Light Energy Transduction by the Purple Membrane of Halophilic Bacteria, San Francisco, Calif., June 6, 1976.) Federation Proceedings,* vol. 36, May 1977, p. 1805-1809. 21 refs. Research supported by the Swiss National Science Foundation; Grants No. NsG-7151; No. NIH-HL-06285.

The reaction cycle of bacteriorhodopsin in the purple membrane isolated from Halobacterium halobium has been studied by optical absorption spectroscopy using low-temperature and flash kinetic techniques. After absorption of light, bacteriorhodopsin passes through at least five distinct intermediates. The temperature and pH dependence of the absorbance changes suggests that branch points and/or reversible steps exist in this cycle. Flash spectroscopy in the presence of a pH-indicating dye shows that the transient release of a proton accompanies the photoreaction cycle. The proton release occurs from the exterior and the uptake is on the cytoplasmic side of the membrane, as required by the function of bacteriorhodopsin as a light-driven proton pump. Proton translocating steps connecting release and uptake are indicated by deuterium isotope effects on the kinetics of the cycle. The rapid decay of a light-induced linear dichroism shows that a chromophore orientation change occurs during the reaction cycle. (Author)

A77-38907 Photochemical and chemical studies on the chromophore of bacteriorhodopsin. T. Schreckenbach and D. Oesterhelt (Würzburg, Universität, Würzburg, West Germany). *(NASA Ames Research Center, Symposium on Light Energy Transduction by the Purple Membrane of Halophilic Bacteria, San Francisco, Calif., June 6, 1976.) Federation Proceedings,* vol. 36, May 1977, p. 1810-1814. 11 refs. Research supported by the Deutsche Forschungsgemeinschaft.

A77-38908 Proton translocation by ATPase and bacteriorhodopsin. Y. Kagawa, K. Ohno, M. Yoshida, Y. Takeuchi, and N.

Sone (Jichi Medical School, Tochigi, Japan). *(NASA Ames Research Center, Symposium on Light Energy Transduction by the Purple Membrane of Halophilic Bacteria, San Francisco, Calif., June 6, 1976.) Federation Proceedings,* vol. 36, May 1977, p. 1815-1818. 21 refs.

Two stable proton translocating proteins from bacterial membranes were purified and reconstituted into vesicles capable of proton translocation. One was a thermostable ATPase from the thermophilic bacterium PS3 and the other was rhodopsin from Holobacterium holobium. The ATPase was composed of two moieties, a proton pump moiety and a proton channel moiety. Both moieties and rhodopsin were highly stable against dissociating agents, acids, and alkali. Phospholipids of these biomembranes were also stable and contained no unsaturated fatty acyl groups. Both protein systems were capable of synthesizing ATP despite the absence of electron transport components. M.

A77-38909 Conformational changes in bacteriorhodopsin accompanying ionophore activity. L. Packer, T. Konishi, and P. Shieh (California, University, Berkeley, Calif.). *(NASA Ames Research Center, Symposium on Light Energy Transduction by the Purple Membrane of Halophilic Bacteria, San Francisco, Calif., June 6, 1976.) Federation Proceedings,* vol. 36, May 1977, p. 1819-1823. 11 refs. ERDA-supported research.

Calcium ions increase the activity of the bacteriorhodopsin in purple membranes, as indicated by greater photopotentials across planar membranes or proton translocation in liposomes. It is suggested that bivalent ions have two effects, causing reorientation of bacteriorhodopsin and promoting interaction of liposomes at the planar membrane interface. Bacteriorhodopsin in the purple membrane patch possesses considerable thermal stability, and this stability is enhanced by treatments with bifunctional cross-linking reagents. Studies with bifunctional cross-linking reagents having a definite chain length seem to indicate that the proton is transferred through a channel and/or pore present in the interior of the bacteriorhodopsin rather than by a translocation mechanism. Other experiments indicate that two conformational states of the protein of bacteriorhodopsin are involved in its functioning as an ionophore. M.L.

A77-38910 * Light-dependent cation gradients and electrical potential in Halobacterium halobium cell envelope vesicles. J. K. Lanyi (NASA, Ames Research Center, Biological Adaptation Branch, Moffett Field, Calif.) and R. E. MacDonald (Cornell University, Ithaca, N.Y.). *(NASA Ames Research Center, Symposium on Light Energy Transduction by the Purple Membrane of Halophilic Bacteria, San Francisco, Calif., June 6, 1976.) Federation Proceedings,* vol. 36, May 1977, p. 1824-1827. 43 refs.

Vesicles can be prepared from Halobacterium halobium cell envelopes, which contain properly oriented bacteriorhodopsin and which extrude H(+) during illumination. The pH difference that is generated across the membranes is accompanied by an electrical potential of 90 to 100 mV (interior negative) and the movements of other cations. Among these is the efflux of Na(+), which proceeds against its electrochemical potential. The relationship between the size and direction of the light-induced pH gradient and the rate of depletion of Na(+) from the vesicles, as well as other evidence, suggest that the active Na(+) extrusion is facilitated by a membrane component that exchanges H(+) for Na(+) with a stoichiometry greater than 1. The gradients of H(+) and Na(+) are thus coupled to one another. The Na(+) gradient (efflux much larger than influx), which arises during illumination, plays a major role in energizing the active transport of amino acids. (Author)

A77-38911 * Light-activated amino acid transport in Halobacterium halobium envelope vesicles. R. E. MacDonald (Cornell University, Ithaca, N.Y.) and J. K. Lanyi (NASA, Ames Research Center, Biological Adaptation Branch, Moffett Field, Calif.). *(NASA Ames Research Center, Symposium on Light Energy Transduction by the Purple Membrane of Halophilic Bacteria, San Francisco, Calif., June 6, 1976.) Federation Proceedings,* vol. 36, May 1977, p. 1828-1832. 48 refs. Research supported by Cornell University; Grant No. NsG-7235.

Vesicles prepared from Halobacterium halobium cell envelopes accumulate amino acids in response to light-induced electrical and chemical gradients. Nineteen of 20 commonly occurring amino acids have been shown to be actively accumulated by these vesicles in response to illumination or in response to an artificially created Na+ gradient. On the basis of shared common carriers the transport systems can be divided into eight classes, each responsible for the transport of one or several amino acids: arginine, lysine, histidine; asparagine, glutamine; alanine, glycine, threonine, serine; leucine, valine, isoleucine, methionine; phenylalanine, tyrosine, tryptophan; aspartate; glutamate; proline. Available evidence suggests that these carriers are symmetrical in that amino acids can be transported equally well in both directions across the vesicle membranes. A tentative working model to account for these observations is presented. (Author)

A77-38912 * Light energy conservation processes in Halobacterium halobium cells. R. A. Bogomolni (NASA, Ames Research Center, Moffett Field; California, University, San Francisco, Calif.). *(NASA Ames Research Center, Symposium on Light Energy Transduction by the Purple Membrane of Halophilic Bacteria, San Francisco, Calif., June 6, 1976.) Federation Proceedings,* vol. 36, May 1977, p. 1833-1839. 37 refs. Grant No. NsG-7151.

Proton pumping driven by light or by respiration generates an electrochemical potential difference across the membrane in Halobacterium halobium. The pH changes induced by light or by respiration in cell suspensions are complicated by proton flows associated with the functioning of the cellular energy transducers. A proton-per-ATP ratio of about 3 is calculated from simultaneous measurements of phosphorylation and the proton inflow. This value is compatible with the chemiosmotic coupling hypothesis. The time course of the light-induced changes in membrane potential indicates that light-driven pumping increases a dark pre-existing potential of about 130 mV only by a small amount (20 to 30 mV). The complex kinetic features of the membrane potential changes do not closely follow those of the pH changes, which suggests that flows of ions other than protons are involved. A qualitative model consistent with the available data is presented. M.L.

A77-38914 # Emotional stress and an astronaut's work capacity (Stres emocjonalny a wydolnosc pracy kosmonauty). W. Z. Kruk. *Astronautyka,* no. 1, 1977, p. 14, 15. In Polish.

Psychophysical and psychokinetic effects and manifestations of stress generated by heavy work load, by combinations of environmental conditions disorienting to nervous systems accustomed to earth conditions, and by prolonged exposure to unfamiliar conditions, are discussed in relation to the training of astronauts, Shuttle operators, and space station construction crews. Psychophysical and neurochemical effects on perception (via any of the senses), motor behavior, responses, concentration, and speech are discussed. Stress-induced psychoses are also considered. R.D.V.

A77-39341 Ultrasound study of dynamic behaviour of left ventricle in genetic asymmetric septal hypertrophy. F. J. Ten Cate, P. G. Hugenholtz, and J. Roelandt (University Hospital Dijkzigt; Rotterdam, Universiteit, Rotterdam, Netherlands). *British Heart Journal,* vol. 39, June 1977, p. 627-633. 11 refs.

Echocardiographic measurements are reported for 20 normal subjects, 19 patients with proven genetic asymmetric septal hypertrophy and 15 patients with coronary artery disease and akinesis of the ventricular septum with an geographically complete obstruction of the descending branch of the left coronary artery and septal akinesia. The contraction patterns of the inter-ventricular septum and left ventricular posterior wall were analyzed. Systolic thickening and normalized wall velocity were calculated. The data indicate that the interventricular septum in genetic asymmetric septal hypertrophy is a hypocontractile structure. The data show that the left ventricular mechanical behavior in genetic asymmetric septal hypertrophy is mainly determined by normal or augmented left ventricular posterior wall contraction while the left ventricle itself remains small. In patients with coronary artery disease the dimensions of the left

ventricle are increased and systolic thickening and normalized posterior wall velocity are decreased. It appears that the left ventricle maintains its systolic function by three mechanisms: Starling's mechanism, increased systolic thickening, and increased velocity of systolic contraction. C.K.D.

A77-39365 **Fast motor units are not preferentially activated in rapid voluntary contractions in man.** J. E. Desmedt and E. Godaux (Bruxelles, Université Libre, Brussels, Belgium). *Nature,* vol. 267, June 23, 1977, p. 717-719. 15 refs. Research supported by the Fonds National de la Recherche Scientifique and FRSM.

A description is presented of an investigation in which it was found that the faster motor units are recruited after the slow motor units, even in fast contractions. A total of 54 single motor units were studied in the first interosseus muscle of the hand in five normal adult subjects. Highly selective bipolar electrodes were carefully positioned in the muscle belly to pick up selectively the action potentials of two to five different motor units at a single site. The recruitment order and force threshold of two motor units in the first interosseus muscle of a normal subject is shown in a graph. G.R.

A77-39371 **Rhodopsin content and electroretinographic sensitivity in light-damaged rat retina.** L. M. Rapp and T. P. Williams (Florida State University, Tallahassee, Fla.). *Nature,* vol. 267, June 30, 1977, p. 835, 836. 8 refs. NSF-NIH-supported research.

A77-39372 **Tuning properties of cochlear hair cells.** I. J. Russell and P. M. Sellick (Sussex, University, Brighton, England). *Nature,* vol. 267, June 30, 1977, p. 858-860. 9 refs. Research supported by the Medical Research Council.

A description is presented of the tuning of intracellularly recorded receptor potentials from histologically identified hair cells of the guinea pig cochlea. On the basis of an evaluation of the results of the investigation, it is concluded that the intracellularly recorded receptor potential is tuned as sharply as the auditory nerve, and hence that any sharpening of the frequency response beyond that of the basilar membrane mechanics does not involve neural interaction. G.R.

A77-39400 **Biochemical effects of environmental pollutants.** Edited by S. D. Lee (U.S. Environmental Protection Agency, Cincinnati, Ohio). Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1977. 487 p. $28.

Selected papers on the biochemical effects of environmental pollution are presented. Major topics include trace metal and oxidant pollutant toxicology, the interactions of nutritional factors modifying the effects of toxic substances, the development of tolerance, and variation of response to toxic materials among individuals. Some of the specific subjects treated include injury and cell renewal in rat lungs exposed to ozone, reaction of ozone with biological membranes, biochemical responses of humans to gaseous pollutants, the role of nutrition in heavy metal toxicology, and neurotransmitter mechanisms in inorganic lead poisoning. C.K.D.

A77-39509 # **Spacecraft contamination modeling.** R. O. Rantanen (Martin Marietta Aerospace, Denver, Colo.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 12th, Albuquerque, N. Mex., June 27-29, 1977, Paper 77-739.* 13 p. 13 refs. Research sponsored by the Martin Marietta Research and Development Funds.

A model for predicting and assessing spacecraft contamination is presented. Both point (attitude control engines and overboard vents) and surface (outgassing, early desorption, reflections) source kinetics are taken into consideration. The transport phenomena described by the model include direct line-of-sight molecular flow, return molecular flux from ambient atmosphere interactions, and return flux from self scattering and secondary surface scattering. The surface reflectance absorptance, transmittance, and surface conductivity are obtained from calculated values for flux, deposition, density, mass and molecular number column density and particle number column density. The application of this modeling approach to Skylab, to the very high resolution radiometer flown on the ITOS series spacecraft, and to the Atmospheric Explorer-D return flux experiment is discussed. C.K.D.

A77-39615 # **Control of muscles in carrying out certain voluntary movements with one degree of freedom. I - Single movements (Upravlenie myshtsami pri vypolnenii nekotorykh proizvol'nykh dvizhenii s odnoi stepen'iu svobody. I - Odnokratnye dvizheniia).** A. I. Litvintsev and N. S. Seropian. *Avtomatika i Telemekhanika,* May 1977, p. 88-102. In Russian.

Experiments utilizing changes in the electromyographic activity of muscles during sudden cessation of motion were used to investigate the control of human muscles in carrying out single wrist-movements. It is shown that both preprogrammed commands of different kinds as well as feedback signals are used in muscular control. B.J.

A77-39676 # **Mars as a habitable environment (Mars kak sreda obitaniia).** S. I. Aksenov, V. D. Davydov, E. I. Zaar, A. B. Rubin, and V. A. Topolovskii. Moscow, Izdatel'stvo Nauka (*Problemy Kosmicheskoi Biologii. Volume 32*), 1976. 232 p. 759 refs. In Russian.

The question as to whether or not life exists or could exist on Mars is examined. Available data on the topographical features of the planet, on climatic changes, and on the composition and dynamics of the Mars atmosphere are reviewed. The ability of organisms to adapt to physical conditions similar to those found at the surface of Mars is examined in detail. Possible means of detecting life on Mars are considered. C.K.D.

A77-39791 # **Three basic levels of the organization of life on earth (Tri osnovnikh rivni organizatii zhivogo na planeti).** M. A. Golubets'. *Akademiia Nauk Ukrains'koi RSR, Visnik,* vol. 41, Mar. 1977, p. 76-86. 36 refs. In Ukrainian.

An organization is devised for earth-based biological systems using systems analysis and biocybernetic theory. The organization consists of three basic levels: that of the organism, that of the population or species, and that of the ecosystem. A structural-functional scheme of interconnection among the levels is outlined. The organization is developed with reference to the theory of biotic communities. B.J.

A77-39802 # **Contracting polymer structures - New energy converters (Sokratitel'nye polimernye struktury - Novye preobrazovateli energii).** R. V. Beliakov (Kievskii Institut Inzhenerov Grazhdanskoi Aviatsii, Kiev, Ukrainian SSR). *Bionika,* no. 11, 1977, p. 7-13. 29 refs. In Russian.

Attention is given to different types of contracting polymer artificial-muscle structures, which differ in the ways they are deformed in contact with chemically diverse liquids. The direct effect of conversion of chemical to mechanical energies is discussed together with the inverse effect of the change of the chemical composition of the liquid medium which contains the artificial muscles as the external mechanical medium acts upon them. A formula is obtained for the circular frequency of self-oscillation of a self-perfusion model based on artificial muscles. B.J.

A77-39834 **The luminance difference threshold as a contrast threshold - Evidence for inhibitory interactions in spatial summation.** J. M. Martinez, II (New York, State University, Buffalo, N.Y.), J. F. Sturr, and N. L. Schmalbach (Syracuse University, Syracuse, N.Y.). *Vision Research,* vol. 17, no. 6, 1977, p. 687-689. 5 refs. Grant No. PHS-EY-01571.

Spatial summation is examined with test stimuli that differ in their time course. Results indicate that ramp (gradual onset and offset) test flashes yield qualitatively different spatial summation functions than functions obtained with square-wave (rapid onset and offset) test flashes. The differences that are observed would not be anticipated if threshold for homogeneous disk stimuli derived from the convolution of purely excitatory retinal elements. Instead, these

differences suggest the involvement of both excitatory and inhibitory factors in detection. (Author)

A77-39912 **Mechanics and performance of human motion.** W. H. Boykin, Jr. (Florida, University, Gainesville, Fla.). In: Recent advances in engineering science. Volume 8.
Boston, Mass., Scientific Publishers, Inc., 1977, p. 281-290. 5 refs. NSF Grants No. GR-4944; No. GK-37024X.

Recent advances in analysis methods, devices and techniques for measurement of human biomechanical activity make it possible to answer fundamental questions about mechanics and performance of human motion. This paper describes recent experimental and theoretical research into the applicability of analytical mechanics to human motion problems, optimal performance of human motion, and optimal modeling for particular human motion. Work in progress is also presented. (Author)

A77-40062 * **A kinesthetic-tactual display concept for helicopter-pilot workload reduction.** R. D. Gilson (Ohio State University, Columbus, Ohio), R. S. Dunn (U.S. Army, Air Mobility Research and Development Laboratory, Moffett Field, Calif.), and P. Sun (U.S. Army, Electronics Command, Fort Monmouth, N.J.). In: American Helicopter Society, Annual National Forum, 33rd, Washington, D.C., May 9-11, 1977, Proceedings.
Washington, D.C., American Helicopter Society, Inc., 1977. 9 p. 16 refs. Research supported by the Ohio State University, U.S. Army, and NASA. (AHS 77-33-22)

A kinesthetic-tactual (K-T) display concept is now under research and development (R & D) at the Ohio State University. It appears to offer considerable promise for useful application in helicopters by conveying control information via the sense of touch. This is a review of the overall R & D program including the original K-T display design, initial studies in automobile and fixed-wing vehicles, and feasibility experiments in a helicopter simulator. In addition to investigations of control and potential workload reduction, present efforts are directed toward establishing optimal design requirements for K-T helicopter displays. Potential applications, modes of usage, and the kinds of information that may be displayed in helicopter applications are discussed along with a brief forecast of future R & D. A brief description of the latest multi-axis laboratory prototype K-T display is also provided. (Author)

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STAR ENTRIES

N77-26789# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
ACQUISITION AND ACTIVITY IN AGED RATS
O. L. Wolthuis, D. L. Knook (Inst. voor Exptl. Geront. TNO), and V. J. Nickolson Apr. 1976 14 p refs
(MBL-1976-4; TDCK-67752) Avail: NTIS HC A02/MF A01

Rats of ages 3, 12, 18, and 30 months (3M, 12M, 18M, and 30M) were trained by conditioned suppression of drinking behavior using punishment or reward. In addition, spontaneous motor behavior was measured. Acquisition rates of the 30M rats were lower than those of 12M and 3M rats, and 3M rats exhibited higher activity than both 30M and 12M rats. It is concluded that the acquisition deficits of 30M rats develop beyond the age of 18 months, independent of differences in activity, reactivity to foot shock, or motor skill. Author (ESA)

N77-26790# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
ISOLATION OF ANTIBODY FORMING CELLS BY USING CLUSTER FORMATION IN COMBINATION WITH VELOCITY SEDIMENTATION
F. H. Lubbe, G. Rossi, and O. B. Zaalberg May 1976 20 p refs
(MBL-1976-6; TDCK-67805) Avail: NTIS HC A02/MF A01

A method to isolate antibody forming cells with the help of cluster formation is described. This was achieved by incubating spleen cells from immunized mice with sheep erythrocytes at 37 C. During incubation a rabbit-anti-mouse immunoglobulin serum was present in order to facilitate the formation of clusters. Thereafter, the clusters were isolated by velocity sedimentation. In this way suspensions containing more than 80 % clusters were obtained. Some of the cells in the clusters still produced antibodies against sheep erythrocytes when cultured for two days in vitro. Author (ESA)

N77-26791# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
OXIME THERAPY AND OXIME BLOOD LEVELS IN RATS: DEPENDENCE ON THE DOSE OF THE ORGANOPHOSPHATE
Otto L. Wolthuis, Herma J. ClasonvanderWiel, and Rob P. L. S. Visser May 1976 12 p refs
(MBL-1976-7; TDCK-67804) Avail: NTIS HC A02/MF A01

Atropinized anesthetized rats were intravenously (i.v.) injected with 4, 6, or 8 x LD50 of the organophosphorous cholinesterase inhibitor soman. Immediately thereafter all animals received an i.v. injection of 100 mg/kg of the oxime HS-6, followed in half of the animals by an infusion of HS-6 of 100 mg/kg/h. The single dose of the oxime delayed the onset of respiratory failure by one hour or more depending on the dose of soman. Infusion of HS-6 further postponed respiratory failure except in the group given 8 x LD50 soman. It was found that at the same infusion rate of HS-6 the blood concentrations of this oxime rose considerably as the dose of soman was increased. It is suggested that the respiratory failure after low, lethal doses of soman is caused by reinhibition of cholinesterase by circulating soman in animals which receive a single injection of HS-6. After higher doses of soman respiratory failure is caused by toxic side effects of the oxime. Author (ESA)

N77-26792# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).
IN VITRO EVALUATION OF SOME LATENT RADIOPROTECTIVE COMPOUNDS
O. Vos, G. A. Grant (Defence Chem., Biol. and Radiation Establ., Ottawa), and L. Budke Aug. 1976 31 p refs
(MBL-1976-11; TDCK-68126) Avail: NTIS HC A03/MF A01

Protection against X-irradiation by a number of cysteamine derivatives was studied in tissue culture and the results compared with data obtained in mice. Compounds with a covered SH group like WR 638, cysteamine phosphate, WR 2721, and AE 48527, showed practically no protection when dissolved in tissue culture medium but developed a protective activity when dissolved in rat blood. Thiol measurements demonstrated that in rat blood the compounds were partly hydrolyzed to thiols. C511 was also hydrolyzed in culture medium and was slightly less effective than cysteamine in culture medium. Cysteamine phosphate was hydrolyzed more easily than cysteamine sulphate and concordantly the protective activity in rat blood was better. WR 2721 was also partly hydrolyzed in rat blood. The in vitro protection of this compound was disappointing when compared with results in vivo. Its SH form (WR 1065) also showed less protection than expected from in vivo experiments. Author (ESA)

N77-26793# Chemical Lab. RVO-TNO, Rijswikj (Netherlands).
SELECTIVE ENRICHMENT AND ISOLATION OF MICROORGANISMS ON ETHYL S-DIISOPROPYL AMINOETHYL METHYLPHOSPHONTHIOATE (VX)
E. Holwerda Nov. 1975 40 p refs In DUTCH; ENGLISH summary
(CL-1975-27; TDCK-67497) Avail: NTIS HC A03/MF A01

Some investigations were made to obtain a selective enrichment in soil of micro-organisms utilizing O-ethyl S-(2-diisopropylaminoethyl) methyl thiophosphonate (VX) on addition of 1 mg VX per g soil. Repeated contamination was needed as a result of the low stability of VX in soil. Shifts in microbial populations occurred. Aqueous solutions of VX (1 mg/ml) were inoculated with an extract of the soil being treated in this manner. Degradation of VX was followed enzymatically, the viable counts were estimated with the plate-count technique. As a result some colonies on count plates were obtained of species which are at least able to survive in the presence of VX. Author (ESA)

N77-26794*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
STARPAHC OPERATIONAL REPORT Interim Report, May 1975 - Oct. 1976
15 Jan. 1977 149 p
(Contract NAS9-13170)
(NASA-CR-151432; LMSC-D508255; IR-3) Avail: NTIS HC A07/MF A01 CSCL 06E

The results of the first one and one-half years of operation of the STARPAHC system are presented. An operational cost summary analysis is included as well as the following: (1) Medical evaluation results, (2) system usage, and (3) hardware evaluation results. B.B.

N77-26795*# Indiana Univ., Bloomington. Section on Pharmacology.
STUDIES IN NEUROENDOCRINE PHARMACOLOGY Final Report
Roger P. Maickel 30 Apr. 1976 307 p refs
(Grant NGL-15-003-117)
(NASA-CR-153278) Avail: NTIS HC A14/MF A01 CSCL 06E

The expertise and facilities available within the Medical Sciences Program section on Pharmacology were used along with informational input from various NASA sources to study areas relevant to the manned space effort. Topics discussed include effects of drugs on deprivation-induced fluid consumption, brain biogenic amines, biochemical responses to stressful stimuli, biochemical and behavioral pharmacology of amphetamines, biochemical and pharmacological studies of analogues to

biologically active indole compounds, chemical pharmacology: drug metabolism and disposition, toxicology, and chemical methodology. Appendices include a bibliography, and papers submitted for publication or already published. Author

N77-26796*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
A CERVIX-TO-RECTUM MEASURING DEVICE IN A RADIATION APPLICATOR FOR USE IN THE TREATMENT OF CERVICAL CANCER Patent Application
David R. Fischell (Howard Univ.) and Jeffrey Mazique, inventors (to NASA) (Howard Univ.) Filed 12 May 1977 12 p
(Grant NGT-09-011-051)
(NASA-Case-GSC-12081-2; US-Patent-Appl-SN-796258) Avail: NTIS HC A02/MF A01 CSCL 06B

A cervix-to-rectum measuring device to be used in the treatment of cervical cancer is described which includes a handle and a probe pivotably connected to the handle for insertion in the rectum. The measuring device further includes means for coupling the handle to an intrauterine radiation applicator when the latter is positioned in the uterine cervix and the probe is inserted in the rectum to pivot the handle about the probe. A gear is provided which is adapted to pivot with the probe. A pinion pivotably connected to the handle meshes with the gear. A pointer fixed to the pinion is displaced in response to the pivoting of the handle about the probe, and this displacement can be read from a scale on the handle, providing an indication of the cervix-to-rectum distance. NASA

N77-26797*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
DETERMINATION OF ANTIMICROBIAL SUSCEPTIBILITIES OF INFECTED URINES WITHOUT ISOLATION Patent Application
Grace L. Picciolo, Emmett W. Chapelle, Jody W. Deming (New England Medical Center, Boston), Christian G. Schrock (New England Medical Center, Boston), Hiller Vellend (New England Medical Center, Boston), Michael J. Barza (New England Medical Center, Boston), and Louis Weinstein, inventors (to NASA) (New England Medical Center, Boston) Filed 23 Apr. 1976 24 p
(NASA-Case-GSC-12046-1; US-Patent-Appl-SN-680015) Avail: NTIS HC A02/MF A01 CSCL 06B

Method is described for the quick determination of the susceptibilities of various unidentified bacteria contained in aqueous physiological fluid sample, particularly urine, to one or more antibiotics. A bacterial adenosine triphosphate (ATP) assay is carried out after the elimination of nonbacterial ATP to determine whether an infection exists. If an infection does exist, a portion of the sample is further processed, including subjecting parts of the portion to one or more antibiotics. Growth of the bacteria in the parts are determined, again by an ATP assay, to determine whether the unidentified bacteria in the sample are susceptible to the antibiotic or antibiotics under test. NASA

N77-26798# Los Alamos Scientific Lab., N. Mex. Mammalian Biology Group.
CESIUM-137 WHOLE-BODY CONTENT IN A NORMAL NEW MEXICO POPULATION
R. G. Thomas, C. R. Richmond, J. E. Furchner, and E. C. Anderson 1976 14 p refs Presented at 10th Midyear Symp. for Health Phys. Soc., New York, 11 Oct. 1976
(Contract W-7405-eng-36)
(LA-UR-76-2097; Conf-761031-5) Avail: NTIS HC A02/MF A01

Nanocuries of cesium-137 and potassium-40 were measured periodically in a fairly consistent population of normal New Mexicans. A large liquid scintillation detector was used for whole body gamma ray counting. Data are expressed in terms of picocuries of cesium-137 per gram of body potassium. Following the peaks of high level atmospheric testing (early to mid-1960's) the levels rose, approaching 120 pCi/gK. For the five year period beginning in 1964 there was a steady decline. During the years of 1969 through 1973 the whole body levels were esentially constant at approximately 20 pCi/gK. A gradual decline occurred over the next two years, reaching the current level of about 10 pCi/gK. A group of 100 individuals was counted during the summer of 1976 and these data are presented, showing that they follow a normal distribution. ERA

N77-26799# Los Alamos Scientific Lab., N. Mex.
BIOLOGICAL EFFECTS OF NEGATIVE PIONS
M. R. Raju, H. I. Amols, E. Bain, S. G. Carpenter, J. F. Dicello, J. F. Frank, R. A. Tobey, and R. A. Walters 1976 33 p refs Presented at Intern. Conf. on Particles and Radiation Therapy, Berkeley, Calif., 15-17 Sep. 1976 Sponsored in part by National Cancer Inst.
(Contract W-7405-eng-36)
(LA-UR-76-2529; Conf-760946-5) Avail: NTIS HC A03/MF A01

Biological effects at the beam entrance were found to be nearly the same as conventional radiations, although some reports have indicated a higher RBE. LET distribution at the peak of a nearly monoenergetic pion beam is not much different from fast neutrons; therefore, one would expect similar biological responses, and the results are consistent with this hypothesis. The RBE peak/RBE plateau ratio is decreased with increasing width of the peak. The OER (approximately 1.6) at the peak for a nearly monoenergetic pion beam is also similar to fast neutrons and is expected to increase with increasing width of the peak. ERA

N77-26800# EEG Research Inst., Oslo (Norway).
INVESTIGATION ON THE SATURATION AND CLEARANCE OF HYDROGEN GAS IN THE BRAIN AND EXTREMITIES OF MAN, AND INVESTIGATIONS ON BIOMEDICAL MONITORING OF DIVERS IN WET-SUITS Final Report, 15 Mar. 1972 - 14 Nov. 1976
Carl Wilhelm Sem-Jackson 14 Nov. 1976 20 p refs
(Contract N00014-72-C-0345)
(AD-A037498) Avail: NTIS HC A02/MF A01 CSCL 06/19

Hydrogen gas clearance and saturation in the brain have been monitored in 22 subjects - twice in 4 of them with 6 months intervals. The half time for hydrogen gas clearance/saturation in the human brain may fluctuate between 1/2 minute and 30 minutes in grey matter and between 6-12 and 14 minutes in white matter. There must be a focal mechanism regulating the blood flow to various areas of the brain. The Vesla on Person Biomedical Monitoring Equipment has been refined. The unit is fitted in a water tight clam shell, to be carried on the diver's back. GRA

N77-26801# Pennsylvania State Univ., University Park. Center for Air Environment Studies.
INFLUENCE OF ALTERED GASEOUS ENVIRONMENTS ON LUNG METABOLISM Final Progress Report, 1 Jul. 1974 - 31 Aug. 1976
Rodney A. Rhoades Sep. 1976 56 p refs
(Grant AF-AFOSR-2767-75)
(AD-A037977; CAES-Pub-445-76; AFOSR-77-0315TR) Avail: NTIS HC A04/MF A01 CSCL 06/20

Isolated lungs were perfused 1.5 hours with a medium of washed bovine red cells resuspended to a 15 percent hematocrit with Krebs-Henseleit bicarbonate buffer containing 5 gram percent albumin. Substrate concentrations were 6 millimolar glucose and 1 millimolar palmitate. Data from altered carbon dioxide tension experiments indicate that prior exposure to high carbon dioxide tension markedly alters the lung's ability to maintain synthesis of cellular constituents from glucose. In a second series of experiments, acute effects of hyperoxia on lung metabolism were examined. Lactate production increased and pyruvate decreased. Data from a series of test of hypoxia on cyclic nucleotides indicate that hypoxia has a selective action on lung cAMP and nutritional stress, potentiates a hypoxic-hypercapnia exposure, and drastically alters lung weight, glycolysis and lipid synthesis in the lung.
Author (GRA)

N77-26802# Kentucky Univ., Lexington.
THE DEVELOPMENT, MAINTENANCE, AND MATHEMATICAL DESCRIPTION OF TRACKING BEHAVIOR IN MAN

AND THE RHESUS MONKEY Annual Report, 1 Oct. 1975 - 30 Sep. 1976

D. F. McCoy and P. K. Bhagat 19 Nov. 1977 40 p
(Grant AF-AFOSR-2751-75)
(AD-A038006; AFOSR-77-0377TR) Avail: NTIS HC A03/MF A01 CSCL 05/10

The overall objective of this research was to explore several possible training methods to produce efficient compensatory tracking in the rhesus monkey. Various approaches were used. Several animals were successfully trained, and a five-parameter model was developed to describe this behavior mathematically. A major finding was that no detrimental effects were evidenced following a shift from pursuit to compensatory tracking. This finding agrees with the findings of others in human tracking situations and illustrates another similarity between human and subhuman response to discrete tracking tasks. The study showed that no special retraining procedures are required to train subhuman primates on either pursuit or compensatory tracking and this feature, that of a universal training method, was a primary goal of this research. Another major finding was that, based on the assumption that low doses of tranquilizing drugs may improve tracking efficiency of shock conditioned animals, it appears that the effect of tranquilizers was dependent as much on the individual animal as it was on dose level. GRA

N77-26803# Grumman Aerospace Corp., Bethpage, N.Y.

A-6E SYSTEMS APPROACH TO TRAINING, PHASE 1 Final Report, Apr. 1975 - May 1976

Samuel C. Campbell, Joseph Feddern, George Graham, and Martin Morganlander Feb. 1977 94 p refs
(Contract N61339-75-C-0099)
(AD-A037468; NAVTRAEQUIPC-75-C-0099-1) Avail: NTIS HC A05/MF A01 CSCL 05/9

This report describes one of four Phase I programs, namely the A-6E TRAM Instructional Systems Development (ISD) Program, established to evaluate the application of a Systems Approach to Training (SAT) in Naval aircraft programs. The research and development goals of this program were to: (a) evaluate a variety of ISD methods and procedures as applied to the aircrew training, (b) achieve a better understanding of the constraints and operating conditions that affect aircrew training, and (c) acquire cost, scheduling, and manpower data for future ISD planning. The operational goal was to design an A-6E TRAM aircrew training program. The approach used to achieve the above goals conformed basically to the ISD methodology. The report discussed the Task Analysis, the development of Specific Behavioral Objectives (SBOs), the selection of instructional media, and the formulation of Lesson Specifications. The role of the Subject Matter Expert (SME) is reviewed, as is the requirement for quantitative standards of performance. The operational aspects of the A-6E Training Program are addressed: program costs and manpower data are included. Specific media requirements and recommendations are presented. Generic descriptions of appropriate training devices are provided. The report includes a number of conclusions and recommendations and a 30-item reference section. Author (GRA)

N77-26804*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.

REMOTE MANIPULATOR SYSTEM STEERING CAPABILITY FOR SVDS

D. T. Martin May 1977 49 p refs
(Contract NAS9-15200)
(NASA-CR-151438; LEC-10595; JSC-12628) Avail: NTIS HC A03/MF A01 CSCL 05H

Details of the remote manipulator system steering capability to be implemented into the space vehicle dynamics simulator are reported. The resolve rate law is included as part of the overall steering capability. The steering model includes three automatic modes, four manual augmented modes, and a single joint rate mode. Author

N77-26805# Royal Naval Personnel Research Committee, London (England).

A STUDY USING INFRA RED THERMOGRAPHY OF CLOTHING ASSEMBLIES FOR USE BY PERSONNEL WORKING BENEATH OPERATING HELICOPTERS

R. Clark, B. J. Mullan, and M. R. Goff May 1976 20 p refs
(AD-A035966; ES-4/76; DRIC-BR-54506) Avail: NTIS HC A02/MF A01 CSCL 06/17

With exposure to the down-draught of a hovering helicopter the surface temperatures of various garment assemblies have been compared, using infrared thermography and the Interim Assembly has been shown to have lowest surface temperature indicating its suitability at heat retention by the body. The surface temperatures observed are seen to be much more uniform in the down-draught than in 'still air' conditions. Thermography reveals the local hot spots over garment assemblies worn in 'still air' conditions. These are the areas where the heat loss will be greatest both in the 'still air' and also when the subjects are exposed to high velocity winds. The very warm areas over the face have been demonstrated in all of the garment assemblies. With the high heat loss coefficients previously measured beneath hovering helicopters, these areas could account for up to 40% of the total body heat loss. Underneath a hovering helicopter an excess temperature of 1 C over any garment assembly can increase heat loss from a subject by upwards of 80 W/sq m. This indicates the sensitivity of heat loss to excess temperature in these environments and emphasizes the importance of adequate and uniform insulating properties of the garment assembly. GRA

N77-26806# Defense Systems Management School, Fort Belvoir, Va.

HUMAN FACTORS CONSIDERATIONS IN NEW GENERATION ARMY AIRCRAFT SYSTEMS

Carl A. Weaver, Jr. Nov. 1976 30 p refs
(AD-A037992) Avail: NTIS HC A03/MF A01 CSCL 01/3

This study is useful to project managers, decision makers and users alike, particularly those interested in rotary-wing system acquisition. It is also useful to behavioral scientists and human factors engineers as an aid to becoming sensitive to user requirements and changes in the operational environment. Purpose, scope and limitations are established. The issues are placed in perspective through a discussion of projected man-machine relationships with respect to the anticipated future operational environment of helicopters. Basic Army aviation systems of the future are described in relation to aviation missions. Projected human factors problems are examined as a function of system performance and operational trends. Human factors are related to life cycle costing by suggesting a relationship between the manager's decision flexibility and a commitment to a final system configuration. It is concluded that a departure from traditional cockpit design is necessary. Recommendations are made concerning decision criteria and human factors-acquisition cycle interface. Author (GRA)

N77-26807# Defense Systems Management School, Fort Belvoir, Va.

HUMAN FACTORS PROGRAMS IN NAVY SYSTEMS ACQUISITION

Stephen C. Merriman Nov. 1976 61 p refs
(AD-A037775) Avail: NTIS HC A04/MF A01 CSCL 05/5

This report examined the role that human factors programs play in Navy systems acquisition. It focused upon the conceptual and validation (advanced development) phases of the acquisition process since it is during this period when the great majority of system design decisions are made. Based upon previous analyses, interview data and the author's personal experience, human factors program activities appropriate to the conceptual and validation phases were identified and discussed relative to key acquisition process milestones; e.g., Development Proposal (DP) and Decision Coordination Paper (DCP) preparation, Defense Systems Acquisition Review Council (DSARC) preparation. Department of Defense and Navy systems acquisition policy was briefly reviewed in terms of its effects on the conduct of human factors programs. Past and present human factors programs were reviewed and critiqued. Current trends and major problem areas were identified and discussed. GRA

N77-26808# IBM Federal Systems Div., Owego, N.Y. Federal Systems Div.

PROGRAM DOCUMENTATION FOR THE T4 EUO CREW STATION SIMULATION PROGRAMS

W. E. Brandt, Jr. Wright-Patterson AFB, Ohio AMRL Feb. 1977 70 p
(Contract F33615-75-C-5152)
(AD-A037944; AMRL-TR-77-6; AMRL-HESS-77-2) Avail: NTIS MF A01 CSCL 05/9

The ALQ-T4 EWO Crew Station Simulation Programs were written for the Crew Station Integration Branch (HED), Human Engineering Division, Aerospace Medical Research Laboratory. The overall function of the entire system of programs is to provide the capability for studying the performance of a trained Electronic Warfare Officer (EWO) during an electronic warfare simulation, to support studies to analyze the impact of the addition of new equipment, and the organization of old equipment on crew performance. A real-time program controls and monitors an AN/ALQ-T4 B-52 EW Crew Station Simulator that has been modified to include a set of equipment changes associated with the Advanced Phase VI B-52 EW Crew Station Project. The subject response times, at which all input transitions occur, and the times that the emitters stations are turned on/off are recorded for subsequent analysis. This sytem was written for an IBM System/370, Model 155 Computer. OS Assembler Language and FORTRAN IV were used in coding the subroutines. GRA

N77-26809# Applied Psychological Services, Wayne, Pa. Science Center.
APPLICATIONS OF HUMAN PERFORMANCE RELIABILITY EVALUATION CONCEPTS AND DEMONSTRATION GUIDELINES Technical Report, 19 Mar. 1976 - 15 Mar. 1977
Arthur I. Siegel, William Rick Leahy, and Joel P. Wiesen 15 Mar. 1977 153 p refs
(Contract N00024-76-C-6126)
(AD-A037632) Avail: NTIS HC A08/MF A01 CSCL 05/5

Although the improvement of equipment systems for human operation and maintenance has been stressed for many years, the actual measurement and specification of human performance reliability in concrete terms has been largely ignored. A set of computer simulation models, which assess the human performance reliability of a system while the system is in the early design state, was previously developed. The results of trial application of these simulation models to an actual system which is under development are presented. Additionally, a set of guidelines is presented which can form the basis for a human performance reliability demonstration in future Navy systems. Author (GRA)

N77-26810# Wyle Labs., Inc., Huntsville, Ala.
PERSONAL FLOTATION DEVICES RESEARCH, PHASE 1 Final Report, Jul. 1975 - Jul. 1976
T. Doll, C. Stiehl, M. Pfauth, and R. MacNeill Jul. 1976 341 p refs
(Contract DOT-CG-42333-A)
(AD-A037221; MSR-76-43; USCG-D-3-77) Avail: NTIS HC A15/MF A01 CSCL 06/7

An Accident Recovery Model (ARM) for recreational boating accidents is presented. Its development and application are described. The model is used to estimate the benefits of regulatory programs in four recovery problem areas. Methods and problems in benefit estimation are described, and recommendations for further development of ARM are offered. An investigation of the causes of sudden and unexplained drownings is reported, including a review of the biomedical literature and an analysis of boating accident reports. Development of the Life-Saving Index (LSI) is described, and its application to the approval of personal flotation devices (PFDs) is discussed. Past mathematical modeling efforts related to PFD effectiveness are discussed. A pilot experiment is reported, and alternative empirical methods for evaluating PFD effectiveness are presented. A large-scale observational study of PFD wear and accessibility, and a study of PFD-related attitudes and preferences are reported. A preliminary index of PFD wearability is formulated. Initial data on PFD quality control and reliability problems are presented. Procedures for evaluating PFD reliability are outlined. Functions which future PFD designs could fulfill and features of inflatable and hybrid devices are reviewed. Tests of two inflatables and three hybrid devices are reported. Author (GRA)

N77-26811# Navy Clothing and Textile Research Unit, Natick, Mass.
LOW-TEMPERATURE HANDWEAR WITH IMPROVED DEXTERITY Technical Report, 1973 - 1975
Salvatore V. Gianola, Dale A. Reins, and James C. Shampine Dec. 1976 41 p
(AD-A037535; TR-117; TR-2; Rept-6-75) Avail: NTIS HC A03/MF A01 CSCL 06/17

Navy Clothing and Textile Research Facility (NCTRF) conducted tests of second generation models of experimental prototypes which proved superior to the Navy standard in all dexterities and equal in low-temperature environments (-40 F for 2 hours). The best candidate prototype (Type IV, Mod 3) was selected, and a limited number were constructed for field tests at various Alaskan military sites. Test subjects, engaged in a variety of duties involving manual dexterity, rated the experimental glove (Type IV, Mod 3) superior to the standard Navy handwear in all dexterities but less protective at -40 F for extended periods of time (4 hours). A single drawback was that the experimental glove, utilizing a polyurethane foam liner, absorbed excessive moisture (perspiration and melting snow), thus representing a potentially serious hazard. Changes were made to incorporate a moisture barrier lining (Mod 4) and NCTRF conducted in-house tests to ascertain the effect on both low-temperature and manipulatory capabilities. Author (GRA)

N77-26812# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EFFECTS OF DIRECT SIDE FORCE CONTROL ON PILOT TRACKING PERFORMANCE Final Report, Jan. - Dec. 1975
Donald R. Loose, Kenneth W. McElreath, and George Potor, Jr. Dec. 1976 27 p
(AF Proj. 7222)
(AD-A036083; AMRL-TR-76-87) Avail: NTIS HC A03/MF A01 CSCL 06/19

An experiment was conducted to determine the effects of direct side force motion on a pilot's tracking performance in a simulated air-to-air engagement. Two degrees of control, pitch and lateral velocity, could be commanded by the pilot. Forty-five second runs at various normal G profiles were made with and without dynamic lateral motion, using four subjects. The results showed some degradation of performance at low normal G levels with side motion, but the subjects demonstrated they could easily maintain effective tracking control with + or - 2 Gs of dynamic lateral acceleration. GRA

N77-27677* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTOMATED SINGLE-SLIDE STAINING DEVICE Patent
Judd R. Wilkins and Stacey M. Mills, inventors (to NASA) Issued 14 Jun. 1977 10 p Filed 29 Oct. 1975 Supersedes N76-13725 (14 - 04, p 0487)
(NASA-Case-LAR-11649-1; US-Patent-4,029,470; US-Patent-Appl-SN-626942; US-Patent-Class-8-94.11; US-Patent-Class-8-3; US-Patent-Class-23-253A; US-Patent-Class-23-259; US-Patent-Class-23-292; US-Patent-Class-118-6; US-Patent-Class-118-7; US-Patent-Class-118-9; US-Patent-Class-118-313; US-Patent-Class-424-3; US-Patent-Class-427-4) Avail: US Patent Office CSCL 06M

A simple apparatus and method is disclosed for making individual single Gram stains on bacteria inoculated slides to assist in classifying bacteria in the laboratory as Gram-positive or Gram-negative. The apparatus involves positioning a single inoculated slide in a stationary position and thereafter automatically and sequentially flooding the slide with increments of a primary stain, a mordant, a decolorizer, a counterstain and a wash solution in a sequential manner without the individual lab technician touching the slide and with minimum danger of contamination thereof from other slides. NASA

N77-27678 Pittsburgh Univ., Pa.
THE ISOLATION AND PURIFICATION OF PROTEIN

FRACTIONS INVOLVED IN E. COLI DNA REPLICATION Ph.D. Thesis
Katryna Bogovich 1976 178 p
Avail: Univ. Microfilms Order No. 77-2990

A method has been developed for the isolation and purification of protein fractions which appear to be involved in the semi-conservative replication of the bacterial nucleoid. The procedure for isolating and purifying the enzymatic fractions consists of separating the 0-50 percent ammonium sulfate out of a high speed cell lysate supernatant into three fractions via a DEAE - cellulose column. The resultant fractions, the 50 mM NaCl breakthrough; the 50-200 mM NaCl fraction; and the 200-600 mM NaCl fraction, were further purified either via gel filtration followed by DEAE - cellulose chromatography or by phosphocellulose chromatography followed by DEAE - cellulose chromatography. The enzymatic fractions were purified on the basis of their ability to stimulate the ATP-dependent DNA synthetic ability of either a single stranded DNA specific protein fraction or a double stranded DNA specific protein fraction.
Dissert. Abstr.

N77-27679 North Carolina State Univ., Raleigh.
RESPONSE OF GUINEA PIG EARS TO PURE TONES, SPEECH, AND OTHER COMPLEX WAVEFORMS IMPARTED ACOUSTICALLY AND BY OSSICULAR CHAIN COUPLED PIEZOELECTRIC TYPE TRANSDUCERS Ph.D. Thesis
Reginald Owen Cook 1976 352 p
Avail: Univ. Microfilms Order No. 77-2738

The feasibility study of imparting speech, complex waveforms, and pure tones onto the ossicular chain of guinea pigs by direct coupling with piezoelectric transducers was carried out. Comparisons were made of the response of the middle and inner ear (cochlea) to identical source waveforms presented in the normal acoustic manner and presented via direct coupled piezoelectric type devices. The data obtained offer compelling evidence for the essential equivalency of direct coupled and acoustically generated means of imparting signals onto the auditory system and of the feasibility of the technique in producing response free from unwanted shock, distortion, or other fidelity degrading side effects.
Dissert. Abstr.

N77-27680*# Michigan Univ., Ann Arbor. Kresge Hearing Research Inst.
DEVELOPMENT OF METHODOLOGIES FOR VESTIBULAR EXPERIMENTATION WITH MAN AND ANIMALS Final Report
D. J. Anderson 25 Apr. 1977 38 p refs
(NASA-CR-151444) Avail: NTIS HC A03/MF A01 CSCL 06D

Calculations on the possibilities for an animal centrifuse which will be useful in the study of the otolith organs in space research are presented with discussion on the design of such a centrifuse.
Author

N77-27681*# Dartmouth Coll., Hanover, N.H. Dept. of Physiology.
THE THYROID AND ENVIRONMENTAL STRESS IN MAMMALS Final Report, 1 Jan. 1975 - 31 Dec. 1976
Valerie Anne Galton 10 Jun. 1977 39 p refs
(Contract NAS9-14439)
(NASA-CR-151462) Avail: NTIS HC A03/MF A01 CSCL 06C

The effects of hyperoxia at ambient pressure on thyroid function and thyroid hormone metabolism have been assessed. Thyroidal activity was depressed in mice and rats by exposure to hyperoxia, due at least in part to a decrease in the rate of secretion of pituitary thyrotropin. The effects of hyperoxia on the peripheral deiodination of thyroxine were dependent on the concentration of oxygen employed and/or the duration of exposure. When significant changes were observed a reduction in the rate of deiodination and in the deiodinative clearance of T sub 4 occurred. Hyperoxia also resulted in a marked fall in circulating T sub 4 concentration and a decrease in T sub 4-binding activity in serum. Many of these effects of hyperoxia were prevented by the concomitant administration of large amounts of Vitamin E. These decreases in thyroid function and T sub 4 metabolism were associated with a decrease in the rate of whole body oxygen consumption. It was concluded that the deleterious effects of oxygen in the rat were not due to an oxygen induced hyperthyroid state in the peripheral tissues. Thyroxine was shown to be essential for survival during acute cold stress.
Author

N77-27682*# Hardin-Simmons Univ., Abilene, Tex. Science Research Center.
RESPONSE OF SELECTED MICROORGANISMS TO EXPERIMENTAL PLANETARY ENVIRONMENTS Semiannual Progress Report, 1 Jul. 1976 - 30 Jun. 1977
Terry L. Foster and Luther Winans, Jr. Jun. 1977 38 p
(Grant NGR-44-095-001)
(NASA-CR-153912; PR-9) Avail: NTIS HC A03/MF A01 CSCL 06C

Results of studies in anaerobic phosphorus metabolism are presented. Specific topics discussed include: (1) anaerobic utilization of PH3; (2) reduction of phosphate or phosphite; (3) isolation of organisms which utilize phosphite or phosphate anaerobically as a final hydrogen acceptor; and (4) the toxicity of PH3 to the organisms. Techniques of anaerobic microbiology associated with space hardware were also studied. These include: (1) the Brewer anaerobe jar/GasPak system; (2) a new procedure to grow aerobes and anaerobes simultaneously; (3) a culture medium to differentiate oblagate from facultative anaerobes; and (4) a procedure to quantitate O2 sensitivity of anaerobes.
J.M.S.

N77-27683# Nebraska Univ., Lincoln. Dept. of Food Science and Technology.
PREPARATION AND EVALUATION OF IMMOBILIZED SINGLE AND MULTIPLE ENZYME SYSTEMS Ph.D. Thesis
Arun Kilara Oct. 1976 155 p refs
(Contract DI-14-34-0001-6028)
(PB-264898/8; W77-05724; OWRT-A-040-NEB(1)) Avail: NTIS HC A08/MF A01 CSCL 06A

The effects of immobilization on the pH and temperature of assay and kinetic parameters such as apparent Michaelis constant and apparent maximal velocity for each enzyme were investigated. It was felt the immobilized multiple enzyme system could be successfully used for the hydrolysis of lactose, proteins and lipids in cheese whey.
GRA

N77-27684# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY: BIOMEDICAL SCIENCES, NO. 4
11 Jul. 1977 57 p refs Transl. into ENGLISH from Russian journals
(JPRS-69399) Avail: NTIS HC A04/MF A01

Information on aerospace medicine, agrotechnology, bionics and bioacoustics, biochemistry, biophysics, environmental and ecological problems, food technology, microbiology, epidemiology and immunology, marine biology, military medicine, physiology, public health, toxicology, radiobiology, veterinary medicine, behavioral science, human engineering, psychology, psychiatry and related fields, and scientists, and scientific organizations in biomedical fields is presented.
Author

N77-27685 Purdue Univ., Lafayette, Ind.
POTASSIUM PERMEABILITY IN THE TRANSVERSE TUBULE SYSTEM AND LATENCY RELAXATION: A STUDY OF EXCITATION-CONTRACTION COUPLING Ph.D. Thesis
Glenn Edward Kirsch 1976 157 p
Avail: Univ. Microfilms Order No. 77-1735

In skeletal muscle, many of the processes linking excitation of the surface membrane with contraction of the myofilaments take place within two intracellular membrane systems: the transverse tubule system (TTS) and the sarcoplasmic reticulum (SR). The origin of the late afterpotential (LAP) was studied because it is believed to be caused by potassium accumulation following the activation of delayed rectification in the TTS. Latency

relaxation (LR) was studied because of its postulated relationship to calcium release from the SR. Results support the potassium accumulation hypothesis and the idea that delayed rectification occurs in the TTS. A calculation of the amount of potassium released by a single spike in the TTS showed that the distribution of delayed rectifier channels is less dense in the TTS than on the surface. Dissert. Abstr.

N77-27686 Texas A&M Univ., College Station.
THE EFFECTS OF INCREASED OXYGEN CONCENTRATIONS AND ACCELERATION FORCES ON THE MECHANICAL PROPERTIES OF THE LUNGS Ph.D. Thesis
Larry Todd Bush 1976 140 p
Avail: Univ. Microfilms Order No. 77-2601

The effects of breathing increased concentrations of oxygen (FIO2's of 0.6 to 1.0) on the pulmonary compliance and pulmonary resistance were examined in normal, seated males. Exposures were for one hour, and volume histories of the lungs were established at 10 minute intervals. There were no significant changes in any of the parameters examined. In addition, the effects of breathing increased oxygen concentrations and exposure to increased acceleration forces on pulmonary compliance and resistance were examined in normal, seated males. Pulmonary compliance decreased significantly in subjects breathing the increased FIO2's after exposure to acceleration forces when compared to room air controls. The decrease in compliance appeared to be a function of the FIO2, with those subjects breathing the greater FIO2 showing a greater decrease in compliance than those subjects breathing the lesser FIO2. There was no significant difference in the degree of compliance decrease between the two acceleration levels for a particular FIO2.
Dissert. Abstr.

N77-27687 Ohio State Univ., Columbus.
INTERACTION BETWEEN THE HEART AND THE VASCULAR SYSTEM: A CIRCUIT APPROACH Ph.D. Thesis
Jean-Pierre Dujardin 1976 169 p
Avail: Univ. Microfilms Order No. 77-2391

The interaction between the heart and the vascular system is studied by using circuit theory. It was shown that the left ventricle can be represented as an ideal flow source in parallel with a source resistor. It was also shown that the arterial system can be described by the total arterial compliance, the characteristic impedance of the proximal aorta and the relationship of the total peripheral run-off versus the mean arterial pressure. All these parameters, characterizing the left ventricle and the arterial system were measured in vivo in closed chest dogs. A mathematical method was introduced to calculate the steady state values for arterial pressure, systolic outflow of the left ventricle and arterial steady power. Dissert. Abstr.

N77-27688 Kent State Univ., Ohio.
CIRCADIAN VARIATIONS IN RESPONSES OF TRAINED AND UNTRAINED MEN TO SUBMAXIMAL EXERCISE Ph.D. Thesis
Paul Michael Couzelis 1976 226 p
Avail: Univ. Microfilms Order No. 77-3821

Twenty-four hour variations of the cardiorespiratory system are examined to determine whether physiologically meaningful circadian rhythms could be detected in groups of men during exercise. In addition, the possible effect of physical training at the same time each day, as an environmental synchronizer of circadian rhythms, was determined. A number of cardiorespiratory parameters were observed during 11 minute bouts of submaximal bicycle ergometer exercise performed every 3 hours for 24 hours. It was concluded that group synchronized circadian rhythms during exercise can be found in systolic blood pressure, diastolic blood pressure, pulse pressure, tidal volume, blood lactate, and serum potassium. Dissert. Abstr.

N77-27689 Indiana Univ., Bloomington.
PACE AND GRADE RELATED TO THE OXYGEN AND ENERGY REQUIREMENTS, AND THE MECHANICS OF TREADMILL RUNNING Ph.D. Thesis
Phillip Likins Henson 1976 139 p
Avail: Univ. Microfilms Order No. 77-1986

The relationships among variations in running speed and grade, and their effects upon various physiological variables in running at a steady state, are investigated. Also determined were changes in various biomechanical variables which occurred along with changes in speed and grade. Some of the conclusions drawn from the investigation were: energy is conserved by running downhill. However, the savings are less than the additional amount required to run the same incline at the same speed; and uphill running is accompanied by a slight forward body lean toward the incline. Dissert. Abstr.

N77-27690 Colorado Univ., Boulder.
DYNAMIC ANALYSIS OF THE THORACIC STRUCTURE SUBJECTED TO IMPACT LOADINGS Ph.D. Thesis
Swaminathan Halasya Sundaram 1976 260 p
Avail: Univ. Microfilms Order No. 77-3241

Passenger protection and injury diagnoses in frontal automobile impacts were studied. A detailed dynamic model of the occupant before and after impact was developed. The occupant's pre-impact motion was analyzed using a three mass (representing the legs, torso, and head), three degree of freedom rigid body model. The three simultaneous nonlinear differential equations of motion of the system were solved numerically by a linear acceleration, time step integration algorithm. A parametric study of the collision variables was performed in which the vehicle velocity, pulse characteristics, seat friction, initial body position, and seat belt stiffness were varied discretely. The motion of the body from the instant of collision with the steering column until the completion of one cycle of compression and decompression was analyzed by treating the thorax as a deformable system of finite elements. Before a proper dynamic analysis was undertaken, static analyses were performed. Dissert. Abstr.

N77-27691 North Carolina Univ., Chapel Hill.
PULSATILE PRESSURE-FLOW DYNAMICS IN RESTING SKELETAL MUSCLE Ph.D. Thesis
Richard Ward Scearce, Jr. 1976 147 p
Avail: Univ. Microfilms Order No. 77-2092

The effects of pulse pressure amplitude and mean perfusion pressure on blood flow through an isolated denervated gracilis muscle of a dog were studied. A pressure regulated pumping system produced the pulsatile perfusion pressure which was composed of a sinusoidal pulse pressure and a mean pressure. Pulse pressure amplitudes of 20, 40, 60, 80, and 100 mm Hg were used in various combinations with pulse pressure frequencies of 0.1, 0.3, 0.5, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, and 7.0 Hz., and mean perfusion pressures of 50, 75, 100, 125, and 150 mm Hg. There were two experimental procedures: mean pressure was held constant while pulse amplitude and frequency were varied, and pulse amplitude and frequency were held constant while mean pressure was varied. Pulsatile pressure and flow data were recorded on magnetic tape and analyzed on a digital computer. Dissert Abstr.

N77-27692*# Harding Coll., Searcy, Ark.
STUDY OF OPTIMAL TRAINING PROTOCOLS AND DEVICES FOR DEVELOPING AND MAINTAINING PHYSICAL FITNESS IN FEMALES PRIOR TO AND DURING SPACE FLIGHT Progress Report, 1 Sep. 1976 - 28 Feb. 1977
Harry D. Olree, Bob Corbin, and Carroll Smith 28 Feb. 1977 21 p refs
(Contract NAS9-14921)
(NASA-CR-151246) Avail: NTIS HC A02/MF A01 CSCL 06P

Pedalling a bicycle at least ten minutes a day at 85% of maximum pulse rate, three days a week for ten weeks will produce moderate increases in overall strength and physical work capacity in college-age females. The longer the training session, up to thirty minutes per session, the greater are the increases in physical work capacity that result when college-age females are trained three days a week for ten weeks at 85% of their maximum heart rate. Author

N77-27693*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
SYSTEM FOR AND METHOD OF FREEZING BIOLOGICAL TISSUE Patent Application
Thomas E. Williams and Thomas A. Cygnarowicz, inventors (to NASA) Filed 14 Jun. 1977 18 p
(NASA-Case-GSC-12173-1; US-Patent-Appl-SN-806440) Avail: NTIS HC A02/MF A01 CSCL 06B

Blood cells, blood marrow, and other similar biological tissue is frozen while in a polyethylene bag placed in an abutting relationship against opposed walls of a pair of heaters. The bag and tissue are cooled with refrigerating gas at a time programmed rate at least equal to the maximum cooling rate needed at any time during the freezing process. The temperature of the bag, and hence of the tissue, is compared with a time programmed desired value for the tissue temperature to derive an error indication. The heater is activated in response to the error indication so that the temperature of the tissue follows the desired value for the time programmed tissue temperature. The tissue is heated to compensate for excessive cooling of the tissue as a result of the cooling by the refrigerating gas. In response to the error signal, the heater is deactivated while the latent heat of fusion is being removed from the tissue while the tissue is changing its phase from liquid to solid. NASA

N77-27694*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
LOCKING MECHANISM FOR ORTHOPEDIC BRACES Patent Application
Jireh I-Le Chao (Howard Univ.) and Charles H. Epps, Jr., inventors (to NASA) (Howard Univ.) Filed 20 May 1977 15 p Sponsored by NASA
(NASA-Case-GSC-12082-2; US-Patent-Appl-SN-798976) Avail: NTIS HC A02/MF A01 CSCL 06B

A locking mechanism for orthopedic braces is described which automatically prevents or permits the relative pivotable movement between a lower brace member and an upper brace member, the locking mechanism also including a secondary manually operable latching device. The upper and lower brace members are provided with drilled bores within which a slidable pin is disposed, and depending upon the inclination of the brace members with respect to a vertical plane, the slidable pin will be interposed between both brace members so as to prevent the relative pivotable movement therebetween, or alternatively, be disposed solely within the bore of the upper brace member so as to permit such relative pivotable movement therebetween. The secondary or auxiliary latching device includes a spring-biased, manually operable lever bar arrangement whereby the same is manually unlatched and automatically latched under the influence of the spring. NASA

N77-27695# Booz-Allen Applied Research, Inc., Bethesda, Md.
APPLICATION OF THE RESPONSE PROBABILITY DENSITY FUNCTION TECHNIQUE TO BIODYNAMIC MODELS Final Report
Robert L. Hershey and Thomas H. Higgins (FAA, Washington, D. C.) 1 Apr. 1977 25 p refs Sponsored by FAA
(AD-A040020; FAA-RD-77-52) Avail: NTIS HC A02/MF A01 CSCL 06/5

The response probability density function technique has applications to predicting probability of injury in a wide range of biodynamic situations. The method, which was developed in connection with sonic boom damage prediction, utilizes the probability density function of the excitation force and the probability density function of the sensitivity of the material being acted upon. The method is especially simple to use when both these probability density functions are lognormal. Studies show that the stresses from sonic booms, as well as the strengths of glass and mortars, are distributed lognormally. Some biodynamic processes also have lognormal distributions, and are therefore amenable to modeling by this technique. The application of the method to the analysis of the thoracic response to air blast and the prediction of skull fracture from head impact is discussed. Author

N77-27696# Civil Aeromedical Inst., Oklahoma City, Okla.
INTERMEDIATE VISUAL ACUITY OF PRESBYOPIC INDIVIDUALS WITH AND WITHOUT DISTANCE AND BIFOCAL LENS CORRECTIONS
Kenneth W. Welsh, Paul G. Rasmussen, and John A. Vaughan Mar. 1977 17 p refs
(AD-A038538/5; FAA-AM-77-7) Avail: NTIS HC A02/MF A01 CSCL 06/14

Visual acuity was determined at the intermediate range for older individuals with various combinations of ocular refractive error and accommodative power. Subjects read numerals ranging in size to measure visual acuity from 20/80 to 20/15 at 51, 76, and 102 cm with 50 fL luminance. Monocular visual acuity scores were determined both with the subject's optimum spectacle lens correction for distance vision and near vision and without lenses. For subjects with low accommodative power, neither the distance nor the near lens correction provides normal vision throughout the intermediate range. Individuals with myopia of less than 2.0 diopters (D) generally have better intermediate visual acuity without correction than with either a near or a distance correction. Younger subjects generally have better acuity under all conditions except subjects with uncorrected myopia exceeding 2.0 D. Author

N77-27697*# Joint Publications Research Service, Arlington, Va.
ROLE OF THE ADRENOCORTICAL REACTION TO PHYSICAL LOAD IN INCREASE IN THE WORKING CAPACITY OF THE BODY
A. A. Viru Washington NASA Jul. 1977 7 p refs Transl. into ENGLISH from Byull. Eksperim. Biol. i Med. (Moscow), no. 7, 1976 p 774-776
(NASA Order W-13183)
(NASA-TM-75026) Avail: NTIS HC A02/MF A01 CSCL 06P

The maximal duration of swimming by rats with a load of 3% of their body weight increased after 5 weeks of training. This time did not increase in animals receiving dexamethasone in the process of training. The blood corticosterone level of these rats with the maximal load increased less than that of animals trained without administration of dexamethasone. Author

N77-27698# Stanford Univ., Calif. Dept. of Statistics.
RELATING SPATIAL DISTRIBUTIONS OF POLLUTANTS TO HEALTH EFFECTS
T. W. Sager 15 Jul. 1976 24 p refs
(Contract EY-76-S-02-2874)
(COO-2874-1; TR-1) Avail: NTIS HC A02/MF A01

A new and potentially useful statistical tool for epidemiology is introduced, and some of its elementary properties are considered. The technique is a promising one for both data analytic and inferential problems. Starting with the collection of isopleths of a spatially distributed explanatory variable (air pollution), the method produces a relationship between the explanatory variable(s) and the response variable (population-adjusted health effects) by accumulating the response within successively wider isopleths. Among other appealing features, the method has some of the flavor of regression, reduces the relationship between three, three-dimensional distributions to a single easily interpreted two-dimensional graph, and effectively utilizes knowledge of the geographic location of data before discarding the location coordinates as nuisance parameters. ERA

N77-27699# Oak Ridge National Lab., Tenn.
TIMED: A COMPUTER PROGRAM FOR CALCULATING CUMULATED ACTIVITY OF A RADIONUCLIDE IN THE ORGANS OF THE HUMAN BODY AT A GIVEN TIME, t, AFTER DEPOSITION
S. B. Watson, W. S. Snyder, and M. R. Ford 1976 154 p refs
(Contract W-7405-eng-26)
(ORNL-CSD-TM-17) Avail: NTIS HC A08/MF A01

TIMED is a computer program designed to calculate cumulated radioactivity in the various source organs at various times after radionuclide deposition. TIMED embodies a system of differential equations which describes activity transfer in the lungs, gastroin-

testinal tract, and other organs of the body. This system accounts for delay of transfer of activity between compartments of the body and radioactive daughters. ERA

N77-27700# Argonne National Lab., Ill.
PULMONARY VENTILATION IMAGING AND FUNCTION STUDIES WITH KRYPTON-81m
E. Kaplan, L. W. Mayron, G. A. Gergans, A. M. Friedman, and J. E. Gindler 1976 14 p refs Presented at IAEA Symp. on Med. Radionuclide Imaging, Los Angeles, 25 Oct. 1976
(Contract W-31-109-eng-38)
(IAEA-SM-210/58; Conf-761060-9) Avail: NTIS HC A02/MF A01

Chronic obstructive lung disease is a significant entity throughout the world. To arrest asymptomatic disease, early diagnosis is required, implying an efficacious, reliable and available methodology, which has the potential for screening suspect populations. Krypton-81m is a 13-second radionuclide that emits a 190 keV gamma ray; it is produced from a rubidium-81- krypton-81m generator and delivery system. The generator effluent, in gaseous form, is continually inhaled by a subject while static equilibrium images and dynamic studies of *ventilation are produced with a gamma scintillation camera system.* The wash-in of/sup 81m/Kr produces heterogeneous images, the activity being proportional to regional ventilation due to rapid decay. Minimal ventilatory delays are detectable. Normal subjects and patients with obstructive lung disease have been evaluated by static equilibrium and dynamic studies. ERA

N77-27701# Oak Ridge National Lab., Tenn.
BIOMEDICAL COMPUTING TECHNOLOGY INFORMATION CENTER: AN INTERNATIONAL RESOURCE FOR TECHNOLOGY SHARING
Betty F. Maskewitz, R. L. Henne (Union Carbide Corp., Oak Ridge, Tenn.), and W. J. McClain (Union Carbide Corp., Oak Ridge, Tenn.) 1976 10 p refs Presented at the IAEA Symp. on Med. Radionuclide Imaging, Los Angeles, 25 Oct. 1976 Sponsored in part by SNM Computer Council and the FDA Bur. of Radiological Health
(Contract W-7405-eng-26)
(IAEA-SM-210/93; Conf-761060-8) Avail: NTIS HC A02/MF A01

The Biomedical Computing Technology Information Center (BCTIC) collects, organizes, evaluates, and disseminates information on computing technology pertinent to biomedicine in general, and nuclear medicine in particular, provides the needed routes of communication between installations, and serves as a clearinghouse for the exchange of biomedical computing software, data, and interface designs. BCTIC services are available to its sponsors and their contractors and to any individual/group willing to participate in mutual exchange. ERA

N77-27702# Argonne National Lab., Ill.
RADIATION CARCINOGENESIS
R. J. Michael Fry 1976 25 p refs Presented at Intern. Conf. on Particles and Radiation Therapy, Berkeley, Calif., 14-17 Sep. 1976
(Contract W-31-109-eng-38)
(CONF-760946-6) Avail: NTIS HC A02/MF A01

The risk of radiation induction of tumors is influenced by the genotype, sex, and age of the patient, the tissues that are exposed, and previous therapy. With chemotherapy the number of cells at risk is usually markedly higher than with radiation therapy. Clearly the problem of the estimation of comparative risks is complex. The current views on the comparative risks, and the importance of the various factors that influence the estimation of risk are presented. ERA

N77-27703# Massachusetts Univ., Amherst.
COMPUTATIONAL TECHNIQUES IN VISUAL SYSTEMS. PART 1: THE OVERALL DESIGN
Michael A. Arbib and Edward M. Riseman Jul. 1976 34 p refs
(Contract N00014-75-C-0459; Grants NSF DCR-75-16098; NS-09755-06)
(AD-A038846; COINS-TR-76-10-Pt-1) Avail: NTIS HC A03/MF A01 CSCL 09/2

The overall goal is to define computational techniques to be used by a system in making a visual scan of a dynamic environment with which it is to interact. Here, both brain mechanisms in the visual systems of animals and humans and computer techniques for the analysis of color photographs of natural scenes are discussed. Schemes as a formalization of the system's knowledge units are presented. This notion is helpful for our work in both the BT (Brain Theory) and AI (Artificial Intelligence) approaches. Further specific studies--from their group and from elsewhere--of subsystems of both animal and computer visual systems are presented. The interaction of high-level processes with low-level systems, as part of a general emphasis on integrated system design are examined. Part II will focus on techniques for segmenting single static colored images. GRA

N77-27704# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND AEROSPACE MEDICINE, NO. 3, 1977
7 Jul. 1977 47 p refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (USSR), no. 31, 1977 p 3-90
(JPRS-69380) Avail: NTIS HC A03/MF A01

The selection and training of cosmonauts, the evaluation and analysis of accumulated data to facilitate the on-going transition from orbital to interplanetary flights, and research aimed at guaranteeing safety on long flights and reliability of the human component of the man spaceship system are discussed. Space psychology and physiology, environmental problems and control, including spacecraft habitability and effects of radiation and weightlessness, and telemetry are among the topics considered. Author

N77-27705 Royal Aircraft Establishment, Farnborough (England).
WHOLE BODY VIBRATION: A MECHANICAL AND PHYSIOLOGICAL STUDY OF WORKING POSTURES AND DRIVERS' SEATS
M. Bjurvald, S. Carlsoeoe, J. E. Hansson, and L. Sjoflot 8 Feb. 1977 27 p refs Transl. into ENGLISH of "Helkpoppsvibrationer en teknisk-fysiologisk studie av arbetsstaellningar och foerarstolar", Arbeteoch halsa-vetenskaplig skriftserie no. 7, Stockholm, Arbeter-Skyddsstyreksen, 1973
(RAE-Lib-Trans-1891; BR58186) Copyright. Avail: Issuing Activity

Mechanical and physiological effects of whole body low frequency vibrations have been studied on male subjects in different standing positions and sitting on different seats. The subjects were exposed to sinusoidal vibrations in vertical and lateral directions at frequencies in the range 1.5 to 8.0 Hz and acceleration level of 0.16g (rms) and 0.28g (rms). EMG recordings have shown some characteristic muscle response to the vibration exposure, and increased oxygen uptake and pulmonary ventilation have occurred in the range of the body natural frequency. Acceleration measurements on the head, shoulder, chest and hip have shown characteristic body response for different postures. The seat design is of special importance for the vibration transmission to the body exposed to lateral vibration. Author

N77-27706 Purdue Univ., Lafayette, Ind.
A DYNAMIC INTERACTIVE COMPUTER GRAPHICS PACKAGE FOR HUMAN MOVEMENT STUDIES Ph.D. Thesis
Donald Ray Riley 1976 149 p
Avail: Univ. Microfilms Order No. 77-1766

The system is broken down into three subsystems: data acquisition and management, two-dimensional analysis, and three-dimensional analysis. The two dimensional analysis compute centers of-gravity, linear and angular displacements, velocities and accelerations, and kinetic energies for both the whole body and the individual body segments. The analyses are performed in a PDP 11/40 minicomputer, and the results are displayed on a Tektronix 4014 storage CRT using software. The user is able to interactively select graphs for viewing by positioning the Tektronix crosshairs in the appropriate box of a menu that is displayed on the screen. In addition, graphs may be scaled to any size, superimposed

on one another, or arbitrarily positioned on the screen. The three dimensional analysis includes extraction of the third dimension from the two dimensional data obtained using the Graf/Pen.
Dissert. Abstr.

N77-27707*# Scientific Translation Service, Santa Barbara, Calif.
SURVEY REPORT OF THE SLEEP TIME ON THE MOSCOW ROUTE
Washington NASA May 1977 38 p Transl. into ENGLISH of "Mosukawa Sen Suimin Jikan Chosa Hokoku", (Tokyo), Oct. 1976 P 1-22
(Contract NASw-2791)
(NASA-TT-F-17530) Avail: NTIS HC A03/MF A01 CSCL 05E

A study is made of fatigue in airline flight crews on the Tokyo-Moscow route. The factors affecting work fatigue are itemized.
Author

N77-27708*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A DUAL-LOOP MODEL OF THE HUMAN CONTROLLER IN SINGLE-AXIS TRACKING TASKS
Ronald A. Hess May 1977 55 p refs
(NASA-TM-73249; A-7064) Avail: NTIS HC A04/MF A01 CSCL 05H

A dual loop model of the human controller in single axis compensatory tracking tasks is introduced. This model possesses an inner-loop closure which involves feeding back that portion of the controlled element output rate which is due to control activity. The sensory inputs to the human controller are assumed to be system error and control force. The former is assumed to be sensed via visual, aural, or tactile displays while the latter is assumed to be sensed in kinesthetic fashion. A nonlinear form of the model is briefly discussed. This model is then linearized and parameterized. A set of general adaptive characteristics for the parameterized model is hypothesized. These characteristics describe the manner in which the parameters in the linearized model will vary with such things as display quality. It is demonstrated that the parameterized model can produce controller describing functions which closely approximate those measured in laboratory tracking tasks for a wide variety of controlled elements.
Author

N77-27709*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ECLSS CONSUMABLES ANALYSIS: ALT CAPTIVE/ACTIVE 1 AND CAPTIVE/ACTIVE 3
G. J. Steines (McDonnell Douglas Technical Services Co., Inc.) Jun. 1977 36 p refs
(NASA-TM-X-74754; JSC-12913) Avail: NTIS HC A03/MF A01 CSCL 06K

A consumables analysis of the environmental control and life support system (ECLSS) was performed for approach and landing test (ALT) captive/active missions 1 through 3 and is also applicable to missions 4 and 5. The ECLSS configuration analyzed and the guidelines and assumptions used in performing the analysis are presented. A projection of ammonia temperatures and pressures during the captive/active 1 mission is also included. The resulting consumables, budgets are presented in tabular and graphic form. Adequate margins were obtained for all systems.
Author

N77-27710*# Virginia Univ., Charlottesville. Dept. of Engineering Science and Systems.
PROCEEDINGS AND FINDINGS OF THE 1976 WORKSHOP ON RIDE QUALITY
A. Robert Kuhlthau, ed. 20 Dec. 1976 86 p refs Proc. held at Fairlee, Vt., 13-15 Oct. 1976 Sponsored by NASA
(Contract DOT-AS-60060)
(NASA-CP-2006; DOT-TST-77-38) Avail: NTIS HC A05/MF A01 CSCL 05H

The workshop was organized around the study of the three basic transfer functions required to evaluate and/or predict passenger acceptance of transportation systems: These are the vehicle, passenger, and value transfer functions. For the purpose of establishing working groups corresponding to the basic transfer functions, it was decided to split the vehicle transfer function into two distinct groups studying surface vehicles and air/marine vehicles, respectively.
Author

N77-27711# Sandia Labs., Albuquerque, N. Mex.
DEVELOPMENT OF A HELMET-MOUNTED PLZT THERMAL/FLASH PROTECTION SYSTEM
J. O. Harris, Jr., J. T. Cutchen, and B. J. Pfoff (US Air Force) 1976 10 p refs Presented at 14th Ann. Safe Symp., San Diego, Calif., 13 Sep. 1976
(Contract E(29-1)-789)
(SAND-76-5894; Conf-760976-1) Avail: NTIS HC A02/MF A01

PLZT thermal/flash protective (TFPD's) goggles to prevent exposure and resultant eye damage from nuclear weapon detonations are reported. The primary emphasis of the present program is to transfer technology and establish production capability for helmet-mounted PLZT/TFPD goggles for USAF flight crews, with a non-helmet-mounted configuration to follow. The operating principles of the PLZT/TFPD goggle device are briefly outlined, and the device configuration and operational characteristics are described.
ERA

N77-27712# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
WORKING PAPERS IN ACQUISITION OF KNOWLEDGE FOR IMAGE UNDERSTANDING Interim Report
Omer Akin, Raj Reddy, Ronald Ohlander, and Marty Schultz 15 Dec. 1977 60 p refs
(Contract F44628-73-C-0074; AF Proj. 2304)
(AD-A037769; AFOSR-77-0325TR) Avail: NTIS HC A04/MF A01 CSCL 09/2

Use of knowledge has facilitated complex problem solving in many areas of research. However, in the Image Understanding area, we do not have any systematic treatment and codification of knowledge that is useful in image perception. Further, we do not even have adequate tools for acquiring the necessary knowledge base. In this report we present an experimental paradigm for knowledge acquisition, discuss an analysis technique, and illustrate the different types of knowledge that seem to be useful in image understanding research. In the first paper, three major aspects of knowledge are presented: primitive feature extraction operators, rewriting rules, and flow of control. The second paper discusses the picture-puzzle paradigm and the various ways in which it can be used as a tool for acquisition of knowledge. The third paper deals with a computer program that assists the transcription of typical protocols obtained from the picture puzzle tasks. Finally, the last paper of the report discusses the pros and cons of using eye-fixation data to acquire knowledge used in some of the tasks of the picture-puzzle paradigm. The total effort represents an account of the initial results of a new experimental paradigm. We hope that this will provide a sound basis for understanding the issues of knowledge used in visual perception and aid in the modelling of seeing systems.
GRA

N77-27713# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
CRITICAL REVIEW AND ANALYSIS OF PERFORMANCE MODELS APPLICABLE TO MANMACHINE SYSTEMS EVALUATION Interim Scientific Report, 1 Oct. 1975 - 30 Sep. 1976
Richard W. Pew, Carl E. Feehrer, Sheldon Baron, and Duncan C. Miller Mar. 1977 306 p refs
(Contract F44620-76-C-0029)
(AD-A038597; BBN-3446; AFOSR-77-0520TR) Avail: NTIS HC A14/MF A01 CSCL 05/8

This report focuses on the review of potentially relevant models and on the identification of issues in model development and application that may have an important impact on models for large-scale, man-machine systems. A detailed and critical evaluation of several classes of human-performance models is presented. Interrelations among existing models are examined, and an evaluation is made on the needs and gaps in the technology. Modelling issues are identified, and research recommendations

indicated. Approximately forty models, techniques that have some applicability to the simulation modelling program are abstracted in the Appendix. Author (GRA)

N77-27714# Naval Postgraduate School, Monterey, Calif.
INVESTIGATION OF USER GENERATED COCKPIT DISCREPANCIES IN NAVAL AIRCRAFT M.S. Thesis
Frederick George Schobert, Jr. Sep. 1976 58 p refs
(AD-A038774) Avail: NTIS HC A04/MF A01 CSCL 01/3

This thesis analyzes problems in current Naval aircraft as reported by fleet aviators attending the U.S. Naval Aviation Safety School. A method is developed which facilitates the collection and processing of the reported information. A collective sample of 286 incidents is stratified into a design discrepancy outline which illuminates 31 specific problem areas. Various recommendations are made concerning concept expansion to a fleet-wide level. Author (GRA)

N77-27715# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
IMPACT TESTS OF A NEAR-PRODUCTION AIR CUSHION RESTRAINT Final Report, Jan. 1972 - Sep. 1975
J. W. Brinkley, G. C. Mohr, H. C. Russell, S. M. Cooper, and J. T. Schaffer Feb. 1977 398 p refs
(Contract DOT-HS-017-1-017-1A)
(PB-265156/0; AMRL-TR-75-47; DOT-HS-802-248) Avail: NTIS HC A17/MF A01 CSCL 13F

A series of impact tests were accomplished to demonstrate the protection provided by an automotive air bag restraint system for the center and right front passengers. Fifteen young healthy male volunteers were impacted at velocities ranging from 14.9 to 30.8 miles per hour. Impact acceleration-time histories approximated automotive barrier crash profiles. The results of dummy tests preceding human testing are summarized and detailed test data are presented from 33 impact tests with volunteer subjects. Test data are compared with similar data collected during earlier impact tests of a prototype air bag restraint system. GRA

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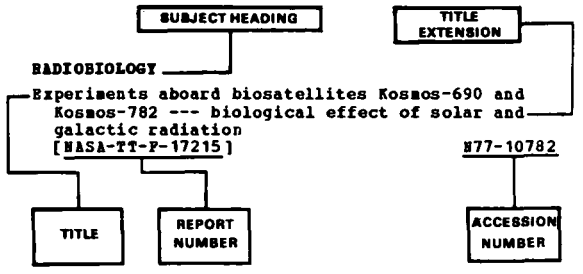

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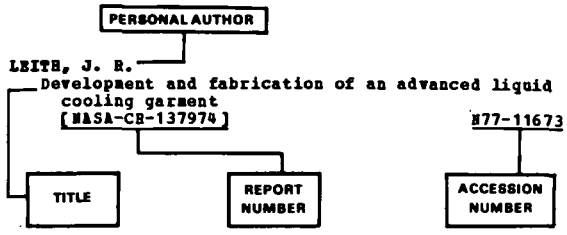

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1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA SP-7011 (172)		

4. Title and Subtitle	5. Report Date
AEROSPACE MEDICINE AND BIOLOGY A Continuing Bibliography (Supplement 172)	October 1977
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
	10. Work Unit No.
9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, DC 20546	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

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17. Key Words (Suggested by Author(s))	18. Distribution Statement
Aerospace Medicine Bibliographies Biological Effects	Unclassified - Unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price*
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