NASA SP-7011 (103)

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 103)

JUNE 1972

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ACCESSION NUMBER RANGES

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

STAR (N-10000 Series)	N72-17986— N72-19990
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NASA SP-7011 (103)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 103)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in May 1972 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 363 reports, articles, and other documents announced during May 1972 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, irregular 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 on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied 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 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.

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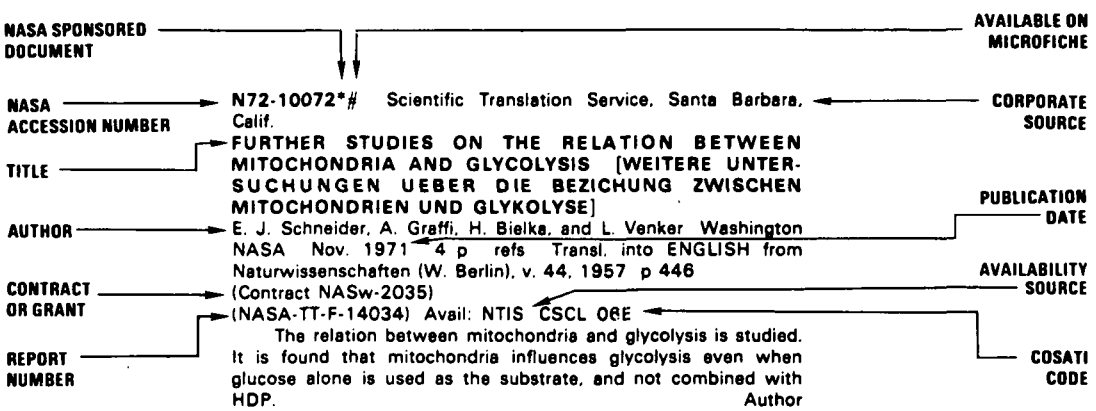

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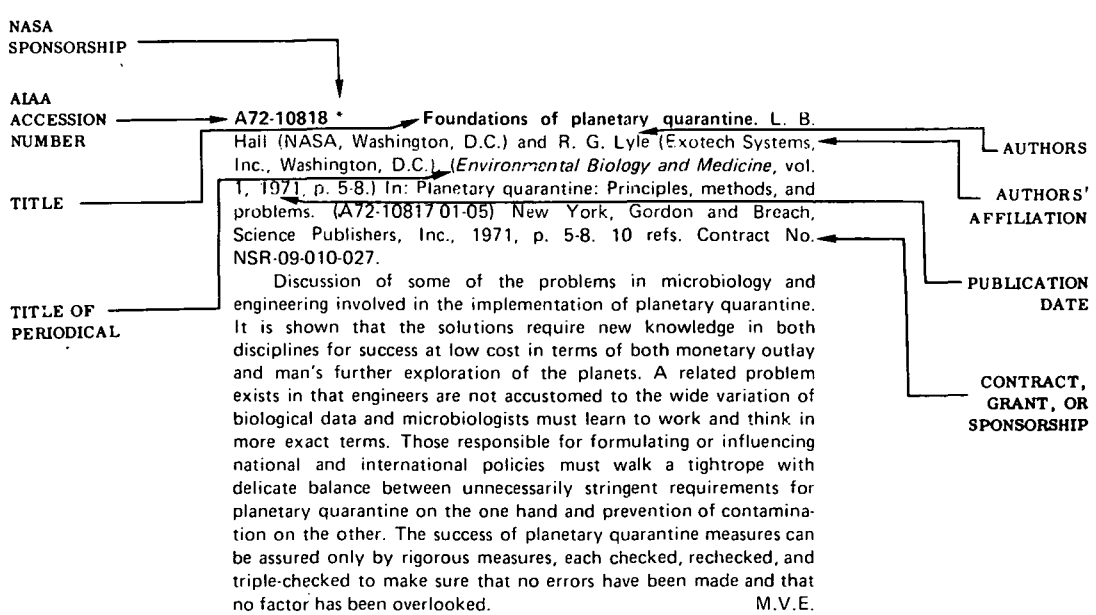

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 103) JUNE 1972

IAA ENTRIES

A72-22222 # **Basic questions concerning the mechanism of excitation-contraction coupling in the myocardium (Osnovnye voprosy mekhanizma sopriazheniia vozbuzhdeniia i sokrashcheniia v miokarde).** R. S. Orlov and V. Ia. Izakov (Sverdlovskii Meditsinskii Institut, Sverdlovsk, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 2, Oct.-Dec. 1971, p. 3-23. 178 refs. In Russian.

Consideration of the role of excitation-contraction coupling processes in the heart muscle as an independent part of the problem of regulation and self-regulation of the heart. A review is presented of current data on the structural features of surface membranes and the sarcoplasmatic reticulum. The functional properties of the structures ensuring excitation-contraction coupling are described, as well as the role of and interrelation between certain protostructures at the molecular level in the process of contraction and relaxation. On the basis of literature data and the authors' own findings an analysis is made of the relation between electrical and chemical processes in the excitation-contraction coupling mechanism, and a hypothesis is developed concerning the leading role of the surface cellular membrane in this process. The action potential of heart cells is considered not only from the standpoint of a trigger device required to initiate a contraction, but as an important element in the system regulating the transport, storage, and liberation of sodium and calcium ions. In conclusion, it is suggested that three types of excitation-contraction coupling exist in the myocardium. A.B.K.

A72-22223 # **Sleep - Neurophysiological, vegetative, psychological, chemical, and pathophysiological aspects (Son - Neirofiziologicheskie, vegetativnye, psikhologicheskie, khimicheskie i patofiziologicheskie aspekty).** A. M. Vein, N. N. Iakhno, V. S. Rotenberg, N. A. Vlasov, and L. I. Sumskii (I Moskovskii Meditsinskii Institut, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 2, Oct.-Dec. 1971, p. 24-72. 461 refs. In Russian.

Discussion of questions concerning the electrophysiological phenomenology of sleep, neurophysiological studies of sleep, the state of the vegetative sphere and the nature of psychic activity during sleep, and the chemistry of sleep. The electrophysiological characteristics of various stages of sleep are described, and a study is made of vegetative and metabolic changes occurring during sleep. The phasic and tonic components of physiological changes occurring during sleep are investigated, and an analysis is made of the systemic and neuron mechanisms of organization of sleep. A detailed study is made of changes in psychic activity and body chemistry occurring during sleep, and certain pathophysiological mechanisms of disturbance of sleep and wakefulness are reviewed, noting, in particular, the sleep patterns of patients suffering from narcolepsy, schizophrenia, epilepsy, and brain tumors. In conclusion, the clinical forms and pathological states accompanying disturbed or inadequate sleep are evaluated in patients suffering from manic-depressive psychosis. A.B.K.

A72-22224 # **Neurophysiological mechanisms of sleep (Neirofiziologicheskie mekhanizmy sna).** D. G. Shevchenko (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 2, Oct.-Dec. 1971, p. 73-99. 175 refs. In Russian.

Review of the present state of knowledge concerning sleep mechanisms from the neurophysiological standpoint, starting from an analysis of the basic trends in the development of the numerous theories about sleep. The participation of various structures in the onset of sleep is considered from the standpoint of 'active' and 'passive' theories. By comparing the overall activity, cellular activity (spontaneous and evoked), and the evoked potentials during the states of sleep and wakefulness, it is shown that sleep is not accompanied by a general reduction of the level of activity of the cortex and subcortical formations. Particular attention is paid to the concepts of the Anokhin school concerning an interaction between the cortex and subcortical structures in the development of a complete picture of sleep as an adaptive factor of the organism. A.B.K.

A72-22225 # **Physiological mechanisms of certain basic patterns of ontogenesis (Fiziologicheskie mekhanizmy nekotorykh osnovnykh zakonomernostei ontogeneza).** I. A. Arshavskii (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Uspekhi Fiziologicheskikh Nauk*, vol. 2, Oct.-Dec. 1971, p. 100-141. 114 refs. In Russian.

Consideration of the energy aspects of individual development which are regarded as leading factors in ontogenesis. A critical analysis is made of the main theories of ontogenesis, giving special attention to a theory known as the 'energetic surface rule.' Comparitive ontogenetic data obtained from representatives of various species of mammals are evaluated, showing that these animals fail to meet the requirements of the surface rule. A theory called the 'energetic motor activity rule' is formulated by the author. The essence of this rule is that motor activity, which arises from the beginning of the existence of the organism in the form of a zygote, is a factor of functional induction of excess anabolism. The latter is the main negentropy factor determining the growth and development of an organism. A.B.K.

A72-22238 # **Experimental brain hypoxia.** D. Bartko (Komenského Universita, Bratislava, Czechoslovakia). Bratislava, Publishing House of the Slovak Academy of Sciences; Baltimore, Md., University Park Press, 1971. 182 p. 399 refs. Price, US dollars 12.50.

Notions and concepts on the most important pathophysiological mechanisms of the origin and course of acute cerebral hypoxia are surveyed. Certain anatomical differences between cerebral vessels in man and the dog are described. The contemporary state of the problem of experimental cerebral hypoxia is reviewed. Experiments are described which investigated changes in hemodynamics, energy metabolism, and electrolyte and water movement in cerebral hypoxia. Changes in proteins and protein fractions of blood serum in cerebral and peripheral venous blood were followed. F.R.L.

A72-22336 # **The transition range in the steady-state current-voltage characteristics of Ranvier's node, its control by a group of altered external solutions and morphological effects on the nerve fiber connected with it (Der Übergangsbereich in der stationären Strom-Spannungskennlinie des Ranvierschen Schnürrings; seine Beeinflussung durch eine Gruppe veränderter Aussenlösungen und damit verbundene morphologische Wirkungen auf die Nervenfaser).** H. Barske. München, Technische Universität, Fakultät für allgemeine Wissenschaften, Dr.-Ing. Dissertation, 1971. 94 p. 33 refs. In German.

Steady-state conductivity characteristics of the membrane were investigated, taking into consideration the microscopic and submicroscopic structure of the myelin. Effects of extracellular solutions on the membrane were studied. These solutions differed from each other with regard to their osmolar properties, their calcium ion concentrations, and their pH values. In a number of solutions the water was replaced by deuterium oxide. It was found that hypotonic and alkaline solutions displace the transition range of the current-voltage characteristics in the direction of the polarization. Solutions with low calcium ion concentrations had the same effect. Structural changes are apparently connected with an increase in the water content of the membrane. G.R.

A72-22454 **A simple heart model designed to demonstrate biological system simulation.** A. M. Cook and J. G. Simes (Sacramento State College, Sacramento, Calif.). *IEEE Transactions on Biomedical Engineering,* vol. BME-19, Mar. 1972, p. 97-100. 12 refs.

A third-order model of the cardiovascular system which is designed to illustrate biological system simulation to bioengineering students and to introduce the students to a maximum number of analog computer components is described. The extreme simplicity of the model allows the students to concentrate on the simulation and computation without the additional burden of physiological complexity. Heart pumping action is derived from a variable capacitor, and the systemic circulation is modeled as an RC filter. The data obtained from this model show good correlation with observed data. After presentation of this simple model in class, the students are asked to improve the simulation by including any or all of several improvements which are suggested in this paper. (Author)

A72-22455 * **Cardiovascular system simulation in biomedical engineering education.** V. C. Rideout (Wisconsin, University, Madison, Wis.). *IEEE Transactions on Biomedical Engineering,* vol. BME-19, Mar. 1972, p. 101-107. 25 refs. Grant No. NGR-50-002-083.

Use of complex cardiovascular system models, in conjunction with a large hybrid computer, in biomedical engineering courses. A cardiovascular blood pressure-flow model, driving a compartment model for the study of dye transport, was set up on the computer for use as a laboratory exercise by students who did not have the computer experience or skill to be able to easily set up such a simulation involving some 27 differential equations running at 'real time' rate. The students were given detailed instructions regarding the model, and were then able to study effects such as those due to septal and valve defects upon the pressure, flow, and dye dilution curves. The success of this experiment in the use of involved models in engineering courses was such that it seems that this type of laboratory exercise might be considered for use in physiology courses as an adjunct to animal experiments. F.R.L.

A72-22456 **Interaction model between the circulatory and respiratory systems.** V. Albergoni (Padova, Università, Padua, Italy), C. Cobelli, and G. Torresin (CNR, Laboratorio per l'Elettronica Biomedica, Padua, Italy). *IEEE Transactions on Biomedical Engineering,* vol. BME-19, Mar. 1972, p. 108-113. 17 refs. Research supported by the Consiglio Nazionale delle Ricerche.

Study designed to illustrate the gas exchange (O2 and CO2) between pulmonary blood and alveolar air. In the model, circulatory and respiratory systems have been separately simulated in order to obtain the driving functions of the interaction model. This last takes into account oxygen and carbon dioxide exchanges between alveolar air and pulmonary blood. The circulation model is simulated by an RLC network which has proper auto- and mutual admittances. Cardiac pressures have been considered as driving functions, and arterial and venous blood flows are so obtained. The respiratory model is simulated by a block, with proper resistance and compliance with respiratory muscle effort as a driving force and tidal volume as output function. The significant variables of the interaction model are alveolar air and pulmonary blood concentrations of O2 and CO2. These are determined from blood flows and tidal volume previously obtained and from gas diffusion across the alveolar membrane. The capillary bed is divided into a discrete number of cells and time in finite intervals, and then the diffusion law is solved with a finite-difference method. The particular interest of the method is in the step-by-step procedure which makes it possible to obtain a complex model from the combination of simpler models. (Author)

A72-22498 # **The role of negative and positive emotional states in variations of the blood cholesterol content and the arterial pressure level /Experimental investigation/ (O roli otritsatel'nykh i polozhitel'nykh emotsional'nykh sostoianii v izmeneniiakh soderzhaniia kholesterina krovi i urovnia arterial'nogo davleniia /Eksperimental'noe issledovanie/).** N. L. Iastrebtsova and L. V. Simutenko (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 201, Dec. 1, 1971, p. 1001-1003. 11 refs. In Russian.

Study of the changes occurring in the blood cholesterol level and arterial blood pressure in dogs made to experience negative and positive emotional states by stimulation of appropriate subcortical formations with implanted electrodes. It is found that a negative emotional reaction of defensive nature is always accompanied by a prolonged increase in the blood cholesterol content and a quickening of the heart contractions. A positive emotional reaction, on the other hand, leads to a decrease in blood cholesterol and, in most cases, to a slowing down of the heart contraction rate. It is suggested that the parallelism observed in most of the experiments between changes in the blood cholesterol content and the arterial pressure level may attest to a common genesis of atherosclerosis and hypertension as a result of disturbances of the subcortical regulation of vegetative functions during nervous stresses. A.B.K.

A72-22524 **Relative biological effectiveness of X-rays delivered at very high dose rates to radish seeds /Raphanus sativus/.** S. Kronenberg, R. Lux, and K. Nilson (U.S. Army Institute for Exploratory Research, Fort Monmouth, N.J.). *Radiation Research,* vol. 47, Sept. 1971, p. 589-597.

The relative biological effectiveness (RBE) of X rays delivered at rates as low as 10 billion rad/sec to Raphanus sativus has been observed to decrease strongly as a function of dose rate. This decrease suggests that nonlinear effects may significantly affect the RBE at sufficiently high dose rates. M.V.E.

A72-22615 # **Flicker and pattern detection - A comparison of thresholds.** U. T. Keesey (Wisconsin, University, Madison, Wis.). *Optical Society of America, Journal,* vol. 62, Mar. 1972, p. 446-448. 12 refs. Grant No. NIH-EY-00308.

Determination of threshold amounts of light variation needed to see flicker and to see a flickering line, as functions of frequency of variation, which are significantly different. Sensitivity to flicker increases between 0.4 and approximately 10 Hz, and shows a subsequent decrease at higher frequencies. Sensitivity to spatial contrast decreases gradually between 3 and 30 Hz. F.R.L.

A72-22616 # **Temporal summation during dark adaptation.** B. R. Stewart (Columbia University, New York, N.Y.). *Optical Society of America, Journal,* vol. 62, Mar. 1972, p. 449-457. 35 refs. Research supported by Columbia University; NSF Grant No. GB-5947; Grant No. PHS-EY-00375.

The change of critical duration and of the form of the function relating threshold energy to stimulus duration was determined during the first 22 s of dark adaptation following light adaptation to several luminances. For all adapting luminances tested, the critical duration increased during dark adaptation from the value obtained for the increment threshold. As adapting luminance decreased or time in the dark increased, the form of the summation function changed, so that the transition from complete temporal summation to no summation became less abrupt. The data show departures from the equivalent background analysis of dark adaptation. A filter model relating threshold energy and time constant under varying adaptation conditions provides a general, but not precise, description of the data. The change of temporal summation during dark adaptation is similar to that found for decreased size of test field, decreased wavelength of test field, and decreased background luminance. (Author)

A72-22617 **Three-color visual response.** W. A. Thornton (Westinghouse Electric Corp., Bloomfield, N.J.). *(Optical Society of America, Annual Meeting, Ottawa, Canada, Oct. 5-8, 1971.) Optical Society of America, Journal,* vol. 62, Mar. 1972, p. 457-459. 9 refs.

The chromaticity of an element in any visual scene is established with minimum power input to the eye when light from the element is composed of a mixture of spectral colors near 450, 540, and 610 nm. In white light, these are chromatically the most effective wavelengths for color discrimination of illuminated objects. Least-effective wavelengths are near 500 and 580 nm; these are shown to be harmful in the sense of causing confusion. Various experiments indicate that three-color response of human vision consists of well-separated channels peaking near 450, 540, and 610 nm. This response is related to the color-matching functions of the 1931 CIE Standard Observer and to brightness per watt of spectral colors. (Author)

A72-22619 **Relations between proposed cone sensitivities and Wright's discrimination lines.** T. Seim (Oslo, Universitetet, Oslo, Norway). *Optical Society of America, Journal,* vol. 62, Mar. 1972, p. 461, 462. 10 refs.

Attempt to determine what would happen to the color-step length if proposed cone-response curves were used as foundations for uniform-chromaticity-scale (USC) diagrams. To simplify the analysis the consideration of discrimination data is restricted to Wright's (1941) results. However, the number of color steps has been extended to 366 by extrapolations of smoothed curves through the observation points along each of the 35 lines in the chart. Results seem to suggest that it is possible to make a good UCS diagram based upon at least six sets of the suggested cone-sensitivity functions, and it also seems possible to group these functions into two classes according to the relative sensitivities of three weighted maxima. F.R.L.

A72-22641 * **The effect of temperature on the survival of microorganisms in a deep space vacuum.** C. A. Hagen, J. F. Godfrey (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.; Avco Corp., New York, N.Y.), and R. H. Green (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Space Life Sciences,* vol. 3, Dec. 1971, p. 108-117. 9 refs.

A space molecular sink research facility (Molsink) was used to evaluate the ability of microorganisms to survive the vacuum of outer space. This facility could be programmed to simulate flight spacecraft vacuum environments at pressures in the .1 nanotorr range and thermal gradients (30 to 60 C) closely associated to surface temperatures of inflight spacecraft. Initial populations of Staphylococcus epidermidis and a Micrococcus sp. were reduced approximately 1 log while exposed to -105 and 34 C, and approximately 2 logs while exposed to 59 C for 14 days in the vacuum environment. Spores of Bacillus subtilis var. niger were less affected by the environment. Initial spore populations were reduced 0.2, 0.3, and 0.8 log during the 14-day vacuum exposure at -124, 34, and 59 C, respectively. (Author)

A72-22642 * **Embryogenesis in 100% O2 at reduced pressure.** H. S. Weiss and M. Grimard (Ohio State University, Columbus, Ohio). *Space Life Sciences,* vol. 3, Dec. 1971, p. 118-124. 22 refs. Grant No. NGR-36-008-004.

Fertile chicken eggs were incubated in an altitude chamber in a near 100% O2 atmosphere at 225 torr. Both N2 and CO2 were kept under 0.5%. Temperature was a standard 37.5 C but a high relative humidity of 90% was required to prevent dehydration. In ten trials involving 382 eggs, hatchability averaged 21% of controls and weight of chicks was 11% less than controls, but embryo mortality was distributed similarly. Low pressure per se and small differences in O2 tension may have affected the results, but similarities to incubation in 21% O2-79% He call attention to absence of nitrogen as a possible explanation. (Author)

A72-22643 **Circadian periodicity of plasma cortisol levels - Effect of random living schedule in man.** G. C. Curtis (Eastern Pennsylvania Psychiatric Institute, Philadelphia, Pa.) and M. L. Fogel (Pennsylvania, University, Philadelphia, Pa.). *Space Life Sciences,* vol. 3, Dec. 1971, p. 125-134. 25 refs. Grant No. NIH-5-M01-RR-40.

Six normal subjects lived for two weeks on disorganized schedules in which they were in bed for four 2-hr periods per day at random intervals. Meals were also served on a random schedule. Subjects varied in their ability to adapt their sleep to such schedules. One subject achieved an excellent adaptation, one very good, and two fairly good. Circadian periodicity of plasma corticosteroid levels was not greatly affected by the experiment, but became 'noisier' in most subjects, possibly because of irregularity of individual cortisol secretory episodes within the circadian cycle. The results do not encourage the belief that circadian adrenal periodicity depends upon the cumulative effects of regular living schedules. (Author)

A72-22644 **Truth table classification and identification.** E. W. Rypka (Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.). *Space Life Sciences,* vol. 3, Dec.

1971, p. 135-156. 43 refs. Grants No. NIH-AI-16385-02; No. NIH-AI-16385-03.

A logical basis for classification is that elements grouped together and higher categories of elements should have a high degree of similarity with the provision that all groups and categories be disjoint to some degree. A methodology has been developed for constructing classifications automatically that gives nearly instantaneous correlations of character patterns of organisms with time and clusters with apparent similarity. This means that automatic numerical identification will always construct schemes from which disjoint answers can be obtained if test sensitivities for characters are correct. Unidentified organisms are recycled through continuous classification with reconstruction of identification schemes. This process is cyclic and self-correcting. The method also accumulates and analyzes data which updates and presents a more accurate biological picture. (Author)

A72-22645 * Interstellar molecules and the origin of life. D. Buhl (National Radio Astronomy Observatory, Green Bank, W. Va.) and C. Ponnamperuma (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.). *Space Life Sciences,* vol. 3, Dec. 1971, p. 157-164. 13 refs.

Synopsis of the various views expressed at the conference held at NASA Ames Research Center in February 1971 on the relationship of interstellar molecules to the origin of life, intended to provide a basis for future discussion and work in this area. The topics covered include: a summary of molecules discovered, the interstellar environment, laboratory measurements, chemical evolution, and exobiology. M.V.E.

A72-22646 A scientist in the cockpit - The case history and analysis of a UFO sighting. H. Wichman (California State College, San Bernardino, Calif.). *Space Life Sciences,* vol. 3, Dec. 1971, p. 165-170. 7 refs.

A UFO sighting took place during a night instrument training flight on which the author served as flight instructor. The UFO was in the form of a bright light approaching on a collision course at a very high rate of speed - a rapid deceleration and hovering - a rapid acceleration away from the author's plane followed by another deceleration and hovering. This apparent reconnoitering activity was repeated approximately ten times after which the object failed to reappear. The paper describes the struggle the author went through, after the first stages of alarm subsided, in an attempt to explain by means of scientific principles what was being seen. A satisfactory tentative explanation was discovered and the method by which this came about is discussed as is the manner in which the explanation was tested in the cockpit. (Author)

A72-22647 *Comparison of tolerance to hypoxia and* hyperoxia in chinchillas and guinea pigs. H. E. Ederstrom, T. K. Akers, K. R. Keefner, and R. E. Thompson (North Dakota, University, Grand Forks, N. Dak.). *Space Life Sciences,* vol. 3, Dec. 1971, p. 171-173. Contract No. N00014-68-A-0499.

Pressure-chamber experiments were performed on Chinchilla laniger, raised on a commercial fur ranch in the Cascade Mountains, for the purpose of investigating chinchilla tolerance to hypoxia or hyperbaric oxygen as compared with another small rodent, the guinea pig. When subjected to progressive hypoxia, the chinchilla survived longer and at lower PO2 levels than did guinea pigs of about the same size. Possibly, the smaller but more numerous red blood cells in the chinchillas accounted for their greater tolerance to hypoxia. In hyperoxic exposures, no differences in survival characteristics were found between the two species. M.V.E.

A72-22648 Effect of immobilization on urinary catecholamine excretion and blood-thyroxine level in rats. L. Tomaszewska, H. Kaciuba-Uściłko, B. Reklewska, J. Sobocińska, and S. Kozłowski (Polish Academy of Sciences, Medical Research Center and Institute of Animal Physiology and Nutrition; Szkoła Główna Gospodarstwa Wiejskiego; Akademia Medyczna, Warsaw, Poland). *Space Life Sciences,* vol. 3, Dec. 1971, p. 174-176. 10 refs.

Investigation of changes in the adrenergic system and in thyroid gland activity in rats during prolonged immobilization. The lower level of thyroxine in the blood of immobilized rats indicates that inactivity causes an inhibition of the release of thyroxine from the thyroid gland and confirms Brown-Grant's (1957) earlier observations. M.V.E.

A72-22777 Man and technology in orientation and navigation (Mensch und Technik in Ortung und Navigation). H. Schmidtke (München, Technische Universität, Munich, West Germany). *(Deutsche Gesellschaft für Ortung und Navigation, Nationale Tagung über Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct. 26, 27, 1971.) Ortung und Navigation,* no. 4, 1971. 18 p. In German.

Many modern systems employ human beings as components. Questions regarding the effectiveness of such systems are investigated, giving particular attention to the influence of the human factor. The availability of mechanical and electronic components with extremely great switching speeds and capacities makes it difficult for the design engineer to integrate man and machine harmonically into one system. Weaknesses and special abilities of human beings have to be carefully considered in each case in order to arrive at an optimally designed system. G.R.

A72-22779 Anthropotechnical aspects of taxiing /pilot/ and taxi-guidance /flight manager/ of aircraft in the landing area (Anthropotechnische Aspekte der Rollführung /Pilot/ und der Bewegungslenkung /Flugleiter/ von Flugzeugen auf dem Rollfeld). C. Wöltge (Hannover, Technische Universität, Hanover, West Germany). *(Deutsche Gesellschaft für Ortung und Navigation, Nationale Tagung über Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct. 26, 27, 1971.) Ortung und Navigation,* no. 4, 1971. 54 p. 26 refs. In German.

The motions of aircraft in the landing area are subject to air traffic regulations. The flight manager assigns to the pilot a runway and an approach to the apron. Aircraft motions are controlled from the control tower on the basis of visual observations. It is pointed out that the present approach for the guidance of aircraft on the ground will not be satisfactory any more in the future because of orientation and observation problems occurring in connection with increasing air traffic. A computer-based operational system of great reliability will be required. Various factors involved in the motions of aircraft on the ground are discussed, giving particular attention to operational aspects. G.R.

A72-22780 Automation in aeronautics from the point of view of the pilot (Automation in der Luftfahrt aus der Sicht des Flugzeugführers). R. D. Andres (Deutsche Lufthansa AG, Frankfurt am Main, West Germany). *(Deutsche Gesellschaft für Ortung und Navigation, Nationale Tagung über Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct. 26, 27, 1971.) Ortung und Navigation,* no. 4, 1971. 12 p. In German.

Scope and effects of automation concerning the planning and the execution of flights are considered, giving attention also to the reasons for an introduction of automation and its limitations. It is shown that these limitations are continuously being reduced in favor of automation because of new advances in technology. A highly automatic system will be the end result of this development. G.R.

A72-22781 **Division of labor between man and machine in aircraft-based flight control - Development, status, and technology (Die Arbeitsteilung Mensch - Maschine in der bordseitigen Flugführung - Entwicklung, Stand und Technik).** R. K. Bernotat (Forschungsinstitut für Anthropotechnik, Meckenheim, West Germany). *(Deutsche Gesellschaft für Ortung und Navigation, Nationale Tagung über Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct. 26, 27, 1971.) Ortung und Navigation,* no. 4, 1971. 11 p. 7 refs. In German.

The operations which can be performed by man in aircraft-based flight control are briefly examined, and trends towards automatic control are discussed. Criteria for optimal division of operations into those which should be performed by the pilot and those which are better undertaken by the machine are related to a high technical performance of the entire system, economic factors, and questions of job satisfaction for the pilot. Stages in the development of a fully automatic system are considered. G.R.

A72-22784 **Flight control systems for VSTOL aircraft from an anthropotechnical point of view (Flugführungssysteme für VSTOL-Flugzeuge aus anthropotechnischer Sicht).** K. Brammer and G. Schweizer (Dornier AG, Friedrichshafen, West Germany). *(Deutsche Gesellschaft für Ortung und Navigation, Nationale Tagung über Mensch und Technik in Ortung und Navigation, Essen, West Germany, Oct. 26, 27, 1971.) Ortung und Navigation,* no. 4, 1971. 24 p. In German.

Systems for the control of VSTOL and conventional aircraft are compared, taking into account the significant landing characteristics in both cases. The limits of human capability have to be considered in the design of the equipment for the control of a VTOL. Various approaches for the control of a VTOL are discussed. A control algorithm is described, and questions regarding the most suitable instrumentation of the aircraft are explored. G.R.

A72-22821 * **Simulation of a steady-state integrated human thermal system.** F. T. Hsu, L. T. Fan, and C. L. Hwang (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.). *Computers in Biology and Medicine,* vol. 2, Feb. 1972, p. 59-79. 10 refs. Contract No. F44620-68-0020; Grant No. NGR-17-001-034. Project THEMIS.

The mathematical model of an integrated human thermal system is formulated. The system consists of an external thermal regulation device on the human body. The purpose of the device (a network of cooling tubes held in contact with the surface of the skin) is to maintain the human body in a state of thermoneutrality. The device is controlled by varying the inlet coolant temperature and coolant mass flow rate. The differential equations of the model are approximated by a set of algebraic equations which result from the application of the explicit forward finite difference method to the differential equations. The integrated human thermal system is simulated for a variety of combinations of the inlet coolant temperature, coolant mass flow rate, and metabolic rates. Two specific cases are considered: (1) the external thermal regulation device is placed only on the head and (2) the devices are placed on the head and the torso. The results of the simulation indicate that when the human body is exposed to hot environment, thermoneutrality can be attained by localized cooling if the operating variables of the external regulation device(s) are properly controlled. (Author)

A72-22863 **Impulse propagation from photically discharged neurones in the visual system.** B. Blum, V. Godel, S. Gitter, and R. Stein (Tel-Hashomer Hospital, Tel Aviv, Israel). *(International Union of Physiological Sciences, International Congress of Physiological Sciences, 25th, Munich, West Germany, July 25-31, 1971.) Pflügers Archiv,* vol. 331, no. 1, 1972, p. 38-43. 18 refs. Research supported by the L. E. Phillips Fund of Psychobiological Research.

Evidence is presented for direct pathways leading from superior colliculus to dorsal and to ventral lateral geniculate nuclei. In the case of the former pathway, it is shown that impulse propagation under photically induced discharges of neurons may be differentiated from that under spontaneous discharges of the same neurons. M.V.E.

A72-22864 **Force-velocity relations of isotonic relaxation (Kraft-Geschwindigkeits-Beziehungen der isotonischen Relaxation).** B. E. Strauer (Göttingen, Universität, Göttingen, West Germany). *Pflügers Archiv,* vol. 331, no. 1, 1972, p. 44-56. 13 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft.

Study of the force-velocity relations of isotonic relaxation in cat papillary muscles using isotonic afterloaded contractions. At a constant preload the peak velocity of isotonic relaxation successively rises with increments of afterload. It becomes maximum at loads of 30% of P sub zero then declines and becomes zero at the maximum isometric tension. Increasing the preload shifts the force-velocity relations of isotonic relaxation upward and to the right. At preloads more than L sub max, however, the force-velocity curves of relaxation are depressed again at each level of afterload due to a successive reduction of the peak velocity of isotonic relaxation. The relations are markedly influenced by different temperatures, various frequencies of stimulation and inotropic interventions; their typical shape, however, qualitatively remains constant. The results are discussed with reference to the three-element model of cardiac muscle. They give evidence for both the existence of at least one viscous property in series to the contractile element and the contribution of a parallel elastic element to isotonic relaxation velocity at high initial muscle lengths. (Author)

A72-22876 # **Methodological errors in current concepts concerning the period of clinical death and the mechanism of biological death (Do pitannia pro metodologichni pomilki v suchasnikh uiavlenniakh pro trivalist' klinichnoi ta mekhanizm biologichnoi smerti).** N. P. Adamenko (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Nov.-Dec. 1971, p. 723-732. 50 refs. In Ukrainian.

Studies dealing with various concepts of death and reanimation are reviewed with particular attention to conceptual and methodological errors in the definition of death. Among the errors noted are the absoluteness of clinical death within 5 to 6 hr without massive revival attempts or exhaustion of self-reanimation potential of the organism, and some erroneous interpretations of irreversible histological alterations. V.Z.

A72-22877 # **Thermal stability of blood serum proteins during diencephalic syndromes (Teplostiikist' sirovatkovikh bilkiv krovi pri dientsefal'nikh sindromakh).** O. F. Makarchenko, B. A. Roitrub, G. D. Dinaburg, and R. P. Poltorats'kii (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Nov.-Dec. 1971, p. 745-750. 14 refs. In Ukrainian.

Thermal stability kinetics of proteins was investigated at 56 C in blood serum samples by measuring the protein solution turbidity after isoelectrical precipitation of proteins. The blood serum samples were from healthy persons and from patients with diencephalic vegetative-vascular and neuroendocrine syndromes. Blood serum proteins from patients with vegetative-vascular syndromes showed a higher stability in the tests. The diverse effects of ATP on the stability of blood serum proteins in patients with different syndromes are discussed. V.Z.

A72-22878 # **Content of 11-oxycorticosteroids in the blood serum of untrained female students after 3-min maximum-stress**

exercises (Vmist 11-oksikortikosteroidiv u plazmi krovi netrenovanikh studentok pislia trikhvilinnoi roboti 3 granichnoiu potuzhnistiu). A. A. Viru (Tartusskii Gosudarstvennyi Universitet, Tartu, Estonian SSR). *Fiziologichnii Zhurnal,* vol. 17, Nov.-Dec. 1971, p. 780-784. 12 refs. In Ukrainian.

A group of 32 untrained female students performed 3-min maximum-speed exercises on a veloergometer. An increase of the 11-OCS content in blood serum was established in 13 subjects 5 min after the exercises, and a decrease in the rest of the group. V.Z.

A72-22879 # Development of arterial hypoxemia during the early stages of hypoxic ontogenesis (Do rozvitku arterial'noi gipoksemii na rannikh etapakh ontogenezu pri gipoksii). M. M. Seredenko (Akademiia Nauk Ukrains'koi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Nov.-Dec. 1971, p. 826-828. 20 refs. In Ukrainian.

Experiments on pups and adult dogs kept under hypoxic conditions showed the development of a more advanced arterial hypoxemia at earlier ages. A mechanism is proposed to explain a stronger development of hypoxemia at earlier ages during hypoxia. V.Z.

A72-22880 # Increased hemoglobin A2 formation during adaptation of man to high mountain conditions (Posilene utvorennia gemoglobinu A2 pri adaptatsii liudini do umov visokogir'ia). E. M. Semencheva (Vsesoiuznii Institut Gigieni i Toksikologii Pestitsidiv Polimernikh i Plastichnikh Mas, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Nov.-Dec. 1971, p. 828-831. 26 refs. In Ukrainian.

Erythrocyte hemolysate cataphoresis shows that the alterations of human hemoglobin during a stepwise adaptation to altitudes of 2200, 3700 and 4200 m above sea level lead to increased contents of HbA2 which has a higher affinity to oxygen than HbA. It was also found that the anodic mobility of hemoglobin was higher in residents of the Mt. Elbrus area than in residents of Kiev. V.Z.

A72-22881 # Multichannel oscillograph for biomedical studies (Bagatokanal'nii ostsilograf dlia biomedichnikh doslidzhen'). G. V. Tsepkov (Akademiia Nauk Ukrains'koi RSR, Institut Kibernetiki, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal,* vol. 17, Nov.-Dec. 1971, p. 845-847. 5 refs. In Ukrainian.

Description of a multichannel oscillograph whose scanning range corresponds to the time range of physiological processes. Combinations of six independent If physiological processes can be simultaneously recorded by acoustic and visual signals of the device. Synchronization with a computer is also possible. V.Z.

A72-22975 Activity of laryngeal motoneurons during Hering-Breuer reflexes (Activité des motoneurones laryngés pendant les réflexes de Hering-Breuer). J.-C. Barillot and A.-L. Bianchi (Aix-Marseille, Université, Marseille, France). *Journal de Physiologie,* vol. 63, no. 8, 1971, p. 783-792. 7 refs. In French. Délégation Générale à la Recherche Scientifique et Technique Contract No. 68,01,218.

Study of the activity of respiratory nervous fibers of the recurrent nerve in Dial-anesthetized cats. Two types of inspiratory fibers were observed with regard to their response during the Hering-Breuer reflex. The first type of fiber showed an inhibition of firing during lung inflation (i.e., the classical response), whereas the second type showed an activation (i.e., the paradoxical response). All the expiratory fibers were inhibited by lung inflation. The electromyographic study of intrinsic laryngeal muscles agrees with these results. The terms 'classical' and 'paradoxical' seem to be inadequate. The fact that the larynx is situated as a valve in the upper respiratory tract gives it a function which is in harmony with that of the chest but which is not exactly the same. A coherent outline of this organization is presented. F.R.L.

A72-23126 Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971, Proceedings. *Ergonomics,* vol. 14, Sept. 1971. 134 p.

Objective research methods and results are described relative to the determination of the stress of work tasks performed by air traffic controllers. Procedures and equipment for determining individual capacities are explained, together with approaches for correlating stress and strain. Topics examined include criteria for evaluating ATC systems, analysis of mental processes in ATC, variation of operator strategies, ergonomics measurements, hardware and software problems in workload analysis, use of subjective ratings, attitudes of operators to work and working conditions, and the use of simulators in testing both individual capacity and system models. T.M.

A72-23127 The human operator in air traffic control systems. J.-H. Kirchner and W. Laurig (Darmstadt, Technische Universität, Darmstadt, West Germany). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 549-556. 8 refs.

System analysis of air traffic control systems with respect to purpose and realization to show the role played by the human operator. The task of man in this system can be identified as information processing. Evaluation of these tasks is important for personnel selection, job evaluation, and for redesigning tasks and jobs in order to fulfill the future tasks of ATC. This evaluation of man's tasks can be regarded either from the demands of the job or from their fulfillment and effect for man. Both aspects must be connected to obtain objective results. Special research problems arise from the influence of individual abilities and from the correlation of stress as the work load factor, and strain as the effect of this work load on man. F.R.L.

A72-23128 Conflicting criteria in evaluating air traffic control systems. V. D. Hopkin (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 557-564.

Consideration of sources of conflicting criteria, which include the multiple aims of air traffic control, the numerous performance measures for each task, incompatibility among behavioral, physiological, and subjective data, the needs of man in contrast with those of the system, and individual differences. The solution requires greater awareness and quantification of relevant measures and of the sources of conflict in evaluation criteria, plus practical acknowledgement of them in the initial specification of air traffic control systems. F.R.L.

A72-23129 Analysis of mental processes involved in air traffic control. A. Bisseret (Institut de Recherches en Informatique et Automatique, Rocquencourt, Yvelines, France). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 565-570. 8 refs.

The research which is briefly presented here has been carried out, during the last ten years, by a team of psychologists at the Centre d'Experimentation de la Navigation Aérienne, whose aim is the automation of the air traffic control system. The general topic refers to the operator-computer's interactions in a complex system. The type of contribution that psychology may provide is shown by indicating the three interdependent aspects of the research: (1) the definition of the operator's algorithms; (2) the analysis of his mental representation; and (3) the study of the effect of the work load on the mental processes. The general methodology of the studies of mental processes is presented; and an experiment on operative memory is discussed. (Author)

A72-23130 Variation of operator's strategies and regulating effects on workload. J. C. Sperandio (Institut de Recherche d'Informatique et Automatique, Rocquencourt, Yvelines, France). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 571-577. 7 refs.

Study of a real work situation where the operative strategy chosen by subjects depends on three variables: the characteristics of the operators (training, motivation, age, health, etc.); the characteristics of the task, i.e., the level of task requirements; and the level of workload, which itself results from the operative strategy. An experimental study carried out in an air traffic control center is summarized, showing how air traffic controllers modify their operative methods when workload increases. F.R.L.

A72-23131 Individual strategies in ATC freedom and choice. J. F. Coeterier (Organization for Health Research TNO, Laboratory of Ergonomic Psychology, Amsterdam, Netherlands). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 579-584. 9 refs.

At Amsterdam airport, an experiment was performed with the help of sixteen approach controllers in order to determine variation in strategies in establishing a landing sequence for a number of planes under different manoeuvring conditions. Static data displays were used. The results indicate that variation in strategy is dependent on variation in the flight progress data of the planes, on the existing manoeuvring conditions in the air space, and on certain personality traits of the controller. (Author)

A72-23132 Variations in ATC-work load as a function of variations in cockpit workload. J. P. Krol (Organization for Health Research TNO, Laboratory for Ergonomic Psychology, Amsterdam, Netherlands). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 585-590. 9 refs.

The relation between pilots' workload and radar controllers' workload was investigated. Pilots' workload served as the independent variable. It was assumed that a number of levels of workload can be distinguished in a standard airport traffic circuit under visual flight rules. The dependent variable (controllers' workload) was measured by response frequency on an auditory binary choice task. Results indicate a rise in radar controllers' workload in a predicted direction for a number of pilots' workload levels. (Author)

A72-23133 Time analyses of the tasks of approach controllers in ATC. M. Soede, J. F. Coeterier (Organization for Health Research TNO, Laboratory for Ergonomic Psychology, Amsterdam, Netherlands), and H. G. Stassen (Delft, Technische Hogeschool, Delft, Netherlands). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 591-601. 5 refs.

A method is outlined modelling the task of an approach controller in an ATC system. The first step is the development of a flow diagram of the task, giving a qualitative description emphasizing the sequence of task components. This is followed by an attempt to quantify the task components in order to find out the bottlenecks in the task. A practical example is described. For 134 inbound flights, the performance of the controller was recorded in a restricted form by measuring the times for the corresponding task components. (Author)

A72-23134 Evaluation of stress factors by analysis of radio-telecommunication in ATC. D. Reiche, J.-H. Kirchner, and W. Laurig (Darmstadt, Technische Universität, Darmstadt, West Germany). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 603-609. 9 refs.

Information content analysis based on information theory can be used to evaluate stress in controllers. The method is applied to the analysis of radiotelecommunication in air traffic control: 'message types' are defined and their information content is evaluated using the syntactic level of information. Related to time, the measurements of information provide a stress factor. Preliminary results indicate the usefulness of the method. (Author)

A72-23135 The use of subjective rating. U. Philipp, D. Reiche, and J.-H. Kirchner (Darmstadt, Technische Universität, Darmstadt, West Germany). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 611-616. 6 refs.

To evaluate work load in ATC-tasks the method of subjective rating has been applied in addition to the recording of physiological data and objective work factors. A scoring method and a procedure for observer rating have been used to record variations in the subjective feeling of work load. The results of subjective rating have been related to different measures of information processing. Some problems concerning the influence of individual capacity in the procedure of observer rating for the evaluation of work load and the difficulties in defining 'difficulty of the control task' are discussed. (Author)

A72-23136 Hardware problems in ergonomics measurements. F. Rosenbrock (Darmstadt, Technische Universität, Darmstadt, West Germany). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 617-623.

Demonstration, by analysis of the task and work load of radar controllers, of the application of multichannel automatic data acquisition and processing. For assessing strain, advantage is taken of the physiological variables: electrocardiogram (ECG), electro-

oculogram (EOG) in both directions, electromyogram (EMG) of a back muscle, and respiration. To correlate these variables with factors of stress and strain a coding is described which evaluates a multidimensional work process study automatically and synchronously with the physiological data. F.R.L.

A72-23137 Software problems in analysing physiological and work study data. W. Laurig, G.-U. Becker-Biskaborn, and D. Reiche (Darmstadt, Technische Universität, Darmstadt, West Germany). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 625-631. 10 refs.

Analysis of man-work relations in air traffic control tasks, where correlations between stress and strain factors are of importance. For specific software problems in analyses of time series of physiological and work study data it can be expected that the dependence of observations within time series can be measured by calculating serial correlation coefficients, and their significance can be tested. For the correlation between time series a correction of the number of degrees of freedom for testing is necessary. The determination of the functional relationship between time series by linear regression analysis requires an examination of the residuals. F.R.L.

A72-23138 Attitudes of air traffic controllers at Frankfurt Airport towards work and the working environment. R. Singer and J. Rutenfranz (Giessen, Universität, Giessen, West Germany). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 633-639.

As part of an opinion survey among air traffic controllers at Frankfurt Airport questions were asked as to attitudes towards work and working conditions. A relatively high percentage of the controllers in question declared that they were satisfied with their job, but at the same time relatively high dissatisfaction could be recognized regarding important factors such as administration, pay and working conditions. The possible cause of this discrepancy is discussed. (Author)

A72-23139 Standards of acceptable load in ATC tasks. J. W. H. Kalsbeek (Organization for Health Research TNO, Laboratory for Ergonomic Psychology, Amsterdam, Netherlands). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 641-650. 26 refs.

Mental load in ATC tasks is described as the brain controlling the controller's controlling performance. A moment of conscious brain control is put forward as a unit to quantify this kind of mental load. New action programs are supposed to require conscious brain control at every step of their execution; with routine this would be less and less the case. The duration of a moment of conscious control varies according to the complexity of the control to be exercised and the number of considerations which have to be taken into account. Propositions are made on how to think about selective attention, identification and cognitive processes in terms of executing programs. A job description method is put forward in terms of such executing programs. Why moments of conscious brain control as units are more suited to the problem of mental load than are units like bits, choices and decisions is discussed. Experiments are described with physiological and psychological variables as a function of the number of moments of conscious brain control per minute. (Author)

A72-23140 The use of simulators for testing individual mental working capacity. H. Luczak (Darmstadt, Technische Universität, Darmstadt, West Germany). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 651-660. 19 refs.

Discussion of simulation in ergonomics research, which is defined as purposeful experimentation on models of work situations. The operator, who determines the functional relationship between stress and strain, is interpreted as the unit of individual mental working capacity. A theory of mental stress built up with concepts from formal logic, systems theory, and information theory is presented. Three simulators of mental stress, constructed from the theoretical concept, are introduced, and attention is given to a measurement of strain with cardiac parameters. Several concepts for the evaluation of individual mental working capacity are considered. F.R.L.

A72-23141 Application of fast-time simulation techniques to the study of ATC systems. M. Davis (EUROCONTROL, Brussels, Belgium). *(Stress in Air Traffic Control Research Association, International Symposium on Objective Assessment of Work Load in Air Traffic Control Tasks, Technische Universität Darmstadt, Darmstadt, West Germany, June 1971.) Ergonomics,* vol. 14, Sept. 1971, p. 661-668.

This paper reviews the techniques open to the study of air traffic control systems and, in particular, the feasibility of fast-time simulation methods. The peculiarities of an ATC system and the difficulties of representing it by a logical element are discussed. A description is, nevertheless, given on the progress which has been made in the development of the so-called 'Ground' model, a fast-time simulation which, although still in its infancy, is expected to evolve very soon into an efficient tool for the study and comparison of various ATC systems and organizations. (Author)

A72-23192 # A method of measuring cardiac cycle intervals (Metodika izmereniia mezhfaznykh intervalov kardiodinamiki). K. Sh. Nadareishvili, M. M. Dzhandzhgava, and L. A. Pochiani (Akademiia Nauk Gruzinskoi SSR, Institut Fiziologii, Tiflis; Ministerstvo Zdravookhraneniia Gruzinskoi SSR, Institut Eksperimental'noi i Klinicheskoi Khirurgii, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia,* vol. 64, Dec. 1971, p. 679-682. 8 refs. In Russian.

Description of a method for measuring the phases of the cardiac cycle and simultaneously recording the findings on both a binary coding machine and punched tape. The proposed method is based on direct measurement of the cardiac cycle intervals on a multibeam cathode oscilloscope synchronized with a multichannel polycardiographic automatic recording machine. Two different variants of this arrangement are proposed. A.B.K.

A72-23193 # The strength of the tentorium cerebelli as judged from the effect of chronic and acute hypoxia on its structure (K voprosu prochnosti mozzhechkovogo nameta v svete vliianiia khronicheskoi i ostroi gipoksii na ego strukturu). M. A. Nebieridze and G. S. Daneliia (Ministerstvo Zdravookhraneniia Gruzinskoi SSR, Institut Akusherstva i Ginekologii, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia,* vol. 64, Dec. 1971, p. 729-732. 6 refs. In Russian.

Study of the microstructure of the tentorium cerebelli and of the strength of its leaflets, taking into account the factors affecting the organs of the fetus, including the tentorium, during pregnancy and labor. It is found that the tentorium is very sensitive to hypoxia

and the strength of its leaflets is mainly determined by whether the pregnancy proceeds normally or with complications. The strength of the leaflets decreases as a result of the action of chronic and acute hypoxia developing during complications of pregnancy and labor. A decisive role in the pathogenesis of tentorium damage is played by chronic hypoxia developing during pregnancy complications. The strength of the leaflets is predetermined before labor. Acute hypoxia occurring during labor and simultaneous mechanical pressure on the head of the fetus aggravate the tissue hypoxia and thus constitute a decisive factor in causing tentorium damage. A.B.K.

A72-23256 # **A respiration function testing device (Légzésfunkció-vizsgáló készülék).** Z. Seres. (*Medicor News,* no. 1, 1971.) *Finommechanika,* vol. 11, Jan. 1972, p. 24, 25. In Hungarian.

Description of a number of recently developed devices for testing the respiration function. The principle of operation of spirographs and gas analyzers is explained, and a description is given of two recently developed spirographs, one designed for filter purposes, and the other for research and diagnostic purposes. A new type of gas analyzer is also cited. Some recommendations are made concerning the design of such devices. A.B.K.

A72-23257 # **The Picoscale blood diagnostic device (A 'Picoscale' vérdiagnosztikai készülék).** M. Agoston and P. Zillich. (*Medicor News,* no. 1, 1971.) *Finommechanika,* vol. 11, Jan. 1972, p. 26-30. In Hungarian.

Description of a recently developed device which simply, rapidly, and accurately measures the number of red and white blood cells, as well as certain other important blood characteristics. The proposed device is distinguished from microscope devices in that it operates electronically on a piston principle, completely eliminates the drawbacks present in the mercury systems of microscope devices, and presents still other advantages. The experience gained in the clinical use of the Picoscale device is summarized. A.B.K.

A72-23272 Cardiac arrhythmias observed during maximal treadmill exercise testing in clinically normal men. P. L. McHenry, C. Fisch, J. W. Jordan, and B. R. Corya (Marion County General Hospital, Indianapolis, Ind.). *American Journal of Cardiology,* vol. 29, Mar. 1972, p. 331-336. 10 refs. Research supported by the Herman C. Krannert Fund, Indiana Heart Association, American Medical Association; Grants No. PHS-HE-6308; No. PHS-HE-5363; No. PHS-HE-5749.

Age-related differences in the incidence of arrhythmias during maximal treadmill exercise testing were studied in 650 men, 25 to 54 years old, including 89 men with definite or suspected cardiovascular disease. The incidence of both superventricular and ventricular premature complexes was higher in more advanced age groups and was greater in patients with definite and suspected cardiovascular disease. V.Z.

A72-23273 The incidence and mortality of intraventricular conduction defects in acute myocardial infarction. J. J. Col and S. L. Weinberg (Good Samaritan Hospital, Dayton, Ohio). *American Journal of Cardiology,* vol. 29, Mar. 1972, p. 344-350. 29 refs.

Observed in a coronary care unit, the incidence of intraventricular conduction defects during sinus mechanism was 24% in 212 consecutive cases of acute myocardial infarction. Patients with these defects had a higher average age than the average age of the whole group, and a higher mortality at a younger age than the others. The most frequent isolated defect was left anterior hemiblock (9.4%), followed by incomplete bilateral bundle branch block (7.5%) and still less frequent complete right and left bundle branch blocks. V.Z.

A72-23274 Reliability and normal variations of computer analysis of Frank electrocardiogram by Smith-Hyde program /1968 version/. R. A. Bruce, S. R. Yarnall, R. Stratbucker, G. Pettit, V. Hofer, and D. J. Thompson (Washington, University, Seattle, Wash.; Nebraska, University, Omaha, Neb.). *American Journal of Cardiology,* vol. 29, Mar. 1972, p. 389-396. 7 refs. Research supported by the Washington/Alaska Regional Medical Program; Grant No. PHS-HS-00092.

Preliminary assessment of computer-analyzed electrocardiographic signal recordings of the Frank X, Y and Z leads for 334 healthy persons and 39 cardiac patients from hospitals in Seattle. The Smith-Hyde analytical program provided an overall sensitivity of 76% for abnormal electrocardiograms and a specificity of 75% for normal electrocardiograms in a predominantly normal case material used in the study. Angular components of the quantified normal electrocardiogram showed less variation than voltage magnitudes, and bimodal distributions for initial and terminal QRS forces were apparent only in the frontal plane when differences in sex and age were disregarded. V.Z.

A72-23275 Velocity and flow measurements by electromagnetic techniques. P. D. Stein (Oklahoma, University; U.S. Veterans Administration Hospital, Oklahoma City, Okla). *American Journal of Cardiology,* vol. 29, Mar. 1972, p. 401-407. 78 refs. Research supported by the U.S. Veterans Administration Service and Oklahoma Heart Association.

In this review of electromagnetic flowmetry, cardiovascular applications of velocity and flow measurements in patients are emphasized. The theory of electromagnetic flowmeters and sequential developments in the field are surveyed in relation to practical problems of utilization of electromagnetic flow devices. The distinction between catheter-tip velocity transducers and catheter flow transducers is discussed. A variety of electromagnetic catheter-tip devices are described, and their potential applicability to patient care is considered. (Author)

A72-23298 # **Psychological, physiological, and methodological foundations of the interpretation of aerial photographs - Education and training of interpreters (Psychologische, physiologische und methodologische Grundlagen der Interpretation von Luftbildern - Ausbildung und Trainieren der Interpretatoren).** D. M. Kudritskii (Laboratorium für Aeromethoden, Leningrad, USSR). In: Internationale Gesellschaft für Photogrammetrie, International Symposium on Photointerpretation, 3rd, Dresden, East Germany, September 10-16, 1970, Reports. Part 2. Leipzig, Landwirtschaftsausstellung der DDR, 1971, p. 577-588. In German.

The stages of photointerpretation include the recognition of the research objective, the determination of the characteristics of the objective, and the analysis of the relations of the objective with the environment. Inductive and deductive approaches are used in the interpretation of aerial photos. The education of the interpreters of aerial photographs is to be based on the study of the technical terminology and the technology of photointerpretation methods. It is pointed out that all specialists in the field of the exploration and the utilization of natural resources should receive a training in the methodology and technology of the interpretation of aerial photos. G.R.

A72-23299 # **Contour-psychological questions in the interpretation of aerial photographs (Gestaltpsychologische Fragen in der Luftbildinterpretation).** J. Albertz (Karlsruhe, Universität, Karlsruhe, West Germany). In: Internationale Gesellschaft für Photogrammetrie, International Symposium on Photointerpretation, 3rd, Dresden, East Germany, September 10-16, 1970, Reports. Part 2. (A72-23276 09-13) Leipzig, Landwirtschaftsausstellung der DDR, 1971, p. 589-598. 5 refs. In German.

Particular attention is given in the discussion to aspects of perception contrast, and the perception of contours and areal distribution. It is pointed out that aspects of the light intensity pattern on the retina are the determining factors in the perception of contours. It is, therefore, of great importance for the photointerpretation to obtain copies and lighting conditions which will produce a light pattern of optimal characteristics on the retina. The formation of contours is connected with the characteristics of the transition between two areas. Questions of the similarity of the patterns on aerial photos are considered. G.R.

A72-23319 **Sonic boom exposure effects. II.2 - Sleep effects.** C. G. Rice (Southampton, University, Southampton, England). *Journal of Sound and Vibration,* vol. 20, Feb. 22, 1972, p. 511-517. 40 refs.

Review of quantitative data which express sleep interference in terms of certain aspects of sleep patterns (sleep stage and accumulated sleep time), individual differences (age, sex, temperament, responsiveness), and stimulus variables (type of sound and intensity). The findings of laboratory studies and their relationship to real life situations are discussed, together with suggestions for standardization of some of the experimental techniques used in different laboratories, in order to receive the maximum information from research efforts on sleep disturbance due to sonic booms. M.V.E.

A72-23320 **Sonic boom exposure effects. II.3 - Startle responses.** R. I. Thackray (Civil Aeronautical Institute, Oklahoma City, Okla.). *Journal of Sound and Vibration,* vol. 20, Feb. 22, 1972, p. 519-526. 35 refs.

Review of human reactions to impulsive acoustic stimuli of the sonic-boom kind in terms of startle reflexes, orienting responses, and effects on performance. Various aspects of reflex response measurement and conditioning discussed include overt behavioral, physiological, and subjective indices, relevant stimulus parameters, and factors modifying the response to impulsive stimulation. Recommendations on needed research are presented. M.V.E.

A72-23321 **Sonic boom exposure effects. II.4 - Annoyance reactions.** P. N. Borsky (Columbia University, New York, N.Y.). *Journal of Sound and Vibration,* vol. 20, Feb. 22, 1972, p. 527-530. 8 refs.

Review of recently published research on human reactions caused by sonic booms. Some of the limitations of these studies are pointed out, and recommendations are presented with respect to the requirements and optimum course of future research. It is shown that the development of an annoyance reaction is dependent upon several primary reactions in addition to non-exposure related factors in the environment. M.V.E.

A72-23322 **Sonic boom exposure effects. II.5 - Effects on animals.** Ph. Cottereau (Lyon, Ecole Nationale Vétérinaire, Lyons, France). *Journal of Sound and Vibration,* vol. 20, Feb. 22, 1972, p. 531-534. 16 refs.

Brief review of studies on the effects of sonic booms on poultry, farm and wild animals, and pets. To date there has been only a limited number of controlled studies of animal response to sonic boom. The literature yields relatively few meaningful data on wild animal response. Recommendations about needed future research are presented. M.V.E.

A72-23324 **Sonic boom exposure effects. III - Workshop perspective.** E. J. Richards (Loughborough University of Technology, Loughborough, Leics., England) and R. Rylander (Department of Environmental Hygiene, National Institute of Public Health, Stockholm, Sweden). *Journal of Sound and Vibration,* vol. 20, Feb. 22, 1972, p. 541-544.

Interpretive summary of the 1971 Stockholm workshop on sonic boom exposure effects. The summary represents an attempt to grasp and coordinate some of the more important topics that were raised, with special emphasis on interdisciplinary aspects. The workshop conclusions and recommendations reported reflect the present status of knowledge. M.V.E.

A72-23325 **Complications of selective percutaneous transfemoral coronary arteriography and their prevention - A review of 445 consecutive examinations.** G. S. Green, C. M. McKinnon, J. Rösch, and M. P. Judkins (Oregon, University, Portland, Ore.). *Circulation,* vol. 45, Mar. 1972, p. 552-557. 16 refs. Grants No. PHS-HE-03275; No. PHS-HE-05828.

Complications encountered during a typical 12-month period of routine work with the Judkins percutaneous transfemoral method of selective coronary arteriography are reviewed. In 445 examinations, 20 complications (16 local and four cardiac) occurred. Local complications included nine delayed hemorrhages, five thromboses of femoral arteries, and two peripheral emboli. Cardiac complications included one ventricular fibrillation, one significant bradyarrhythmia, and two myocardial infarctions. Causes of individual complications are analyzed and means for their prevention discussed. Guidelines of the procedure are proposed to minimize the complications of selective coronary arteriography. Emphasis is placed on patient evaluation, preparation for the procedure, and meticulous examination technique. (Author)

A72-23403 * # **Fluorescence activated cell sorting.** W. A. Bonner, H. R. Hulett, R. G. Sweet, and L. A. Herzenberg (Stanford University, Stanford, Calif.). *Review of Scientific Instruments,* vol. 43, Mar. 1972, p. 404-409. 8 refs. Grants No. NIH-GM-17367; No. NGR-05-020-004.

An instrument has been developed for sorting biological cells. The cells are rendered differentially fluorescent and incorporated into a small liquid stream illuminated by a laser beam. The cells pass sequentially through the beam, and fluorescent light from the cells gives rise to electrical signals. The stream is broken into a series of uniform size drops downstream of the laser. The cell signals are used to give appropriate electrostatic charges to drops containing the cells. The drops then pass between two charged plates and are deflected to appropriate containers. The system has proved capable of providing fractions containing large numbers of viable cells highly enriched in a particular functional type. (Author)

A72-23414 **Research in electrocardiography and magnetocardiography.** R. McFee and G. M. Baule (Syracuse University, Syracuse, N.Y.). *IEEE, Proceedings,* vol. 60, Mar. 1972, p. 290-321. 222 refs.

The mathematical, physical, and engineering aspects of electrocardiography and magnetocardiography are reviewed. A brief summary of relevant physiological and clinical information is also given. The aim of the article is to provide a general perspective for engineers

new to the area who want to do research. A detailed discussion of difficulties encountered in determining the heart vector and the nondipolar properties of the heart's field is included. Stress is placed on the need for development of practical ECG and MCG systems for use in the clinic. A number of research problems of current interest are pointed out. (Author)

A72-23430 # **Man-machine decision-making procedures /Survey/ (Cheloveko-mashinnye protsedury priniatiia reshenii /Obzor/).** O. I. Larichev. *Avtomatika i Telemekhanika,* Dec. 1971, p. 130-142. 22 refs. In Russian.

Description of methods of decision-making in the presence of many criteria. The problem of aggregating estimates - i.e., obtaining a general estimate of an object on the basis of estimates with respect to individual criteria - is considered, and approaches to the solution of this problem based on utility theory and on the intervention of a human decision maker are outlined. Among the man-machine decision-making procedures considered are the ELECTRE method (a method of comparing objects which are not readily comparable), the method of pairwise comparison of objects, and various methods developed for use in linear programming in the presence of many quality criteria. A.B.K.

A72-23440 Calorimetric analysis of the effect of drinking saline solution on whole-body sweating. I - An attempt to measure average body temperature. J. W. Snellen (Newfoundland, Memorial University, St. John's, Newfoundland, Canada), D. Mitchell, and M. Busansky (Chamber of Mines of South Africa, Johannesburg, Republic of South Africa). *Pflügers Archiv,* vol. 331, no. 2, 1972, p. 124-133. 27 refs.

Calorimetric measurements have been made in a healthy man already sweating at a constant rate and drinking hot water, with the aim of establishing an average body temperature. The experiment demonstrated that the human thermoregulatory mechanism operates on a Joule-per-Joule basis, and that drinking per se provokes a sweating response in addition to the caloric demand. O.H.

A72-23441 Calorimetric analysis of the effect of drinking saline solution on whole-body sweating. II - Response to different volumes, salinities and temperatures. J. W. Snellen (Newfoundland, Memorial University, St. John's, Newfoundland, Canada) and D. Mitchell (Chamber of Mines of South Africa, Johannesburg, Republic of South Africa). *Pflügers Archiv,* vol. 331, no. 2, 1972, p. 134-144. 8 refs.

The authors' previous (1972) calorimetric study of a sweating man's response to drinking hot water has been extended to investigate the whole-body sweating as a function of the temperature, the volume, and the salinity of the ingested liquid. The difference in the way in which the body reacts to hypertonic and to hypotonic ingested liquid is explained. O.H.

A72-23442 Local heat clearance probes with alternative heating and their application in the measuring of human muscle blood flow. K. Golenhofen and R. Felix (Marburg, Universität, Marburg an der Lahn, West Germany). *Pflügers Archiv,* vol. 331, no. 2, 1972, p. 145-152. 11 refs.

Local heat clearance probes containing two measuring points each surrounded by a heating system, thus enabling an alternative heating of both points, were tested in model experiments and in the measuring of human muscle blood flow. Measurements with alternative heating of both measuring points at the same probe position allow the determination of the degree of homogeneity of local blood flow. Thus inhomogeneity errors in estimating the local heat clearance (heat transport index, HTI), which arise from the fact that the reference measuring point is always slightly coheated, can be avoided. With this modified technique, the chances of finding suitable probe positions for the measurement of human muscle blood flow are significantly increased. (Author)

A72-23443 Continuous measurement of venous diameter by a combined photoelectric-photographic and plethysmographic technique. M. Echt and L. Lange (Berlin, Freie Universität, Berlin, West Germany). *Pflügers Archiv,* vol. 331, no. 2, 1972, p. 153-159. Research supported by the Deutsche Forschungsgemeinschaft; Contract No. F44620-71-C-0117.

The combined photoelectric-photographic and plethysmographic technique allows for the investigation of the distensibility characteristics and pharmacological influence on the capacitance vessels in a uniform vascular bed (skin veins of the isolated rabbit ear). Diameter changes of a vein segment are recorded continuously by means of a photoresistor and are photographed for calibration. Volume changes of the tissue are measured by a water filled plethysmograph and can be compared with diameter changes of the selected vein segment. The method allows for better interpretation of the results obtained by the plethysmographic technique. In particular, it is possible to distinguish between outward filtration and stress-relaxation. (Author)

A72-23500 # **Visual evoked responses during exposure to strong colored lights.** C. Huber (Universitäts-Augenklinik, Zurich, Switzerland). *Ophthalmic Research,* vol. 3, no. 1, 1972, p. 55-62. 18 refs.

Specific color-dependent waveforms of the visual evoked response (VER) were isolated using test lights projected with a slow repetition rate on a strong background. Study of the results shows that the VER reflects several color-specific mechanisms. However, at high luminances, the response is mainly due to the action of longer wavelength mechanisms. The best condition to evoke stable VERs is flashing a red light on a blue background. O.H.

A72-23579 Developing measures to reveal individual styles in the use of an acceleration control. J. H. F. Huddleston (Royal Aircraft Establishment, Farnborough, Hants., England). *International Journal of Man-Machine Studies,* vol. 4, Jan. 1972, p. 33-44. 22 refs.

Three limited studies are described in which attempts were made to quantify some of the differences in style between individual operators of a simulated aircraft control. Two-dimensional tracking tasks (height and heading control) were presented on a CRT display. Even a straight-forward integral of control displacement over time can show differences between individuals within a group (for example R.A.F. squadron pilots). Other, less gross analyses may be required, however, if interoperator differences are to be explained in terms less coarse than, say, a pilot-test pilot distinction. (Author)

A72-23580 A criticism of adaptive neural nets as models of perception. B. Rosenberg (Commonwealth Scientific and Industrial Research Organization, Div. of Computing Research, Canberra, Australia). *International Journal of Man-Machine Studies,* vol. 4, Jan. 1972, p. 45-53. 15 refs.

Discussion of the perception-modeling merits of adaptive neural nets, i.e., collections of threshold logic units connected by variable weights. These nets are often compared to biological systems, serving as models for memory and perception, and are frequently used for

optical character recognition. The Perceptron is one of the most commonly used models among these nets. Taking it as an example, it is shown to be inadequate to account for perception. M.V.E.

A72-23581 Prominence patterns in air traffic control messages. R. W. A. Scarr (Standard Telecommunication Laboratories, Ltd., Harlow, Essex, England) and M. A. A. Tatham (Essex, University, Colchester, Essex, England). *International Journal of Man-Machine Studies,* vol. 4, Jan. 1972, p. 55-78. 11 refs.

Recordings of messages spoken by Air Traffic Controllers have been analysed subjectively and objectively in an attempt to obtain acoustic correlates of the subjective measures 'syllabic prominence' and 'word prominence'. A computer program has been written that assigns syllabic prominence at two levels with fair success. The repercussions of this on the recognition of continuous speech by machine are discussed. Word prominence depends on the complex interrelationship of many speech features; is difficult to assign by rule and of less value to speech recognition by machine. (Author)

A72-23582 Topographical organization of cortical efferent zones projecting to distal forelimb muscles in the monkey. H. Asanuma (New York Medical College, New York, N.Y.) and I. Rosén. *Experimental Brain Research,* vol. 14, no. 3, 1972, p. 243-256. 26 refs. Grant No. NIH-NS-09095.

The functional organization of the cortical efferent system controlling contralateral distal forelimb muscles was examined in monkeys using the method of intracortical microstimulation (ICMS). Results show that thresholds of stimulation for producing contraction of these muscles are much lower in the depth of the cortex than on the surface, and that these low threshold spots are confined to a small region of the cortex; for a given moment, these spots are distributed along the direction of radial fibers within the gray matter constituting a columnar shape. Within a given columnar efferent zone, the thresholds are lower in the deep layer than in the superficial layers. Efferent zones controlling various movements of a joint are located close together, and zones projecting to proximal muscles are located more rostrally than those projecting to distal muscles. These efferent zones constitute a fine mozaic organization within the depth of the cortex, which is more finely arranged than in cats. O.H.

A72-23583 Peripheral afferent inputs to the forelimb area of the monkey motor cortex - Input-output relations. I. Rosén and H. Asanuma (New York Medical College, New York, N.Y.). *Experimental Brain Research,* vol. 14, no. 3, 1972, p. 257-273. 30 refs. Grant No. NIH-NS-09095.

Peripheral afferent inputs to cells in the cortical efferent columns projecting into distal forelimb muscles were examined in monkeys using one microelectrode for both low-intensity intracortical stimulation and for recording cellular discharges. A well-defined relation is demonstrated between these inputs and the motor effects produced by intracortical microstimulation of the cortical efferent columns. The possible functional role of these neuronal connections is considered. Finally, it is shown that the hand area of the motor cortex receives a short latency projection of cutaneous and high-threshold muscle afferents, whereas group I muscle afferents project to an adjacent cortical zone. O.H.

A72-23592 # Microbe biogeochemistry of oxygen (Mikrobnaia biogeokhimiia kisloroda). K. E. ZoBell (California, University, La Jolla, Calif.). *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* Jan.-Feb. 1972, p. 23-42. 127 refs. In Russian.

The mechanisms of the influence of microorganisms on oxygen and its compounds are discussed. The part played by living organisms and microorganisms in the oxygen cycle and the cycles of other elements is examined in the case where the processes occurring in these cycles lead to changes in the oxygen distribution in the earth as a whole, the earth's crust, the hydrosphere, atmosphere, and biomass. V.P.

A72-23593 # The influence of a simultaneous rotation in two reciprocally perpendicular planes on the vestibular apparatus of humans (Vozdeistvie odnovremennogo vrashcheniia v dvukh vzaimno perpendikuliarnykh ploskostiakh na vestibuliarnyi apparat cheloveka). F. A. Solodovnik. *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* Jan.-Feb. 1972, p. 103-111. 24 refs. In Russian.

During rotation of an individual in two planes the nistagm reaction as well as the direction and the character of illusory phenomena were registered. Due to a confrontation of theoretical calculations of the forces and practical results of the experiments the character of excitation of the vestibular apparatus was determined. The character of the influence depends on the direction and rotation speed of the individual in each plane as well as on the location of the object of the experiment during rotation. The excitation intensity does not remain constant but varies according to the sinusoidal law. Under these conditions maximal excitation of the horizontal semicircular canals occurs when the head is bent 90 deg down while that of the vertical ones - takes place when the head is held 'straight.' It follows that the maximal excitation values in the horizontal and vertical semicircular canals do not coincide, being shifted in their phase by 90 deg. This depends on the mutually perpendicular disposition of the horizontal and vertical semicircular canals. (Author)

A72-23594 # Cryolysis of ribonuclease preliminarily irradiated with UV (Krioliz ribonukleazy, predvaritel'no obluchennoi ul'trafioletovym svetom). G. S. Komolova, I. A. Egorov, T. B. Vasil'eva, and V. F. Makeeva (Akademiia Nauk SSSR, Institut Biokhimii, Moscow, USSR). *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* Jan.-Feb. 1972, p. 146-148. 8 refs. In Russian.

Data are discussed bearing on the combined consecutive action of UV irradiation and repeated freezing and thawing on ribonuclease solutions. UV irradiation induces in the ribonuclease molecule destruction of one S-S-bond which does not affect the enzyme activity. However disulphide bonds constitute the general stability of the molecular conformation and the destruction of even one of them increases molecule damage by additional influences. Such is for instance repeated freezing-thawing. The effect becomes manifest by an activation increase as well as by a change in the enzyme behavior during gelfiltration on a column. (Author)

A72-23595 # The influence of parenterally introduced protein hydrolyzates on the external secretory activity of the human pancreas (Vliianie parenteral'no vvedennykh belkovykh gidrolizatov na vneshnesekretornuiu deiatel'nost' podzheludochnoi zhelezy cheloveka). G. K. Shlygin, T. V. Laktaeva, Iu. E. Berezov, P. I. Ostrin, and I. S. Kazas (Akademiia Meditsinskikh Nauk SSSR; II Moskovskii Meditsinskii Institut, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 73, Jan. 1972, p. 20-23. 16 refs. In Russian.

Parenteral administration to man of casein hydrolyzate causes an intense pancreatic secretion and, correspondingly, a sharp rise in the quantity of duodenal juice. Aminopeptide in similar conditions produces a much lesser secretion of juice, the rate of which is 2-3 times lower than during the action of casein hydrolyzate. Both hydrolyzates stimulate the enzymatic secretory processes in the

pancreas. This is particularly true in respect to casein hydrolyzate, under the influence of which there occurs a sharp increase in the quantity of juice, as well as the quantity of pancreatic enzymes secreted per unit of time. (Author)

A72-23596 # **Indices of aerobic working capacity in runners (Pokazateli aerobnoi rabotosposobnosti u begunov).** Ia. P. Piarnat, A. A. Viru, and A. P. Pisuke (Tartuskii Gosudarstvennyi Universitet, Tartu, Estonian SSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 73, Jan. 1972, p. 25-27. 9 refs. In Russian.

Fourteen trained runners were investigated with the aid of increasing (50 W every two minutes) exertions until the person refuses to work on the veloergometer. The indices of gas exchange' pulse rate, pulmonary ventilation, and acid-base balance were determined. The maximal utilization of oxygen correlates with the maximal elimination of oxygen, maximal pulmonary ventilation, maximal oxygen pulse, and watt-pulse. The pH decreases during the work to a lesser degree in those runners who had a higher aerobic working capacity. During the determination of the maximal oxygen utilization with the aid of Margaria's indirect method the error comprised +10%. (Author)

A72-23597 # **The influence of increased atmospheric pressure on the blood coagulation (Vliianie povyshennogo atmosfernogo davleniia na svertyvaemost' krovi).** E. I. Chinchenko and A. A. Mel'nik (Odesskii Meditsinskii Institut, Odessa, Ukrainian SSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 73, Jan. 1972, p. 33-35. In Russian.

In rabbits who were under the pressure of 3 atmospheres for 24 hours, after decompression there were changes of the thrombo-elastogram pointing to hypercoagulation, which in 24 hours was replaced by hypocoagulation. On the third day after decompression, persistent and more marked manifestations of hypercoagulation were revealed, which gradually disappeared by the 6th-9th day. (Author)

A72-23625 **The UV radiation and its biological-medical significance (Die Ultraviolett-Strahlung und ihre biologisch-medizinische Bedeutung).** R. Lotmar (Zürich, Universität, Zurich, Switzerland). *Naturwissenschaftliche Rundschau,* vol. 25, Mar. 1972, p. 89-99. 30 refs. In German.

Photoelectric and photochemical methods are used for the measurement of UV radiation intensity. The UV radiation within the atmosphere of the earth is composed of two components, including radiation coming on a straight-line path from the sun and radiation emitted diffusely by the sky. The intensity of UV radiation is discussed together with the altitude dependence of the radiation intensity, aspects of radiation absorption by ozone, the dependence of radiation intensity on the angle of the propagation direction of the radiation, factors of radiation reflection by snow, and diurnal and annual radiation variations. Effects of natural UV radiation on a human being are considered, giving attention to the sensitivity of the human skin to UV radiation. G.R.

A72-23647 **Selection, inspection, and naming in visual search.** C. R. R. Snyder (Oregon, University, Eugene, Ore.). *Journal of Experimental Psychology,* vol. 92, Mar. 1972, p. 428-431. 7 refs. Contract No. F44620-67-C-0099.

A two-stage model of visual search, as suggested by perceptual theory, animal studies, and visual search data, was tested in a partial report paradigm. According to this model, a preattentive process selects portions of the field for higher attentive processing, signaling the select input by its location in the field. It follows from this model that errors should cluster spatially around cued items in a display. The subjects were briefly shown an array of letters and required to report the name and location of a single cued letter. In all three cue conditions, items adjacent to targets were reported more frequently than other nontargets. Also, the magnitude of this adjacency effect varied with cue type, suggesting an inverse relationship between the level at which a cue property might be analyzed and the likelihood of a signaling error. (Author)

A72-23672 # **Selection, training, and compatibility of a spacecraft crew (Ekipazh kosmicheskogo korablia: Otbor, podgotovka, sovmestimost').** *Aviatsiia i Kosmonavtika,* Jan. 1972, p. 30-32. In Russian.

Selection and training procedures for Soviet spacecraft crews are discussed by Soviet astronaut Leonov in an interview given to a newsman. The topics include the professional and psychological qualities, scientific training and background, and compatibility of crew members as the key requirements for productive work in space. V.Z.

A72-23693 # **Vasomotor efferent effects in the lung /Nervus vagus stimulation in rabbit/ (O vazomotornykh efferentnykh vliianiiakh na legkie /Razdrazhenie bluzhdaiushchego nerva u krolika/).** B. I. Mazhbich and L. P. Osadchuk (Akademiia Nauk SSSR, Institut Fiziologii, Novosibirsk, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 72, Dec. 1971, p. 3-6. 14 refs. In Russian.

Investigation of blood content variations in the posterior lobe of the lung of rabbits in response to electrical stimulation of the peripheral ends of vagus nerves resected at the neck. Stimulation increased blood content in the central portion of the lobe and decreased it in the peripheral areas of the lobe. V.Z.

A72-23694 # **Study of electrobioluminescence of the blood (Izuchenie elektrobioliuminestsentsii krovi).** V. M. Iniushin and I. B. Beklemishev (Kazakhskii Gosudarstvennyi Universitet, Alma-Ata, Kazakh SSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 72, Dec. 1971, p. 37, 38. 5 refs. In Russian.

Maxima at 42 and 50 C were established for electrobioluminescence of blood samples investigated at temperatures from 35 to 50 C by a previously described technique (Iniushin et al., 1968). The two luminescence peaks are linked to the changes in protein and lipid molecular structures at these temperatures. V.Z.

A72-23695 # **Effect of haptoglobin on the immunochemical properties of hemoglobin (Vliianie gaptoglobina na immunokhimicheskie svoistva gemoglobina).** A. P. Andreeva, A. A. Levina, V. M. Belostotskii, V. M. Shlimak, and G. Ia. Rozenberg (Tsentral'nyi Institut Gematologii i Perelivaniia Krovi, Moscow, USSR). *Biulleten' Eksperimental'noi Biologii i Meditsiny,* vol. 72, Dec. 1971, p. 58-61. 15 refs. In Russian.

The immunochemical properties of human oxyhemoglobin are compared with those of a haptoglobin-hemoglobin complex in an antihemoglobin serum. The haptoglobin-hemoglobin complex was prepared from human HbO2 and canine Hp. It is found that the reaction between the complex and the serum is stronger than the reaction between HbO2 and the serum. A theory is proposed to explain this finding. V.Z.

A72-23717 * **The long winter model of Martian biology - A speculation.** C. Sagan (Cornell University, Ithaca, N.Y.). *Icarus,* vol. 15, Dec. 1971, p. 511-514. 17 refs. Grant No. NGR-33-010-098.

A temporal microenvironment model is proposed for Martian biology that is based on an estimated mean thickness of nearly 1 km of frost in the Martian north polar cap summer remnant. If vaporized, this frost could yield not only 1 kg per sq cm of atmosphere, but also higher global temperatures through the greenhouse effect and a greatly increased likelihood of liquid water. Vaporization of such cap remnants may occur twice each equinoctial precession, and Martian organisms may now be in cryptobiotic repose awaiting the end of the long precessional winter. The Viking biology experiments might test this hypothesis. M.V.E.

A72-23726 * Theory of antimotion sickness drug mechanisms. D. C. Wood (U.S. Naval Aerospace Medical Laboratory, Pensacola, Fla.) and A. Graybiel (Louisiana State University, Shreveport, La.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 249-252. 18 refs. NASA-sponsored research. NASA Order R-93.

The results of a series of antimotion sickness drug evaluations indicates that drugs with central anticholinergic actions and drugs that increase central sympathetic activity are effective against motion sickness. The combination of these actions produces a synergistic effect against motion sickness. The effect of these medications on central acetylcholine or on norepinephrine could alter a balance between the neurons in the vestibular and reticular areas which influence motion sickness and also sympathetic and parasympathetic reactions. It is suggested that this could be their mechanism of action in preventing motion sickness. (Author)

A72-23727 Rest and activity patterns for prolonged extraterrestrial missions. A. N. Nicholson (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *(International Symposium on Basic Environmental Problems of Man in Space, 4th, Yerevan, Armenian SSR, Oct. 1-5, 1971.) Aerospace Medicine,* vol. 43, Mar. 1972, p. 253-257. 32 refs.

Difficulties in obtaining satisfactory sleep have been encountered during many space missions and it is generally recognized that an appropriate rest and activity pattern is essential to maintain the well being and operational effectiveness of spacecrews. Irregular duty periods superimposed upon daily cycles of varying duration are experienced by long haul transport aircrew and an analysis of these schedules has suggested that irregular patterns of rest are compatible with a satisfactory sleep pattern as long as the workload is limited. It is considered that a similar relationship could be established for prolonged spaceflights and in this context the sleep patterns of an airline pilot operating worldwide schedules are examined and relevant recent work on modified sleep regimes is discussed. (Author)

A72-23728 * Urological considerations in space medicine. A. T. K. Cockett, W. R. Adey, and A. P. Roberts (Rochester, University, Rochester, N.Y.; California, University, Los Angeles, Calif.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 258-262. 5 refs. NASA-supported research.

Urological problems encountered during the preparation phases of Biosatellite III, flight of Bonny the Space Monkey, are detailed. The solution to each problem is detailed. The catheter system employed, antibiotic coverage used, and bacteria encountered in the urine of the five animals are detailed. Urinary calcium levels in three ground based animals are illustrated. Testicular alterations encountered in all animals are mentioned. It is concluded that space flights of duration beyond nine days may present serious problems of a urological nature. (Author)

A72-23729 Inhibition of vertebrate retinal lactic dehydrogenase during exposure to normobaric oxygen. D. A. Baeyens and J. R. Hoffert (Michigan State University, East Lansing, Mich.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 263-265. 14 refs. Grant No. PHS-EY-00009.

Retinal lactate dehydrogenase (LDH) activity was measured in vitro in the teleost (Salmo gairdneri) and the amphibian (Rana pipiens) under oxygen tensions ranging from 0 to 740 mm Hg. In related experiments acetazolamide was administered to fish to produce retinal hypoxia and LDH activity was measured as before. In no instance was untreated teleost retinal LDH inhibited at normobaric oxygen tensions in vitro. Amphibian LDH activity fell 10.8% when going from 0 to 740 mm Hg of oxygen. The acetazolamide treated teleosts demonstrated significantly higher retinal LDH activity than the untreated teleosts and furthermore the LDH after acetazolamide treatment was subject to the same inhibitory effects of oxygen as demonstrated by the amphibian. The increased LDH activity after hypoxia, induced by acetazolamide treatment, was attributed to the reduction of normally oxidized sulfhydryl groups. (Author)

A72-23730 Temporal organization of night workers' sleep. G. G. Globus, E. C. Phoebus, and R. Boyd (California, University, Irvine, Calif.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 266-268. 10 refs. PHS-supported research.

The temporal organization of night workers' (day sleepers) sleep was compared with day workers' (night sleepers) sleep in terms of the period and amplitude of the intrasleep REM-NREM ultradian sleep cycle. Significant differences between night sleepers and day sleepers were not obtained for period and amplitude. However, highly significant differences were obtained for variability of the period across sleep sessions with night workers showing instability of the temporal organization of sleep over time. It is speculated that circadian modulation of ultradian oscillations during sleep has been impaired in night workers. (Author)

A72-23731 Effects of increased tensions of O2, N2, and He on the activity of a Na-K-Mg ATPase of rat intestine. G. J. Koehler (Peter Eckrich and Sons, Fort Wayne, Ind.) and S. F. Gottlieb (Purdue University, Fort Wayne, Ind.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 269-273. 40 refs. Grant No. NIH-GM-16761.

The Na-K-Mg ATPase from rat intestine was found to be a pressure-sensitive enzyme. Oxygen at 15 psia and in the range of 90-135 psia, inhibits ATPase activity. In the range of 150-240 psia, oxygen enhances ATPase activity. Substrate protection did not account for failure of oxygen to exert marked inhibition. Nitrogen, in the range of 15-105 psia, does not inhibit ATPase activity. In the range of 30-80 psia, nitrogen activates the enzyme. A progressive increase in degree of inhibition of ATPase occurs in the range of 120-285 psia. At nitrogen pressures greater than 285 psia activation of ATPase activity occurs. Effects of He on ATPase activity are qualitatively similar to that of nitrogen. Quantitative differences between He and nitrogen were observed in the ranges of 15-90 psia and 105-260 psia. (Author)

A72-23732 Review of high performance aircraft take off and landing accidents. E. V. Rice and E. H. Ninow (U.S. Navy, Naval Safety Center, Norfolk, Va.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 274-277.

Irreversible emergencies which occur on or just over the runway during takeoff or landing present pilots with the need for immediate decision - to eject or to stay with the aircraft. This study presents a three-year review of these emergencies and assesses survival probability under various conditions as follows: (1) takeoff vs landing, (2) on runway vs over runway, and (3) ejection vs no ejection. These were analyzed individually as well as in relation to each other. It is concluded that there is a predictable pattern of

survival/nonsurvival. The findings of this study are intended to provide pilots and those charged with their training with a general knowledge of survival probabilities to serve as a guideline in planning an individual course of action in these emergencies. (Author)

A72-23733 Relation of tilt tolerance to aerobic capacity and physical characteristics. E. Shvartz and N. Meyerstein (Negev Institute for Arid Zone Research, Beersheba, Israel). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 278-280. 16 refs.

Thirty-four normal men, aged 17-30 years, were tested for physical characteristics, maximal aerobic capacity (VO2 max) and orthostatic tolerance. VO2 max was predicted from submaximal heart rates on a bicycle ergometer, and orthostatic tolerance was determined by a 20-minute tilt table test. Four subjects fainted during the tilt table test. The results showed small and insignificant relationships between weight, surface area and tilt table responses. Some relationship was found between height and orthostatic heart rate, the fainters being slightly taller than the nonfainters. The same degree of relationship existed between VO2 max and orthostatic heart rate. The best indicator of orthostatic response was reclining heart rate. (Author)

A72-23734 # Prediction of tolerance in cold water and life raft exposures. J. F. Hall, Jr. (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 281-286. 14 refs.

A model based on net effective thermal insulation, assumed metabolism, surface area, and body mass is presented. The model permits prediction of tolerance time for clothed aircrewmen to attain specified limits (90, 125, 180 kcals) of body heat loss during cold water and life raft exposures at various water or ambient air temperatures. The variables of hydrostatic compression, decreased insulation by wetting, and increased body cooling rate in water were considered and can be included in the tolerance predictions for water exposures. Factors of life raft air and thermal insulation of a wet canopy type life raft are also included by assuming reasonable estimated values concerning air movement within the life raft and thermal insulation of the wet life raft respectively. Predictive tolerance curves based on net effective insulation and three body heat loss limits are presented for cold water and life raft exposures. (Author)

A72-23735 # Cooling of anesthetized paralyzed dogs during hypercapnia and b-adrenergic blockade. W. E. Pepelko and S. M. Cain (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 287-290. 23 refs.

Oxygen consumption and body temperature were measured in male mongrel dogs, anesthetized, paralyzed, artificially ventilated and cooled in a water bath at 34 C. Treatments included inspiration of 10% or 20% CO2, beta-adrenergic blockade (propranolol) and beta-blockade plus 10% CO2. Oxygen consumption in ml/kg/min STPD after water immersion showed an average increase of 0.41 in air breathing controls but decreased an average of 0.31 with beta-blockade, 0.69 with 10% CO2 inspiration, 0.76 with 10% CO2 plus beta-blockade, and 1.35 with 20% CO2 inspiration. All experimental groups had a lower post-treatment oxygen consumption than controls, with the 20% CO2 group exhibiting a greater depression than the other three experimental groups. It was concluded that hypercapnia inhibits beta-adrenergic calorigenic mechanisms while having little apparent effect upon heat loss. (Author)

A72-23736 * Ash content of bones in the pigtail monkey, Macaca nemestrina. G. P. Vose and T. L. Roach (Texas Women's University, Denton, Tex.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 291, 292. 7 refs. Grant No. NGR-44-013-055.

Ash analyses of skeletons of four adult primates, Macaca nemestrina, revealed some similarities and some marked contrasts when compared with published data on human skeletal ash. The skull in both Macaca nemestrina and man has the highest ash content of all bones in the skeleton. While the bones of the arms of humans have an ash content nearly identical to that of the legs (0.3% difference), in Macaca nemestrina the humeri and radii contain 5.4% more ash than the femora and tibiae. Similarly in Macaca nemestrina the bones of the hands contain 3.5% more ash than the bones of the feet, while in humans the same bones agree within 0.3% implying that adaptive use function is a factor in bone ash concentration. The ribs of Macaca nemestrina showed an unexpectedly high ash content in comparison with those of humans. In contrast with the relatively constant ash content throughout the vertebrae in humans, a conspicuous decrease axially was noted in Macaca nemestrina. (Author)

A72-23737 # Physiologic stress during 50-hour double-crew missions in C-141 aircraft. H. B. Hale, B. O. Harman, D. A. Harris, E. W. Williams, R. E. Miranda, J. M. Hosenfedl, and B. N. Smith (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 293-299.

By use of a battery of urinary techniques, the physiologic cost (stress) of prolonged C-141 flying operations (either staged or nearly continuous) was shown to be mild-to-moderate in degree. Staged missions lasting 5 to 7 days tended to be less stressful than double-crew nearly continuous 50-hour missions. In the latter type of mission, two extremely different work/rest schedules, namely, 4/4 and 16/16 hours, induced similar degrees of physiologic stress. Anticipatory stress which was detected prior to double-crew flights tended to be higher than the flight stress that followed. Crew position was a contributory factor, slightly modifying flight and postflight trends. Pre-existing circadian periodicity persisted, although flight had modifying influence. Times of day that represented night at home were the times of highest sensitivity to flight. (Author)

A72-23738 Effects of a multi-hour immersion on trained and untrained subjects. I - Renal function and plasma volume. D. Boening, H.-V. Ulmer, U. Meier, W. Skipka, and J. Stegemann (Deutsche Sporthochschule, Cologne, West Germany). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 300-305. 38 refs. Nordrhein-Westfalen Landesamt für Forschung Grant No. A/2-4744.

In 30 experiments the effects of 8-hour recumbency and 4- to 8-hour immersion in thermo-indifferent water on renal function and plasma volume of trained and untrained persons were consecutively followed. Recumbency led to an increased diuresis and sodium excretion. With immersion the diuresis rose even more. For the trained subjects the urine excretion increased more slowly than in the case of the untrained. No reproduceable difference of electrolyte excretion between both groups could be substantiated. The plasma volume was diminished after recumbency and immersion. No difference between trained and untrained persons could be substantiated. The decrease of plasma volume depended mainly on the amount of urine excreted. The later rise of diuresis for trained persons may exhibit an adaptation of the volume regulating reflexes to blood volume fluctuations during frequent work. (Author)

A72-23739 * Effects of exposing rats to 100% oxygen at 450 and 600 mm Hg on in vitro liver and adipose tissue lipid synthesis. D. D. Feller, E. D. Neville, and K. S. Talarico (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 310-313. 12 refs.

Male rats (260-285 gm) were exposed to 100% oxygen at 450 or 600 mm Hg for 1 to 4 days. Rats maintained at 450 mm Hg ate 92% the amount of food eaten by ad libitum controls maintained at sea level conditions. At 600 mm Hg, the food intake was 77% of the ad libitum controls. No difference was found in the plasma level of glucose, free fatty acids, and corticosterone between oxygen exposed rats and their respective pair-fed controls. The in vitro conversion of acetate into fatty acids by adipose tissue from rats exposed at 450 mm Hg for 2, 3, or 4 days was significantly increased above pair-fed controls and ad libitum controls. Increasing the oxygen pressure to 600 mm Hg abolished this increase, and in fact, reversed the increased synthesis to a significant decrease for the 4-day exposure. (Author)

A72-23740 Anti-hijacking efforts and cardiac pacemakers - Report of a clinical study. O. C. Hood, E. Podolak (FAA, Office of Aviation Medicine, Washington, D.C.), J. M. Keshishian, N. P. D. Smith, N. R. Baker (FAA, Office of Aviation Medicine; Potomac Fund for Cardiovascular Research, Washington, D.C.), and A. A. Hoffman. *Aerospace Medicine,* vol. 43, Mar. 1972, p. 314-322. 5 refs. Research supported by the Potomac Fund for Cardiovascular Research; Contract No. DOT-FA71WA-2578.

The use of intelligence data, hijacker profiles, passive magnetometers, and physical search have been employed to prevent hijackers from boarding aircraft. An external electromagnetic field used in a weapon detector system (WD-4) may produce minor changes in the rate of certain pacemakers, specifically the sensitive unipolar atrial or the atrial or atrio-ventricular pacing systems. These changes were clinically insignificant to the patient and to the pacing system. Other systems, such as unipolar fixed rate, and unipolar and bipolar ventricular pacemakers, were totally unaffected. The weapons detector studied (WD-4) was determined to be safe for use in the public environment of an airport. Recommendation for its use was made to FAA Research and Development officials. The WD-4 may now be implemented as another method for detecting objects that could be used in the hijacking of aircraft. (Author)

A72-23741 # Aeromedical consultation service case report - Evaluation of asymptomatic flying personnel with intermittent supraventricular arrhythmias. J. E. Douglas (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 323-330.

Several relatively simple procedures for reproducing and elucidating the mechanisms of a patient's electrocardiographic dysrhythmia are considered. Two case histories evaluated because of supraventricular dysrhythmias are discussed as illustrative examples. One case history concerns a 45-year-old pilot who was referred to the USAF School of Aerospace Medicine for evaluation of cardiac arrhythmia. The other case history is about a 36-year-old pilot who was referred for evaluation because an annual ECG was interpreted as showing A-V dissociation with A-V block and abnormal intraventricular conduction. G.R.

A72-23742 Intracranial aneurysm and sudden death. S. W. Berkheiser (Harrisburg Polyclinic Hospital, Harrisburg, Pa.). *Aerospace Medicine,* vol. 43, Mar. 1972, p. 331, 332. 6 refs.

Approximately 16,000 cases of subarachnoid hemorrhage secondary to ruptured intracranial aneurysm occur annually in the United States. The possibility of sudden pilot incapacitation with resultant lost of consciousness may be significant in the general aviation population. A retrospective study disclosed an overall incidence of intracranial aneurysm of 3.6% in 1,140 autopsies with complete central nervous system examinations. In 25 instances rupture of the aneurysm was the direct cause of death, and in 20 subjects (80%) death occurred within 12 hours or less. A high incidence of intraventricular hemorrhage (68%) was directly related to sudden disability or death. The average age of the subjects with ruptured aneurysm was 44 years, with males predominating (60%). Other possible related diseases were cardiac hypertrophy (40%), and varying degrees of coronary atherosclerosis (24%). (Author)

A72-23743 Mental health intervention in aeromedical evacuation. M. A. Becker (USAF, Air National Guard Base, Van Nuys, Calif.). *(Aerospace Medical Association, Annual Scientific Meeting, 42nd, Houston, Tex., Apr. 26-29, 1971.) Aerospace Medicine,* vol. 43, Mar. 1972, p. 333-339. 11 refs.

The field of psychiatry is rapidly changing. Treatment modalities no longer rely in toto on passive acceptance and permissiveness in relation to the patient's behavior. The increasing demand by the public for psychiatric help and new discoveries in the field have led to the exploration of more aggressive type treatment patterns. The increased demand, combined with the shortage of highly qualified specialists and adequate inpatient treatment facilities, has led to a broadening of the philosophy of who is capable of administering psychiatric care. It is now an accepted fact that paramedical personnel, such as nurses, with some additional preparation can act as effective therapeutic agents in helping people resolve emotional problems. The flight nurse is in a key position to implement early mental health intervention for the patient to whom she is responsible. (Author)

A72-23795 * A stochastic model for eye movements during fixation on a stationary target. R. Vasudevan, A. V. Phatak, and J. D. Smith (Southern California, University, Los Angeles, Calif.). In: Conference on Decision and Control, Miami Beach, Fla., December 15-17, 1971, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1971, p. 264-270. 22 refs. NSF Grant No. GK-1834X; Grants No. NIH-GM-16197-03; No. NIH-RR-0712-04; No. NGL-05-018-022.

A stochastic model describing small eye movements occurring during steady fixation on a stationary target is presented. Based on eye movement data for steady gaze, the model has a hierarchical structure; the principal level represents the random motion of the image point within a local area of fixation, while the higher level mimics the jump processes involved in transitions from one local area to another. Target image motion within a local area is described by a Langevin-like stochastic differential equation taking into consideration the microsaccadic jumps pictured as being due to point processes and the high frequency muscle tremor, represented as a white noise. The transform of the probability density function for local area motion is obtained, leading to explicit expressions for their means and moments. Evaluation of these moments based on the model is comparable with experimental results. (Author)

A72-23924 * Measurements, modeling, control and simulation - as applied to the human left ventricle for purposeful physiological monitoring. D. N. Ghista, D. N. Rasmussen, R. N. Linebarger, and H. Sandler (NASA, Ames Research Centre, Moffett Field, Calif.). *Franklin Institute, Journal,* vol. 292, Dec. 1971, p. 545-554. 11 refs.

Interdisciplinary engineering research effort in studying the intact human left ventricle has been employed to physiologically monitor the heart and to obtain its 'state-of-health' characteristics. The left ventricle was selected for this purpose because it plays a key role in supplying energy to the body cells. The techniques for measurement of the left ventricular geometry are described; the geometry is effectively displayed to bring out the abnormalities in cardiac function. Methods of mathematical modeling, which make it possible to determine the performance of the intact left ventricular muscle, are also described. Finally, features of a control system for the left ventricle for predicting the effect of certain physiological stress situations on the ventricle performance are discussed. O.H.

A72-23925 **The molecular code of memory (Le code moléculaire de la mémoire).** G. Ungar. *La Recherche,* vol. 3, Jan. 1972, p. 19-27. 7 refs. In French.

Discussion of the present state of knowledge of the biology and biochemistry of memory, and assessment of current theories on possible molecular mechanisms that could underlie the cerebral processing of information. Recent developments favoring a correlation of information acquisition and chemical changes in the brain are reviewed. Some of the findings suggesting the possibility of a memory code operating on the molecular level in the brain are examined. The implications of this possibility are discussed. M.V.E.

A72-23999 **Reliability design for an airborne ecological system.** L. S. Gephart and V. Balachandran (Dayton, University, Dayton, Ohio). In: Annual Reliability and Maintainability Symposium, San Francisco, Calif., January 25-27, 1972, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 393-399. 5 refs.

In the reliability design and prediction of an airborne ecological system for jumbo jets, failure was defined as 'that operating condition which could cause the aircraft to be delayed in performing its stated mission, until the failure is repaired.' This operating condition is directly related to 'adequacy' of the flushing of toilets in the 'rest rooms.' A multiple server queuing model presented describes the reliability prediction and design for such an airborne ecological system. G.R.

A72-24001 **Stochastic modeling of human performance effectiveness functions.** T. L. Regulinski (USAF, Institute of Technology, Wright-Patterson AFB, Ohio) and W. B. Askren (USAF, Human Resources Laboratory, Wright-Patterson AFB, Ohio). In: Annual Reliability and Maintainability Symposium, San Francisco, Calif., January 25-27, 1972, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 407-416. 14 refs.

Human performance effectiveness functions reliability and correctability are mathematically modelled in stochastic, time continuous domain from error data experimentally generated by tracking and vigilance tasks. The probability density functions governing the random variables time-to-error, and time-to-error-correction are isolated using the Kolmogorov-Smirnov test and the likelihood Ratio test. A number of task performance predictions are reported based on the Weibull, and Lognormal density functions. (Author)

A72-24002 **A test of a basic assumption of human performance modelling.** J. C. Lamb (U.S. Navy, Naval Underwater Systems Center, New London, Conn.). In: Annual Reliability and Maintainability Symposium, San Francisco, Calif., January 25-27, 1972, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 417-419.

Many of the proposed models of human performance reliability are based on an assumption of independence of the actions taken by the operator. An experiment was conducted to test the basic assumption of independence using realistic setting and problems as well as actual maintenance personnel. The experimental task chosen was symptom detection and fault location of sonar system failure. Quantitative and qualitative data show that at the task level there is independence of maintenance actions of the type used in the study. G.R.

A72-24003 **Prediction of human performance.** W. H. Teichner (New Mexico State University, Las Cruces, N. Mex.). In: Annual Reliability and Maintainability Symposium, San Francisco, Calif., January 25-27, 1972, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 420-429. 15 refs. Contract No. N00014-70-A-0147-0002.

This paper is concerned with the development of functional relationships between measures of human performance and the variables on which those measures depend. The data used are the absolute values of experimental studies in the literature. The methods employed are seen as providing an increasingly refined, emerging performance classification system where each subclass represents a different set of relationships for a single dependent measure; each measure defines a major class. Methods, including a data base, and selected results are presented; the utility of the approach to human factors engineering and training, and to problems of reliability are indicated. It is concluded, contrary to frequent assertions, that the experimental literature is both relevant and sufficiently consistent for applied uses if the effort is made to employ it appropriately. (Author)

A72-24241 # **Manoeuvres affecting sympathetic outflow in human skin nerves.** W. Delius, K.-E. Hagbarth, A. Hongell, and B. G. Wallin (University Hospital, Uppsala, Sweden). *Acta Physiologica Scandinavica,* vol. 84, Feb. 1972, p. 177-186. 18 refs. Swedish Medical Research Council Grants No. B71-14X-2881-02; No. B71-14X-2881-02K; No. B71-19X-3116-01.

Sympathetic activity was recorded from human skin nerves during the execution of a variety of different maneuvers. The neural activity was regularly affected by emotional, thermal, and respiratory stimuli. Mental stress, body cooling, and increased respiratory movements increased the sympathetic outflow. The activity decreased during moderate body warming and when the subject was calm and relaxed. Maneuvers known to cause changes in baroreceptor activity usually did not affect the sympathetic outflow to the skin. G.R.

A72-24269 **Stereoscopic acuity for photometrically matched background wavelengths at scotopic and photopic levels.** R. H. Young and A. Lit (Southern Illinois University, Carbondale, Ill.). *Perception and Psychophysics,* vol. 11, Mar. 1972, p. 213-216. 17 refs. Research supported by the Southern Illinois University; NSF Grant No. GB-2553; Grants No. PHS-NB-07617; No. PHS-EY-00383.

Equidistance settings have been obtained experimentally for black targets viewed against a white and four chromatic backgrounds, each of which was photometrically matched at each level of illumination tested. The binocular depth settings were analyzed in terms of the angular magnitude of both the variable error and the constant error. The variable error data are plotted as a function of retinal illuminance and analyzed. Results indicate that, for both rod and cone vision, wavelength has no differential effect on the variability of depth settings. The data for the constant error are found to be less regular than those for the variable error, and the rod-cone discontinuities appear less pronounced. O.H.

A72-24270 **Natural visual capture in bilateral length comparisons.** J. T. Walker (Missouri, University, St. Louis, Mo.). *Perception and Psychophysics,* vol. 11, Mar. 1972, p. 247-251. 24 refs.

In left-right comparisons of perceived length, objects on the left were slightly overestimated by vision alone but not by touch alone. This conflict between vision and touch occurred in the absence of any experimentally induced distortion or illusion. Judgments made with concurrent vision and touch were similar to those made with vision alone regardless of whether the Os were judging which object felt longer, looked longer, or was longer. The resolution of a natural conflict between vision and touch is an example of natural visual capture. (Author)

A72-24295 **Fluid mechanics of the cochlea. I.** M. B. Lesser and D. A. Berkley (Bell Telephone Laboratories, Inc., Whippany, N.J.). *Journal of Fluid Mechanics,* vol. 51, Feb. 8, 1972, p. 497-512. 18 refs.

Brief examination of the physiology of the cochlea in conjunction with a description of the 'place' theory of hearing. The role played by fluid motions is seen to be of importance, and some attempts to bring fluid mechanics into a theory of hearing are reviewed. Following some general fluid-mechanical considerations a potential flow model of the cochlea is examined in some detail. A basic difference between this and previous investigations is that in this case an enclosed two-dimensional cavity is tested as opposed to one-dimensional and open two-dimensional models studied earlier. Also the two time-scale aspect of the problem, as a possible explanation for nonlinear effects in hearing, has not previously been considered. Thus observations on mechanical models indicate that potential flow models are applicable for times of the same scale as the frequency of the driving acoustic inputs. For larger time scales mechanical models show streaming motions which dominate the qualitative flow picture. (Author)

A72-24348 **A neural effect of partial visual deprivation in humans.** R. D. Freeman (California, University, Berkeley, Calif.), D. E. Mitchell (Dalhousie University, Halifax, Nova Scotia, Canada), and M. Millodot (Montréal, Université, Montreal, Canada). *Science,* vol. 175, Mar. 24, 1972, p. 1384-1386. 14 refs. National Research Council of Canada Grant No. APA-7660; Grant No. NIH-FR-7006.

Certain human subjects have considerable sensitivity differences in the visual resolution of vertical gratings as compared to horizontal gratings. Although only subjects with pronounced ocular astigmatism exhibit this effect, the differences are of neural, rather than optical, origin. It is argued that the resolution anisotropies result from early abnormal visual input caused by astigmatism. This abnormal input permanently modifies the brain. (Author)

A72-24373 **On the instantaneous measurement of blood-flow by ultrasonic means.** M. G. J. Arts and J. M. J. G. Roevros (Eindhoven, Technische Hogeschool, Eindhoven, Netherlands). *Medical and Biological Engineering,* vol. 10, Jan. 1972, p. 23-34.

Part of the problem of determining the flow through a blood vessel is the measurement of the instantaneous average blood velocity over a cross-section of the vessel. In this paper a new method is described to estimate that velocity from the received signal of a Doppler flowmeter using continuous ultrasound. The method is based on the determination of the frequency shift averaged over the power density spectrum of the received signal. Due to a new type of instrumentation this can be done without carrying through a complete frequency analysis of that signal. This provides a rather accurate determination of the instantaneous value of the blood velocity. (Author)

A72-24374 **New phonocardiographic transducers utilizing the hot-wire anemometer principle.** D. E. Laughlin and R. P. Mahoney (Iowa, University, Iowa City, Iowa). *Medical and Biological Engineering,* vol. 10, Jan. 1972, p. 43-55. 18 refs.

Hot thermistors and hot wires have been adapted to detect vascular and precordial pulses and heart sounds, respectively. The activity from the skin is amplified hydraulically by sealing a plastic cup over the area of interest and mounting the sensing elements in the center of a small exit port plugged into a hole in the cup. Two thermistors can be mounted physically and electrically in such a way as to produce biphasic unbalancing of a Wheatstone bridge for subaudio pulses. Fine heated wires sense higher frequency sound waves. Records of external carotid, jugular venous and apex pulses and heart sounds are presented and comparisons are made with two standard transducers as evidence of the usefulness of the devices. A compact, low impedance transducer, rugged enough to withstand dropping from ceiling to floor, with a superior signal-to-noise ratio and insensitive to ambient sounds is evident. (Author)

A72-24375 **A system for providing an on-line analogue display of beat-by-beat cardiac output.** D. T. Krausman (Johns Hopkins University, Baltimore, Md.). *Medical and Biological Engineering,* vol. 10, Jan. 1972, p. 81-88. Grant No. NIH-ME-06965.

A system for an on-line analogue display of beat-by-beat cardiac output and other cardiovascular functions is described. The phasic aortic blood flow signal, derived from an electromagnetic flowmeter with the flow probe implanted around the ascending aorta, drives a multichannel recorder with a combination of associated signal conditioning input couplers and peripheral electronic circuitry, to provide a continuous analogue display of beat-by-beat phasic stroke volume, integrated stroke volume, heart rate, and cardiac output. These cardiovascular functions, which permit instantaneous on-line feedback of these parameters, were all derived from the single aortic flow measurement. (Author)

A72-24384 * **Biological experiments - The Viking Mars Lander.** H. P. Klein (NASA, Ames Research Center, Moffett Field, Calif.), J. Lederberg (Stanford University, Stanford, Calif.), and A. Rich (MIT, Cambridge, Mass.). *Icarus,* vol. 16, Feb. 1972, p. 139-146. 18 refs.

From the biological point of view, the Viking 1975 mission might be regarded as a test of the Oparin-Haldane hypothesis concerning the chemical evolution of living systems. Mars is a planet whose early history was probably similar to that of the earth and whose present environmental conditions may be compatible with the maintenance of living organisms. Thus, the biological experiments aboard the Viking I spacecraft are primarily concerned with the question of whether chemical evolution on Mars took place, and, if so, whether the process reached a level of complexity characteristic of replicating systems. G.R.

A72-24387 **Light scattering experiment - The Viking Mars Lander.** W. V. Vishniac and G. A. Welty (Rochester, University, Rochester, N.Y.). *Icarus,* vol. 16, Feb. 1972, p. 185-195. 10 refs.

Microbial growth can be detected with great sensitivity by light scattering. Even the low level of bacterial multiplication in distilled water can be reliably detected. It is proposed to observe the turbidity of an aqueous phase in contact with Martian soil for changes which can be interpreted as growth. (Author)

A72-24409 # **Medicobiological investigations based on the Soiuz flight program (Mediko-biologicheskie issledovaniia po programme poletov kosmicheskikh korablei 'Soiuz').** L. I. Kakurin. *Akademiia Nauk SSSR, Vestnik,* Feb. 1972, p. 30-39. In Russian.

The physiological effects caused by prolonged weightlessness are studied on the basis of data obtained during the flights of Soiuz 3 through 9 with durations ranging from 48 hr to 17 days 17 hr. Recordings of the behavior of the astronauts and the changes in their physiological systems are presented and discussed. V.P.

A72-24439 # **The space flight crew and system reliability.** J. R. Burnett (General Dynamics Corp., Convair Aerospace Div., San Diego, Calif.). *American Institute of Aeronautics and Astronautics, Man's Role in Space Conference, Cocoa Beach, Fla., Mar. 27, 28, 1972, Paper 72-228.* 9 p. 21 refs. Members, $1.50; nonmembers, $2.00.

The evolution of current concepts concerning the role of man as a machine operator is examined on the basis of some significant results in restoring faulty systems, achieved in space flights by direct communication between highly trained flight crews and ground crews. It is pointed out that all systems are made up of human and machine elements, and the objective of good design is therefore to optimize this relationship. V.P.

A72-24441 * # Advanced extravehicular protective systems for shuttle, space station, lunar base and Mars missions. P. F. Heimlich, J. G. Sutton, and E. H. Tepper (United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn.). *American Institute of Aeronautics and Astronautics, Man's Role in Space Conference, Cocoa Beach, Fla., Mar. 27, 28, 1972, Paper 72-231.* 11 p. Members, $1.50; nonmembers, $2.00. NASA-supported research.

Advances in extravehicular life support system technology will directly influence future space mission reliability and maintainability considerations. To identify required new technology areas, an appraisal of advanced portable life support system and subsystem concepts was conducted. Emphasis was placed on thermal control and combined CO2 control/O2 supply subsystems for both primary and emergency systems. A description of study methodology, concept evaluation techniques, specification requirements, and selected subsystems and systems are presented. New technology recommendations encompassing thermal control, CO2 control and O2 supply subsystems are also contained herein. (Author)

A72-24442 * # A space maintainability experiment aboard the Ben Franklin submersible during the 30-day Gulf Stream drift mission. J. R. Kappler (Grumman Aerospace Corp., Bethpage, N.Y.) and C. B. May (NASA, Marshall Space Flight Center, Huntsville, Ala.). *American Institute of Aeronautics and Astronautics, Man's Role in Space Conference, Cocoa Beach, Fla., Mar. 27, 28, 1972, Paper 72-232.* 15 p. 5 refs. Members, $1.50; nonmembers, $2.00. NASA-supported research.

In the summer of 1969, a deep submersible drifted for 30 days below the surface of the Gulf Stream, while operated by a six man crew. The main purpose of the mission was oceanographic research. The crew's activities and completely self-contained environment resembled those of a space station such as Skylab. Because of these similarities aspects of onboard vehicle maintenance during the actual conduct of a scientific mission were investigated. The maintainability study was accomplished in six distinct phases. Two useful plots of manpower distribution were developed. A maintenance action summary is presented in a table. G.R.

A72-24468 An experimental study of the velocity distribution and transition to turbulence in the aorta. R. M. Nerem (Ohio State University, Columbus, Ohio), W. A. Seed, and N. B. Wood (Imperial College of Science and Technology, London, England). *Journal of Fluid Mechanics,* vol. 52, Mar. 14, 1972, p. 137-160. 30 refs. Research supported by the Wates Foundation, Nuffield Foundation, Science Research Council, St. Thomas's Hospital Endowment Fund, Medical Research Council, Skinners' Co., Goldsmiths' Co., and Pfizer, Ltd.

Description of the development and evaluation of a hot-film probe, suitable for use within arteries and operated with a commercial constant-temperature anemometer and linearizer. The performance of the system in the recording of arterial velocity wave forms is described, and instantaneous and time-averaged velocity profiles constructed from measurements in the thoracic aorta of dogs are presented. The profiles were blunt, with boundary layers estimated to be less than 2 mm thick throughout the cycle, and significant skews were observed, the explanation for which appears to lie in the influence of local geometry on the flow. A preliminary study of flow disturbances in the aorta based on visual observation of instantaneous velocity wave forms and frequency spectrum analysis is reported. The occurrence of flow disturbances and turbulence is shown to be related to peak Reynolds number and the frequency parameter alpha. The possible roles of free-stream disturbances and boundary-layer transition in generating these disturbances are discussed. (Author)

A72-24469 Flow patterns in models of small airway units of the lung. M. R. Davidson and J. M. Fitz-Gerald (Queensland, University, Brisbane, Australia). *Journal of Fluid Mechanics,* vol. 52, Mar. 14, 1972, p. 161-177. 6 refs.

Investigation of quasi-steady creeping flow in models of small airway units of the lung. A respiratory unit of the lung is modeled by a sphere, an oblate and a prolate ellipsoid of revolution, and a circular cylinder of finite length. The solution of the Stokes equations for each of these geometries is indicated for general axisymmetric boundary conditions. For particular cases consistent with the models, streamlines are plotted and some velocity profiles are shown. It is suggested that bulk flow in the final generations of the lung is significant for gas transport even though diffusion is the predominant mechanism there. (Author)

A72-24476 Diffusing capacity of the lung for CO in man during acute acclimation to 14,246 ft. R. B. Weiskopf and J. W. Severinghaus (California, University, San Francisco, Calif.). *Journal of Applied Physiology,* vol. 32, Mar. 1972, p. 285-289. 22 refs. Grants No. NIH-HE-06285; No. PHS-1-P01-GM-15571-03.

We measured the diffusing capacity of the lung for carbon monoxide (Dco) at two different oxygen tensions, in six healthy men, during the initial 3 days at high altitude. Dco and pulmonary capillary blood volume (Vc) both decreased during the period studied. This event helps explain some of the alveolar-to-arterial oxygen tension difference (A-a)DO2 seen at altitude. The fall in Vc caused a calculated increase in the (A-a)DO2, which on the 2nd day accounted for nearly the entire measured (A-a)DO2. The finding of a decreased Vc supports the concept that the pulmonary capillaries remain at low pressure during acute acclimatization to high altitude. (Author)

A72-24477 Blood and muscle pH after maximal exercise in man. L. Hermansen and J.-B. Osnes (Institute of Work Physiology, Oslo, Norway). *Journal of Applied Physiology,* vol. 32, Mar. 1972, p. 304-308. 35 refs.

Changes in capillary blood and muscle pH were studied in 13 young subjects (2 females and 11 males), performing maximal exercise of short duration. The type of exercise was continuous or intermittent, or both. Needle biopsy specimens of the m. quadriceps femoris and capillary blood samples were obtained at rest and at different time intervals in the recovery or rest periods. Changes in the muscle pH were evaluated from measurements of the pH in muscle homogenates. Resting values (mean plus or minus SE) for capillary blood and muscle pH were 7.42 and 6.93, respectively. Capillary blood pH decreased to 7.11 and 6.94 (avg values) after continuous and after intermittent maximal exercise, respectively. The muscle pH decreased to about the same values (approximately 6.40) in both intermittent and continuous exercise. These results seem to indicate that the pH of the muscle might be a limiting factor during maximal exercise of short duration. (Author)

A72-24478 Effect of increased lung recoil pressure on maximal expiratory flow in normal subjects. S. E. Stubbs (Minnesota, University, Rochester, Minn.) and R. E. Hyatt (Mayo

Clinic and Mayo Foundation, Rochester, Minn.). *Journal of Applied Physiology,* vol. 32, Mar. 1972, p. 325-331. 28 refs. Grant No. NIH-HE-12229.

In eight normal males, chest restriction was produced by thoracoabdominal strapping. The average vital capacity decreased 40%, and the residual volume decreased 11%. Static pressure-volume curves of the lung were shifted to the right so that, at any volume, lung recoil Pst(1) increased and compliance decreased. Slopes of flow-volume curves were increased, and maximal flow at 50% control total lung capacity increased 88%. Lung conductance (GL) at a given volume also rose. Relating maximal flow and GL to Pst(1) indicated that these variables were uniquely determined by Pst(1). Analysis of flow-limiting pressures suggested that the mechanics of flow limitation and dynamic compression were similar in control and strapped states. Analysis of these data plus review of the literature suggested that the increased lung recoil induced by strapping was in part due to a decrease in the surface compliance of the lung. (Author)

A72-24479 * Stresses, strains, and surface pressures in the lung caused by its weight. J. B. West (California, University, La Jolla, Calif.) and F. L. Matthews (Imperial College of Science and Technology, London, England). *Journal of Applied Physiology,* vol. 32, Mar. 1972, p. 332-345. 27 refs. Grants No. PHS-HE-13687; No. NGL-05-009-109.

In an effort to understand how the lung is deformed by its own weight, we have analyzed the distribution of regional expansion, stresses, and surface pressures in a theoretical elastic lung-shaped model using the technique of finite elements. In the upright position, the parenchyma was most expanded at the apex and least at the base. Stresses in both the vertical and lateral directions were maximal at the apex. As the lung was inflated from very low volumes to total lung capacity, parenchymal expansion and stress at the apex first decreased, then increased. This behavior can be explained by the increasing rigidity of the expanded lung which enabled it to resist distortion by its own weight. At functional residual capacity, the stress at the apex was near its minimum. The differences in intrapleural pressure down the lung were volume dependent, increasing at very low volumes. In the inverted lung, the regional differences in stress, strain, and surface pressures were less marked because of the shape of the chest. (Author)

A72-24480 * Pattern of filling in the pulmonary capillary bed. D. A. Warrell, J. W. Evans, R. O. Clarke, G. P. Kingaby, and J. B. West (California, University, La Jolla, Calif.). *Journal of Applied Physiology,* vol. 32, Mar. 1972, p. 346-356. 19 refs. Grants No. PHS-HE-13687-01; No. NGL-05-009-109.

Artificially ventilated and perfused dog lungs were rapidly frozen under various physiological conditions. In 2-micron-thick sections the number of red blood cells (RBCs) per 10-micron length of alveolar septum was counted. Under conditions in which alveolar pressure exceeded venous pressure, variation in RBC concentration within areas supplied by single arterioles accounted completely for variation between areas supplied by different arterioles. Except at very high perfusion pressures when venous pressure exceeded alveolar pressure, there was no significant correlation between RBC concentrations of pairs of adjacent septa. G.R.

A72-24481 * Effect of stratified inequality of blood flow on gas exchange in liquid-filled lungs. J. B. West (California, University, La Jolla, Calif.), J. E. Maloney (Melbourne, University, Melbourne, Australia), and B. L. Castle (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.). *Journal of Applied Physiology,* vol. 32, Mar. 1972, p. 357-361. 8 refs.

This investigation set out to answer two questions: (1) are the distal alveoli in the terminal lung units less well perfused than the proximal alveoli, i.e., is there stratification of blood flow; and (2) if so, does this enhance gas exchange in the presence of stratified inequality of ventilation. Excised dog lungs were ventilated with saline and perfused with blood. Following single inspirations of xenon 133 in saline and various periods of breath holding, the expired xenon concentration against volume was measured and it confirmed marked stratified inequality of ventilation under these conditions. By measuring the rate of depletion of xenon from alveoli during a period of blood flow, we showed that the alveoli which emptied at the end of expiration had 16% less blood flow than those exhaling earlier. However, by measuring the xenon concentration in pulmonary venous blood, we found that about 10% less tracer was transferred from the alveoli into the blood when the inspired xenon was stratified within the respiratory zone. Thus while stratification of blood flow was confirmed, it was shown to impair rather than enhance the efficiency of gas transfer. (Author)

A72-24482 Urine and plasma proteins in men at 5,400 m. D. Rennie, R. Frayser, G. Gray, and C. Houston (Arctic Institute of North America Facility, Kluane, Yukon Territory, Canada; Rush-Presbyterian-St. Luke's Medical Center, Chicago, Ill.). *Journal of Applied Physiology,* vol. 32, Mar. 1972, p. 369-373. 38 refs. Research supported by the United Health Fund; Grant No. DADA17-68-C-8019.

Urine and plasma proteins were measured before, during, and after ascent from 800 to 5,400 m altitude on Mount Logan, in completely unacclimatized men who had made the ascent by plane in 40 min, and in acclimatized individuals who had climbed up and had lived at 5,400 m for 6 weeks. Protein excretion rates were increased, and creatinine excretion and clearance rates decreased, with increases in plasma creatinine levels, in both groups at 5,400 m. These changes were similar and therefore independent of acclimatization and of polycythemia. There was no evidence, from clearances of proteins and of polyvinylpyrrolidone, of any change in glomerular sieving, and the character of the proteinuria was qualitatively normal. Increases in plasma protein occurred only in those in whom there was evidence of dehydration. In the unacclimatized, after abrupt ascent, transferrin levels were decreased, possibly as a means of enhancing iron supply to the developing red cells, but after acclimatization transferrin levels rose to above normal levels. (Author)

A72-24483 Role of tachycardia in mediating the coronary hemodynamic response to severe exercise. S. F. Vatner, D. Franklin, E. Braunwald (California, University, San Diego; Scripps Clinic and Research Foundation, La Jolla, Calif.), and C. B. Higgins. *Journal of Applied Physiology,* vol. 32, Mar. 1972, p. 380-385. 18 refs. Grants No. PHS-HE-12373; No. PHS-HE-13441; No. PHS-GM-01159.

The response of the coronary vascular bed to severe unrestrained exercise was studied in healthy conscious dogs, instrumented with Doppler flow probes around the left circumflex coronary artery and miniature arterial pressure gauges. Severe exercise increased heart rate from 77 to 244 beats/min, arterial pressure from 91 to 135 mm Hg, coronary flow from 38 to 124 ml/min, and decreased coronary resistance from 2.39 to 1.10 mm Hg/ml per min. It was found that the tachycardia of exercise accounts for approximately one-third of the increment in coronary flow during severe exercise. G.R.

A72-24484 Cardiovascular changes produced by brief whole-body vibration of animals. R. G. Edwards, E. P. McCutcheon, and C. F. Knapp (Kentucky, University, Lexington, Ky.). *Journal of Applied Physiology,* vol. 32, Mar. 1972, p. 386-390. 19 refs. Contract No. F44620-69-C-0127.

Cardiovascular changes were observed by monitoring central and regional blood flow velocities and blood pressures. Four anesthetized dogs and one pig were restrained with the spine vertical and vibrated

along that axis for 30 sec. Vibration frequencies were varied from 2 to 12 Hz with acceleration amplitudes 1, 2, and 3 G. Measurements included flow velocity from transducers chronically implanted on the aorta and carotid artery, and arterial pressures from acutely placed transducers. Force transmitted between animal and vibration exciter was also measured. The simultaneously measured force transmission data established the resonant frequencies of organ systems, and correlations confirmed that relative motion of internal masses was reflected in the cardiovascular data. G.R.

A72-24485 Human calorimetry with a water-cooled garment. P. Webb, J. F. Annis, and S. J. Troutman, Jr. (Webb Associates, Inc., Yellow Springs, Ohio). *Journal of Applied Physiology*, vol. 32, Mar. 1972, p. 412-418. 22 refs. Contract No. F44620-70-3-0045.

A human calorimeter is described which provides a dynamic and continuous record of heat dissipation from the body surface over extended periods of time. Unlike earlier whole-body calorimeters, it does not require a subject to stay quiet in order to achieve some sort of thermal steady state. Results of three experiments using this calorimeter are presented. O.H.

A72-24590 Physical examinations of workers exposed to trichlorotrifluoroethane. H. R. Imbus (Burlington Industries, Inc., Greensboro, N.C.) and C. Adkins (Trans World Airlines, Inc., Occupational Health Services, Kennedy Space Center, Fla.). *Archives of Environmental Health*, vol. 24, Apr. 1972, p. 257-261. 7 refs.

A group of 50 workers, exposed for an average of 2.77 years in an environment, samples of which contained from 46 to 4700 ppm of trichlorotrifluoroethane (Freon 113), was examined. There were no subjective complaints, other than one case of dryness of the skin, referable to this occupational exposure. At this time, it is our opinion that there is no evidence of adverse effects from exposure to trichlorotrifluoroethane under the conditions encountered by these personnel. We believe that continued, periodic, follow-up examinations of these workers will be helpful in further evaluating any possible long-range effects of this material. (Author)

A72-24640 # Hypothetical 'heart-lungs' model (Gipotetichna model' 'sertse-legeni'). R. V. Beliakov. *Avtomatika*, vol. 16, Nov.-Dec. 1971, p. 65-68. 15 refs. In Ukrainian.

Discussion of the possibility of developing an artifical heart using contractile polymer membranes that react with gases and liquids to act as synthetic muscles. Design features are illustrated for devices where the mechanical energy is developed by polymer membranes due to differences in the chemical energy of two fluids such as venous blood and air. Gas exchange takes place across the membrane, and the venous blood yields carbon dioxide, becomes enriched by oxygen, and is forced to circulate in the body by the contracting membranes. No electrical, pneumatic, or other external energy sources would be required. T.M.

A72-24650 * # Electroadhesive devices for zero-g intra/extravehicular activities. G. P. Beasley and W. W. Hankins (NASA, Langley Research Center, Hampton, Va.). *Journal of Spacecraft and Rockets*, vol. 9, Apr. 1972, p. 283, 284.

Initial studies of the electroadhesive phenomenon are shown to indicate that electroadhesors are potentially usable as zero-g assistive devices for a range of intra- and extravehicular activities in space missions. These uses generally are related to astronaut and cargo maneuvering, worksite restraint, and tool and equipment tiedown. M.V.E.

A72-24750 * Thermolabile triose phosphate isomerase in a psychrophilic Clostridium. Y. W. Shing, J. M. Akagi, and R. H. Himes (Kansas, University, Lawrence, Kan.). *Journal of Bacteriology*, vol. 109, Mar. 1972, p. 1325-1327. 17 refs. Grant No. NGR-17-002-042.

It was found that a psychrophilic Clostridium contains a triose phosphate isomerase which is very labile at moderate temperatures. An investigation showed that the optimal growth temperature of the psychrophile was between 15 and 20 deg C. No growth occurred at 25 deg C. The thermostability of the glycolytic enzymes in the cell-free extracts of Clostridium sp. strain 69 was studied. The data obtained show that the triose phosphate isomerase is quite labile at moderate temperatures. The instability of the enzyme is sufficient to explain the low maximum growth temperature of the psychrophile. G.R.

A72-24786 # Light-evoked potentials of the human visual cortex (Vyzvannye svetom potentsialy zritel'noi kory cheloveka). A. I. Bogoslovskii, V. K. Zhdanov, A. G. Koval'chuk, E. N. Semenovskaia, and A. M. Shamshinova (Moskovskii Nauchno-Issledovatel'skii Institut Glaznykh Boleznei, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 201, Nov. 21, 1971, p. 721-723. 10 refs. In Russian.

A photostimulator was used in a study of the potentials of the visual cortex in 49 male and female healthy adults with normal vision to determine the involvement of the macular area of the retina in reactions of the visual cortex to photostimulation. Acoustic signals of 800 Hz were applied to study the potentials of the visual cortex produced by acoustic stimulation in the group. Curves are given for visual cortex potentials stimulated by light and sound in the subjects. V.Z.

A72-24787 # Control mechanism of the pulmonary diffusion capacity (O mekhanizme regulirovaniia diffuzionnoi provodimosti legkikh). M. A. Khanin, I. B. Bukharov, and A. S. Kossov. *Akademiia Nauk SSSR, Doklady*, vol. 201, Nov. 21, 1971, p. 728-730. 14 refs. In Russian.

Mathematical analysis of mechanisms which can conceivably vary the number of open capillaries and, thus, control the diffusion capacity of the lung. A humoral control mechanism with a constant blood pressure in the capillaries and a hydraulic control mechanism with blood pressure variations are given mathematical interpretations. V.Z.

A72-24796 Effects of pressure suits on seven psychomotor skills. R. D. Huchingson (Texas A & M University, College Station, Tex.). *Perceptual and Motor Skills*, vol. 34, Feb. 1972, p. 87-92. 5 refs.

A battery of tests measuring 7 psychomotor skills were administered to Ss under 5 conditions: an older pressure suit, pressurized and unpressurized; a more recent pressure suit, pressurized and unpressurized; and shirtsleeve conditions. Test performance involving manual dexterity with and without tools was degraded more by suit conditions than was test performance involving arm and wrist movement such as tracking. Performance with the older, USN Mark IV suit at 2.0 psig closely approximated performance with the Gemini 3C-8 at 3.5 psig, which supports the feasibility of using older suits for selected types of psychomotor research. (Author)

A72-24797 # Human response to whole-body vibration. R. W. Shoenberger (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Perceptual and Motor Skills*, vol. 34, Feb. 1972, p. 127-160. 103 refs.

Research concerning several types of human response to wholebody vibration is reviewed and evaluated. Major emphasis is on two categories of behavioral research, subjective judgments of vibration intensity and the effects of vibration on human performance. Discussion of the biodynamic response of the human body to vibration provides background information to aid the reader in understanding and interpreting vibration parameters and results of behavioral studies. Also included are considerations of the mechanisms through which vibration affects behavioral response, and some problems and shortcomings in human vibration research. (Author)

A72-24811 A review of the bases for the hydraulic transmission line equations as applied to circulatory systems. J. C. Chao and N. H. C. Hwang (Houston, University, Houston, Tex.). *Journal of Biomechanics,* vol. 5, Mar. 1972, p. 129-134. 17 refs.

The hydraulic transmission line theory which can be used to predict the transmission characteristics in an arterial system is reviewed. The major features considered herein are the conversion of the basic equations of motion of the fluid and of the tube wall to the transmission line equations. The differences in the conversion approaches and the convenience of their application are discussed in detail. The differences in the results predicated on different assumptions are generally a function of the values of the selected system parameters. The solution of the equations in terms of computer computation is also discussed. (Author)

A72-24812 A model for the dynamic mechanical properties of arteries. R. H. Cox (Pennsylvania, University, Philadelphia, Pa.). *Journal of Biomechanics,* vol. 5, Mar. 1972, p. 135-152. 46 refs. Grant No. PHS-HE-07762; Contract No. Nonr-551/54/.

The model was tested with regard to mechanical properties data derived from simultaneous measurements of intra-arterial pressure and external diameter from surgically exposed femoral arteries of anesthetized dogs. It was found that a model consisting of a spring in series with a Voigt element adequately represented data from experiments where the fundamental heart frequency was 2 Hz or more. But when the latter was 1 Hz or less, 2 Voigt elements, of different time constants, in series with the spring were necessary to represent the data. G.R.

A72-24822 * Urinary excretion values in 2-day food-deprived, unrestrained chimpanzees. J. J. McNew, I. M. Sabbot, T. Hoshizaki, A. J. Mandell, C. E. Spooner, I. Marcus, and W. R. Adey (California, University, Los Angeles, Calif.). *American Journal of Physiology,* vol. 222, Mar. 1972, p. 640-644. 24 refs. Contract No. NSR-05-007-158.

A study was conducted to determine the baseline 24-hr urinary excretion values in the young, unrestrained chimpanzee, and also changes in urinary values, if any, induced by the two-day food deprivation stress. Urine was analyzed for volume, osmolarity, creatinine, creatine, urea nitrogen, 17-hydroxycorticosteroids (17-OHCS), 3-methoxy-4-hydroxymandelic acid (VMA), calcium, and inorganic phosphorus. Significant increases due to food deprivation stress were observed for volume, creatine, urea nitrogen, 17-OHCS, VMA, and phosphorus values, with significant decreases in osmolarity and calcium. All values approached normal levels by the second poststress day. No significant changes were observed in creatinine. A comparison is drawn between human and chimpanzee adaptation to stress. O.H.

A72-24973 Closed loop life support systems. D. Dooling, Jr. *Spaceflight,* vol. 14, Apr. 1972, p. 134-139. 8 refs.

Various methods currently investigated as a means of developing a life support system that is capable of regenerating molecular oxygen and water are examined. Manned and unmanned tests performed in two four-man chambers, ranging from a brief open-door test of a new subsystem to a closed-door test of several weeks with a crew inside, are discussed. A successful 90-day test completed in summer 1970 with the McDonnell Douglas Space Station Simulator is noted. Results of Soviet experiments are reviewed. V.P.

A72-24985 What is the basis of choice reaction-time. A. T. Welford (Adelaide, University, Adelaide, Australia). *Ergonomics,* vol. 14, Nov. 1971, p. 679-693. 17 refs. Research supported by the Australian Research Grants Committee.

In an 8-choice reaction task, times for responses by the ring and middle fingers were found to be substantially longer than those for responses by the index and little fingers. Supplementary experiments showed that the inequalities were not due to motor factors but rather to perceptual features which affected the ease with which the positions of signals and response keys could be identified. The inequalities observed are incompatible with several types of model which have been proposed to account for the linear rise of reaction-time with the logarithm of degree of choice; in particular, the serial classification model which assumes a simple progressive dichotomization, and models which assume that evidence from all the possible signal sources is examined simultaneously. However, the times for 2-, 4- and 8-choice tasks accorded remarkably well with predictions from a modified serial-classification model proposed by the author in 1960. (Author)

A72-24987 Psychophysiological aspects of paced and unpaced performance as influenced by age. G. Salvendy (New York, State University, Buffalo, N.Y.) and J. Pilitsis (Western Electric Co., Buffalo, N.Y.). *Ergonomics,* vol. 14, Nov. 1971, p. 703-711. 22 refs.

As a result of experimental evidence on paced performance, the hypothesis was proposed that for various age groups a different freely chosen pace exists in which human energy expenditure per unit of external work performed is minimum. Working either below or above this freely chosen pace, the energy expenditure per unit of work increases. The experiments conducted using an arm ergometer, on 15 male sedentary subjects aged 21-64, support the hypothesis for the subjects in the age range of 21-43 years; above this age range the minimum physiological cost per work is not exhibited within a freely chosen working range of the subjects. (Author)

A72-24988 Fatigue problems in modern industry. C. Cameron (West Virginia University, Morgantown, W.Va.). *Ergonomics,* vol. 14, Nov. 1971, p. 713-720. 26 refs.

A study of fatigue in civil aircrew is briefly described and a view of fatigue as a generalized response to stress is developed from the results. The factors associated with a fatigue reaction in aircrew are identified, and it is pointed out that they derive directly from technological advances in the airline industry. Similar advances in other branches of industry may be expected to bring similar problems, notably a progressively wider adoption of shift working. Solutions may be achieved by the application of human factors principles to the full range of human factors problems in industry, and by the determination of appropriate work-rest cycles for various kinds of work. (Author)

A72-24989 The kinetics of recovery oxygen intake and blood lactic acid concentration measured to a baseline of mild steady work. C. T. M. Davies and G. W. Crockford (London School of Hygiene and Tropical Medicine, London, England). *Ergonomics,* vol. 14, Nov. 1971, p. 721-731. 19 refs.

The relationship between blood lactate, pyruvate and excess lactate removal, and the excess oxygen consumed during the recovery from work on a stationary bicycle ergometer was studied intensively on two healthy male subjects. The results showed contrary to the recent work of Huckabee (1958) and the studies of Rowell et al. (1966) that a clear quantitative relationship exists between the area under the second portion of a double exponential oxygen uptake recovery curve and the oxygen equivalents of lactate. The findings fully support the earlier concept of Margaria et al. (1933) of separate 'alactic' and 'lactic' portions of the oxygen debt and suggest that it is these components of the post exercise oxygen uptake which must be used in the analysis and interpretation of the contribution of anaerobic processes during work. (Author)

A72-24990 Durations of safe exposure for men at work in high temperature environments. C. R. Bell, M. J. Crowder (London School of Hygiene and Tropical Medicine, London, England), and J. D. Walters (Institute of Naval Medicine, Gosport, Hants., England). *Ergonomics,* vol. 14, Nov. 1971, p. 733-757. 64 refs. Research sponsored by the Medical Research Council.

Times taken to reach a state of imminent heat collapse were examined in a sample of 87 fit, unacclimatized young men dressed in overalls. Subjects were required to perform a routine of continuous work at approximately 310 J/sec in environmental conditions within the range 37.0/30.0 C to 83.4/41.2 C dry-bulb/wet-bulb temperature in which air movement was either 0.76 or 1.02 m/sec and air and wall temperatures were equivalent. From the analysis of 440 observations, a general equation expressing a rectangular hyperbolic relationship between imminent heat collapse times and environmental severity, described in terms of 0.22661 dry-bulb + 0.77339 wet-bulb temperature in deg C, was derived. On the basis of this equation lower confidence limits for individual observations were calculated as recommendations of safe exposure times from 120 mins to 10 mins. (Author)

A72-24991 Semi-automatic measurement of oxygen uptake up to and including maximum. J. Musgrove and E. S. Reeves (London School of Hygiene and Tropical Medicine, London, England). *Ergonomics,* vol. 14, Nov. 1971, p. 759-763. 6 refs.

Several existing techniques are combined into a place- and labor-saving technique for recording and analysis of oxygen uptake in human subjects. The technique requires a respiratory apparatus, a gas meter, a respiratory valve, a mixing bottle and a sampling system. A circuit is used for converting meter volumes into a digital display. Tested on groups of subjects, the technique proved efficient in rapid measurements with an accuracy comparable to that of more conventional methods. V.Z.

A72-25071 # Evaluation of the use of heated cross-thermocouples for assessments of regional myocardial blood flow. Y. Uchida (Tokyo, University, Tokyo, Japan) and H. Ueda (Tokyo Women's Medical College, Tokyo, Japan). *Japanese Heart Journal,* vol. 12, Nov. 1971, p. 562-574. 19 refs.

Investigations have been made in dogs to elucidate to what extent can the difference of the regional alterations in the myocardial temperature induce changes in the thermoelectromotive voltage of heated cross thermocouples sewn into the subepicardial layers of the left ventricle. Results obtained support the conclusion that, subject to some limitations, this method is well applicable for assessments of the regional blood flow in the myocardium. O.H.

A72-25098 Allometric ratios, invariant numbers and the theory of biological similarities. B. Günther (Universidad de Chile, Santiago, Chile). *Pflügers Archiv,* vol. 331, no. 4, 1972, p. 283-293. 20 refs.

A satisfactory correlation has been established between empirical body weight exponents of 80 allometric equations and the predicted reduced exponent, according to the theory of biological similarities. Quantitative rules of the morphometric and physiometric organization of mammals are discussed, such as the numerical relationships among organs, functions, and body weight. The results seem to validate the general importance of scale-up methods in biological research. O.H.

A72-25099 Efferent vestibular activity in the frog (L'activité vestibulaire efférente chez la grenouille). J. Caston (Rouen, Université, Mont-Saint-Aignan, Seine-Maritime, France). *Pflügers Archiv,* vol. 331, no. 4, 1972, p. 365-370. 17 refs. In French.

Results of a study of efferent vestibular activity in the frog indicate that rotatory stimulations in the horizontal plane evoke bursts of efferent spikes regardless of whether spontaneous discharges are present or absent. Only stimulations eliciting an increase of the afferent activity are active to efferent responses. Some efferent activity characteristics are specified. O.H.

A72-25113 Hand steadiness during unrestricted linear arm movements. P. G. Mead and P. B. Sampson (Tufts University, Medford, Mass.). *Human Factors,* vol. 14, Feb. 1972, p. 45-50. 5 refs. Grant No. PHS-DH-00035-04.

Factors influencing hand steadiness were investigated in 66 subjects performing unrestricted linear arm movements. Results demonstrated that most hand tremor occurs in the up-down plane, with right-left and in-out tremor occurring less frequently. In addition, arm movements made by subjects viewing a target by means of a mirror were found to produce more errors than those made by direct viewing. Other literature is cited, and implications are discussed for the utility of a hand-steadiness procedure in dental practice. (Author)

A72-25114 # Human engineering the keyboard. K. H. E. Kroemer (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). *Human Factors,* vol. 14, Feb. 1972, p. 51-63. 29 refs.

The standard typewriter keyboard serves as a model for keyboards of teletypewriters, desk calculators, consoles, computer keysets, cash registers, etc. This man machine interface should be designed to allow high frequency, error-free operation with the least possible strain on the operator. This paper discusses several feasible biomechanical improvements of the keyboard. Some experimental findings are described which support the following design concepts: (1) the keys should be arranged in a 'hand-configured' grouping to simplify the motion patterns of the fingers; (2) the keyboard sections allotted to each hand should be physically separated to facilitate the positioning of the fingers; and (3) the keyboard sections allotted to each hand should be declined laterally to reduce postural muscular strain of the operator. (Author)

A72-25115 Task complexity and serial performance under steadily increasing input rates. M. S. Huntley, Jr. (Vermont, University, Burlington, Vt.). *Human Factors,* vol. 14, Feb. 1972, p. 65-75. 11 refs.

Twenty-seven subjects were trained on a multichannel information processing task, under three levels of stimulus complexity, and tested in these conditions in each of three 5-min sessions of rapidly increasing input rate. Correct responses, errors, and omissions were

examined for each condition. During testing, performance decrements which followed initial performance peaks occurred at lower input rates were least severe, and recovery was quickest when stimulus complexity was greatest. Subjects adapted to high input rates by filtering and making omissions rather than incorrect responses. In addition two types of attention strategies were identified, one of which produced superior performance at low input rates, and the other superior performance at high input rates. Error and response rates were positively correlated for all code complexity levels when pooled across subjects. However, at the most complex level this relation only held for one of the two attention strategies when the two sets of data were analyzed separately. (Author)

A72-25126 Visual and haptic angle perception in the matching task. S. Appelle (New York, State University, Brockport, N.Y.). *American Journal of Psychology,* vol. 84, Dec. 1971, p. 487-499. 21 refs. Grant No. NIH-R01-HD-03105.

Forty subjects reproduced angles of 30-150 deg from a series of comparison angles presented in ascending and descending orders. Magnitude of error was significantly lower for the visual-visual group than for the haptic-haptic, visual-haptic, and haptic-visual groups. The results suggest that haptic percepts of angle are smaller in magnitude than those for vision and that performance differences between modalities reflect both the nature of form discrimination and the nature of the matching task itself. (Author)

A72-25127 Modality, difficulty, and 'coupling' in vigilance behavior. M. Loeb and J. R. Binford (Louisville, University, Louisville, Ky.). *American Journal of Psychology,* vol. 84, Dec. 1971, p. 529-541. 6 refs. Army-supported research.

With auditory, loosely coupled visual, and closely coupled visual intensity-discrimination tasks matched for difficulty (d') for each of 20 subjects in a short-term monitoring session, subsequent vigilance performance on the tasks was predictable, and a number of indices of performance and performance change correlated significantly and appreciably across the vigilance tasks. There were indications of modality specificity, but degree of coupling was not as significant a factor as expected. (Author)

A72-25177 Comparison of LGN and optic tract intensity-response functions. R. W. Winters and D. I. Hamasaki (Miami, University, Coral Gables, Fla.). *Vision Research,* vol. 12, Apr. 1972, p. 589-608. 34 refs. Research supported by the University of Miami; NSF Grant No. G4-3302; Grants No. PHS-EY-00376-03; No. PHS-SB13-FR-07022-04; No. PHS-RO1-EY-00701-01.

In an attempt to delineate the transformations that occur in the lateral geniculate neurons (LGN), single cell recordings were made from cat LGN while varying the luminance and size of spots flashed in the center of their receptive fields. Comparisons were made between the data recorded and previously published data from single optic neurons, obtained under similar stimulus conditions. Two components were found in the LGN that were not found in the optic tract fibers. First, at intensities near threshold, at the termination of the stimulus, there is a long period of about 300 msec, in which neural activity is completely suppressed. Second, at intensities greater than 1.4 log units above threshold, there is a brief period in which there is a complete suppression of the response. A quantitative evidence for these findings is given. O.H.

A72-25178 * Average evoked potential correlates of two-flash perceptual discrimination in cats. C. K. Peck and D. B. Lindsley (California, University, Los Angeles, Calif.). *Vision Research,* vol. 12, Apr. 1972, p. 641-652. 22 refs. Contract No. N00014-69-A-0200-4024; Grants No. NGL-05-007-049; No. PHS-NS-8552.

Average evoked potentials (AEPs) were recorded from the optic tract, lateral geniculate nucleus, and visual cortex of cats trained to discriminate between two successive flashes of light at various interflash intervals (IFI) and a single flash. The percent of correct responses to two-flash stimuli decreased sharply as IFI decreased from 100 to 20 msec. This behavioral response decrement was paralleled by a progressive overlapping of the AEPs to the two flashes and at 20 msec the AEPs resembled those to a single flash at all levels of the visual pathways. Implications for the coding of the information relevant to the discrimination of two flashes are discussed. (Author)

A72-25179 The validity of magnitude estimations of luminosity and the measurement of the relative effects of preadaptation and contrast. J. E. Saunders (City University, London, England). *Vision Research,* vol. 12, Apr. 1972, p. 689-698. 19 refs.

Magnitude estimation scales of foveal luminosity (subjective brightness) of two subjects were studied for ranges of preadaptation and contrast luminances. Inter-subject differences cast doubt on the use of this technique in establishing fundamental psychophysical laws. However these were not associated with perceptual differences or adaptation effects. The data for two special cases (1) for equal preadaptation and contrast luminances and (2) for the light adapted eye and dark surrounds agree well with previously obtained haploscopic data. When the preadaptation and contrast luminances are not identical the preadaptation component of adaptation influences luminosity for low or dark surrounds, whereas with luminous surrounds the contrast component dominates perception. (Author)

A72-25180 The effect of stimulus complexity on human cyclofusional response. A. E. Kertesz (California Institute of Technology, Pasadena, Calif.). *Vision Research,* vol. 12, Apr. 1972, p. 699-704. 17 refs. Grants No. PHS-EY-00687; No. PHS-NS-03627.

Objective measurement of human cyclofusional response was carried out, using a binocular recording technique. Increasing stimulus complexity was found to result in an increased cyclofusional amplitude. The greater cyclofusional amplitude resulting from increased stimulus complexity is realized by an increased central response, while compensatory eye movements, if they indeed occur, play a minor role. Hence the extent of Panum's fusional areas can no longer be considered constant and their dependence upon stimulus parameters should be recognized. (Author)

A72-25181 Flicker adaptation. II - Effect on the apparent brightness of intermittent lights. A. Pantle (California, University, Los Angeles, Calif.). *Vision Research,* vol. 12, Apr. 1972, p. 705-715. 22 refs. Research supported by the University of California; Grant No. PHS-1-R03-MH-18696-01.

It was found that an intermittent light must be made more intense after adaptation to a flickering light in order to appear as bright as it does after adaptation to a steady light of the same time-average retinal illuminance. The largest decreases of brightness gain occurred with adapting stimuli of intermediate frequencies (6-11 Hz). Furthermore, the loss of gain produced by an adapting stimulus of intermediate frequency was highly nonlinear in the sense that it was not constant from one test frequency to the next. Both low- and high-frequency adapting stimuli produced relatively small, but reliable, reductions of gain at all test frequencies. The effects of flicker adaptation on brightness gain are compared with published data on the effects of flicker adaptation on temporal modulation sensitivity, and possible mechanisms of flicker adaptation are discussed. (Author)

A72-25182 **Edge-contingent color after effects - Spatial frequency specificity.** C. F. Stromeyer, III (Bell Telephone Laboratories, Inc., Murray Hill, N.J.). *Vision Research,* vol. 12, Apr. 1972, p. 717-733. 31 refs.

Edge-contingent color after effects (McCollough effects) were shown to be spatial frequency-specific: after effect color saturation was generally greatest when the frequency of adaptation and test gratings matched and became progressively weaker as the test frequency diverged from the adaptation frequency. When adaptation and test frequencies matched, the strongest after effects occurred at approximately 5 c/deg and progressively weaker after effects occurred at higher and lower frequencies. In another experiment, complementary color after effects were generated together on gratings of the same orientation, each after effect tied to a different frequency. The after effects could then be varied by the apparent frequency shift (Blakemore and Sutton, 1969); however, the interocular transfer of the frequency shift had no effect on the color after effect. (Author)

A72-25183 * **Differences in apparent straightness of dot and line stimuli.** M. B. Parlee (Wellesley College, Wellesley, Mass.). *Vision Research,* vol. 12, Apr. 1972, p. 735-742. 22 refs. Grants No. NIH-MH-07642; No. NsG-496.

An investigation has been made of anisotropic responses to contoured and noncontoured stimuli to obtain an insight into the way these stimuli are processed. For this purpose, eight subjects judged the alignment of minimally contoured (3 dot) and contoured (line) stimuli. Stimuli, presented to each eye separately, vertically subtended either 8 or 32 deg visual angle and were located 10 deg left, center, or 10 deg right in the visual field. Location-dependent deviations from physical straightness were larger for dot stimuli than for lines. The results were the same for the two eyes. In a second experiment, subjects judged the alignment of stimuli composed of different densities of dots. Apparent straightness for these stimuli was the same as for lines. The results are discussed in terms of alternative mechanisms for analysis of contoured and minimally contoured stimuli. O.H.

A72-25184 **Electronic production of shifting grid pattern displays.** R. F. Stamps, Jr. and J. R. Bourne (Vanderbilt University, Nashville, Tenn.). *Vision Research,* vol. 12, Apr. 1972, p. 743-746. 7 refs. NSF Grant No. GK-27863.

A flexible and inexpensive electronic display system is proposed which can be used to produce shifting grid patterns on an oscilloscope. The grid patterns feature variable spatial frequency, temporal frequency, and modulation depth. Presently, the system is being used in an investigation of the relationship between binocular rivalry suppression and the visual evoked response. O.H.

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STAR ENTRIES

N72-18059*# Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex.
[METABOLIC, RESPIRATORY, AND CARDIOLOGICAL MEASUREMENTS DURING EXERCISE AND REST]
28 Dec. 1971 112 p refs
(Contract NAS9-7009)
(NASA-CR-115362) Avail: NTIS CSCL 06P

Low concentration effects of CO2 on metabolic respiration and circulation were measured during work and at rest. The relationship between heart rate and metabolic rate is examined, as well as calibration procedures, and rate measurement during submaximal and standard exercise tests. Alterations in acid base and electrolytes were found during exhaustive exercise, including changes in ECG and metabolic alkalosis effects. J.A.M.

N72-18060*# Translation Consultants, Ltd., Arlington, Va.
ELECTROLYTES IN CELLS OF SKELETAL MUSCLES AND MYOCARDIUM IN CONGESTIVE HEART FAILURE
L. Szczepanski Washington NASA Feb. 1972 9 p refs Transl. into ENGLISH from Polski Tygod. Lekar. Wiadomosci Lekar. (Warsaw), v. 21, issue 26, 1966 p 990-992
(Contract NASw-2038)
(NASA-TT-F-14128) Avail: NTIS CSCL 06P

Fragments of abdominal rectus muscle and of the myocardium obtained during autopsy from patients dying from congestive heart failure and from cases of sudden death were studied. The total water content of the muscle, the extracellular and intracellular water, chlorides, sodium, calcium, potassium and magnesium content in fresh muscle and the concentration of sodium, potassium and magnesium in the intracellular water was determined. In congestive heart failure a statistically significant increase of the total and extracellular water content and chlorine and sodium were observed in fresh muscle and a decrease of potassium and magnesium in the fresh muscle and in intracellular water was found. The water and electrolyte content in the myocardium with pathological changes in cases without signs of congestive heart failure was simular to the content in a control group. It was found that the sum of cation concentration in the intracellular water is decreased in cases of congestive heart failure. Author

N72-18061*# Techtran Corp., Glen Burnie, Md.
STIMULATION OF THE ADRENERGIC SYSTEM BY POTASSIUM IONS IN RATS
A. Cession-Fossion Washington NASA Feb. 1972 14 p refs Transl. into ENGLISH from Arch. Intern. Physiol. Biochim. (Liege), v. 73, no. 4, 1965 p 633-645
(Contract NASw-2037)
(NASA-TT-F-14127) Avail: NTIS CSCL 06C

Experiments on rats, partially confirmed on cats, show that potassium ions can stimulate peripheral, medullary adrenal or post-ganglionic orthosympathetic structures. The medullary adrenal stimulation is greatest and is independent of any cholinergic nicotinic mechanism. Details on doses and laboratory techniques are provided. Author

N72-18062*# California Univ., Berkeley. Space Sciences Lab.
ENZYME ACTIVITY IN TERRESTRIAL SOIL IN RELATION TO EXPLORATION OF THE MARTIAN SURFACE Semiannual Progress Report
M. S. Ardakani, R. G. Burns, A. D. McLaren, and A. H. Pukite
1 Jan. 1972 42 p refs
(Grant NGL-05-003-079)
(NASA-CR-125591; SSL-Ser-13-Issue-1; SAPR-15) Avail: NTIS CSCL 06M

Urease activity in soil is persistent for long periods under low water, low temperature, and sterile regimes, and it was suggested that some form of enzyme-protective mechanism exists in soil. Dublin soil was extracted by sonication in water followed by adding a mixture of salts. Urease activity is associated with the organo-mineral complex thus obtained and is resistant to the activities of proteolytic enzymes. Clay free soil organic matter prepared subsequently by filtration also exhibits urease activity which is resistant to proteolysis. Models consisting of enzymes with bentonite and lignin were found to mimic this resistance to proteolysis. A model system is presented which suggests both the origin and location of soil ureases and a reason for their persistence in nature. Author

N72-18063*# Food and Drug Administration, Cincinnati, Ohio. Div. of Microbiology.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Oct. - 31 Dec. 1971
J. E. Campbell Feb. 1972 9 p
(NASA Order W-13411)
(NASA-CR-125659; QPR-27) Avail: NTIS CSCL 06M

A set of conditions in which 90 C was a more lethal temperature than 125 C for the destruction of Bacillus subtilis var. niger was identified as a function of relative humidity, with maximum effectiveness at 100% R.H. A systematic study of the influence of head-space moisture and temperature on the destruction of B. subtilis var. niger is reported. Author

N72-18064*# Food and Drug Administration, Cincinnati, Ohio. Div. of Microbiology.
ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Quarterly Progress Report, 1 Jul. - 30 Sep. 1971
J. E. Campbell Nov. 1971 11 p ref
(NASA Order W-13411)
(NASA-CR-125658; QPR-26) Avail: NTIS CSCL 06M

Data showing that 90 C was a more effective temperature than 125 C for the destruction of Bacillus subtilis var. niger when the head-space moisture was fixed at 474 micrograms H2O/ml have been confirmed and are summarized. The influence of head-space moisture at 90 C was investigated and it was observed that as the head-space moisture was increased 474 micrograms H2O/ml, there was a corresponding increase in lethality of the system. This moisture level corresponded to 100% relative humidity at 90 C, and additional water in the cans should have had no effect. A profound descrease was observed in the destruction of the organisms when additional water was added. The discontinuity observed in these data is troublesome and must be resolved as the first step in an orderly exploration of low temperature inactivation of B. subtilis var. niger. Author

N72-18065*# Translation Consultants, Ltd., Arlington, Va.
THE PROBLEM: APHANOASCUS ZUKAL OR ANIXIOPSIS HANSEN
G. A. deVries Washington NASA Feb. 1972 18 p refs Transl. into ENGLSH from Mykosen (Berlin), v. 12, no. 2, 1969 p 111-122
(Contract NASw-2038)
(NASA-TT-F-14092) Avail: NTIS CSCL 06M

Aphanoascus Zukal and Anixiopsis Hansen are considered to be two different genera on the basis of the different color and size of the cleistothecia and the late, or early, closure of the peridial wall, whereas Anixiopsis stercoraria Hansen and Anixopsis reticulispora Routien are considered to belong to one species, Anixiopsis fulvescens (Cooke) nov. comb. based on their close similarity. These phenomena are examined in detail. Author

N72-18066*# Missouri Univ., Columbia.
GLC ANALYSIS OF BASE COMPOSITION OF RNA AND DNA HYDROLYSATES
Duane B. Lakings and Charles W. Gehreke 1971 52 p refs
(Grant NGR-26-004-011-S5)
(NASA-CR-125593) Avail: NTIS CSCL 06A

Various methods used for the analysis of the base composition of RNA and DNA hydrolysates are presented. The methods discussed are: (1) ion-exchange chromatography, (2) paper chromatography, (3) paper electrophoresis, (4) thin layer chromatography, (5) paper chromatography and time of flight mass spectrometry, and (6) gas-liquid chromatography. The equipment required and the conditions for obtaining the best results with each method are described. Author

N72-18067# Joint Publications Research Service, Washington, D.C.
HYDRODYNAMICS OF FISH AND DOLPHINS
9 Feb. 1972 17 p refs Transl. into ENGLISH from Zool. Zh. (Moscow), v. 50, no. 11, 1971 p 1686-1694, 1755-1757
(JPRS-55143) Avail: NTIS

The hydrodynamic wake, drag, and vortex formation behind swimming fish and dolphins are studied.

N72-18068# Joint Publications Research Service, Washington, D.C.
SOME DISTINCTIONS OF HYDRODYNAMICS OF NEKTON (FISH AND DOLPHINS)
A. N. Lyapin *In its* Hydrodyn. of Fish and Dolphins 9 Feb. 1972 p 1-11 refs
Avail: NTIS

Some nekton swimming in heavy liquids experience considerably less hydrodynamic drag than inanimate solid objects in the range of velocity and immersion depth ratios (Froude numbers) at which manmade apparatus is often subject to vibration and even loss of control. The adaptations of nekton to liquid movement indicate that changes in hydrodynamic pressure rather than in velocity should serve as the basis of liquid and body movement control and, in the broader sense, the basis of their physical interaction. Considering interaction between bodies and liquids as a unique oscillatory process, it is deemed possible to substantiate both the optimum form of a living body as a whole and the possible means of lowering resistance which living organisms use with some success. Author

N72-18069# Joint Publications Research Service, Washington, D.C.
VORTEX FORMATION IN THE HYDRODYNAMIC WAKE OF FISH DURING PROPULSION
O. P. Ovcharov *In its* Hydrodyn. of Fish and Dolphins 9 Feb. 1972 p 12-16 refs
Avail: NTIS

The vortex formation behind moving fish was studied by wake visualization. The results indicate that vortex formation in the wake is related to active function of the locomotor organ. It is observed only when the fish is accelerating and at an established regular velocity. In all cases of breaking there is no vortex formation in the hydrodynamic wake. As the propulsion velocity increases, there is an increase in intensity of vortex formation and an increase in vortical resistance. Author

N72-18070*# Techtran Corp., Glen Burnie, Md.
FLIGHT AND PSYCHOLOGY
V. Levashov and A. Pikovskiy Washington NASA Feb. 1972 5 p refs Transl. into ENGLISH from Grazhdsnskaya Aviatsiya (Moscow), no. 3, Mar. 1970 p 9
(Contract NASw-2037)
(NASA-TT-F-13951) Avail: NTIS CSCL 05J

Investigation of the psychological characteristics of flight and the condition of passengers during flight on commerical airlines are presented. Attention is paid to the elimination of factors which could have a negative psychological influence on the passengers. The effects of positive psychological motivation on crew performance and flight safety are discussed. Author

N72-18071*# Scientific Translation Service, Santa Barbara, Calif.
FURTHER EXPERIMENTAL WORK ON THE RELATION BETWEEN POTASSIUM AND PHYSICAL EXERCISE
M. Mitolo and D. Leone Washington NASA Feb. 1972 10 p refs Transl. into ENGLISH from Boll. Soc. Ital. Biol. Sper. (Naples), v. 43, no. 13, 1967 p 807-810
(Contract NASw-2035)
(NASA-TT-F-14125) Avail: NTIS CSCL 06S

The influence of potassium upon the duration of swimming is investigated. Eight male, white rats were used for the study. It is concluded that potassium lengthens the swimming periods. *Author*

N72-18072*# Techtran Corp., Glen Burnie, Md.
THE MECHANISM OF REGULATION OF ALPHA-ACETOHYDROXYACID SYNTHETASE PROPERTIES IN BACILLUS CEREUS T.
J. Raimond and N. Grelet Washington NASA Feb. 1972 12 p refs Transl. into ENGLISH from Biochemie (Paris), v. 53, 1971 p 783-788
(Contract NASw-2031)
(NASA-TT-F-14141) Avail: NTIS CSCL 06M

The alpha-acetohydroxyacid synthetase properties in Bacillus cereus T. were studied. According to the results, there is only one enzymatic alpha-acetolactate forming system, operating at pH 7.5. The enzyme is sensitive, in vitro, to valine, leucine, and isoleucine inhibition, the partial inhibitions of leucine and isoleucine being additive and equal to the maximum inhibition caused by valine alone. The Kinetic constants are Km = 0.002 M with respect to pyruvate and Ki = 0.00007 M for valine. A mixed rate and affinity inhibition system for this enzyme is suggested by the kinetic of inhibition. Author

N72-18073# National Research Council of Canada, Ottawa (Ontario).
RADIO WAVES AND THE LIVING ORGANISM
Yu. V. Sebrant and M. P. Troyanskii 1972 34 p refs Transl. into ENGLISH from Biol., Ser. 4 (Moscow), 1969 31 p
(NRC-TT-1519) Avail: NTIS

The possible effects of radio waves, from various sources including natural and instrumental, on humans are examined. The effects of various lengths, frequencies, and time of exposure were also examined. Efforts were made to determine how man can be protected from these waves if indeed they are harmful to him. It was concluded that no specific standards could be set for damage though in some cases damage did occur. Radio waves were also found to be helpful in treating various types of diseases and injuries. E.H.W.

N72-18074*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE ESTIMATION OF GALACTIC COSMIC RAY PENETRATION AND DOSE RATES
M. O. Burrell and J. J. Wright Washington Mar. 1972 43 p refs
(NASA-TN-D-6600; M444) Avail: NTIS CSCL 06R

This study is concerned with approximation methods that can be readily applied to estimate the absorbed dose rate from cosmic rays in rads - tissue or rems inside simple geometries of aluminum. The present work is limited to finding the dose rate at the center of spherical shells or behind plane slabs. The dose rate is calculated at tissue-point detectors or for thin layers of tissue. This study considers cosmic-rays dose rates for both free-space and earth-orbiting missions. Author

N72-18075*# Scientific Translation Service, Santa Barbara, Calif.
CHRONIC POTASSIUM DEFICIENCY AND EXCITABILITY OF MUSCLE CELLS. MEASUREMENTS WITH INDIVIDUAL HUMAN MUSCLE CELLS IN SITU
H.-D. Bolte and B. Luederitz Washington NASA Feb. 1972 11 p refs Transl. into ENGLISH from Klin. Wochschr. (Berlin), v. 48, 1970 p 34-36
(Contract NASw-2035)
(NASA-TT-F-14129) Avail: NTIS CSCL 06P

A resting membrane potential of -99.6 mV, a threshold current of 4.37 x 10 to the -8th power A, and a latency time of 27.2 msec. was found in patients with chronic potassium deficiencies of various origins. In comparison to controls in healthy persons, the resting membrane potential was increased by 16.0 mV. The threshold current did not show a statistically significant change. The latency time was increased by more than 100%; i.e., by 15.3 msec. Under the conditions of general potassium deficiency, an increased resting membrane potential is not necessarily linked with an increase of the threshold current or with a decrease in excitability. The increase in the latency time indicates a decrease of the ionic conductivity when the extracellular potassium concentration is diminished in general potassium deficiency. Author

N72-18076*# National Aeronautics and Space Administration, Washington, D.C.
MEDICAL AND BIOLOGICAL PROBLEMS IN THE CONQUEST OF SPACE
V. V. Parin Washington NASA Feb. 1972 15 p Transl. into ENGLISH from Zemlya i Vselennaya (Moscow), no. 3, 1970 p 15-23
(NASA-TT-F-14165) Avail: NTIS CSCL 06E

The medical and biological problems associated with life support systems in a space environment for long periods of time are examined. Subjects discussed are: (1) water and oxygen regeneration, (2) synthesis of food, (3) energy expenditure and conservation, (4) design of life support systems, and (5) biological effects of prolonged space flight. The results of a one year medical and technical experiment at a Soviet Union ground testing facility to study life support systems are presented. Author

N72-18077*# Boeing Co., Seattle, Wash. Space Physics Group.
RADIATION HAZARDS TO MAN
S. B. Curtis (California Univ., Lawrence Radiation Lab.) and M. C. Wilkinson 12 Apr. 1971 46 p refs
(Contract NASw-1963)
(NASA-CR-125592; D180-12878-1) Avail: NTIS CSCL 06R

The secondary dose contribution expected from the heavy primaries of the galactic cosmic rays was evaluated by a calculational technique developed in this study. Improvements in the solar and galactic cosmic ray environments made possible by recent experimental and theoretical work are discussed and presented. The recommendations of the National Academy of Sciences' space radiation study panel, are used in conjunction with a shielding analysis, to evaluate the radiation status of an astronaut during the triple solar particle event of 10, 14, 16 July 1959. Author

N72-18078*# Bellcomm, Inc., Washington, D.C.
USE OF SHUTTLE FOR LIFE SCIENCES
R. E. McGaughy 25 Jan. 1972 24 p refs
(Contract NASw-417)
(NASA-CR-125666; B72-01008) Avail: NTIS CSCL 06B

The use of the space shuttle in carrying out biological and medical research programs, with emphasis on the sortie module, is examined. Detailed descriptions are given of the goals of space life science disciplines, how the sortie can meet these goals, and what shuttle design features are necessary for a viable biological and medical experiment program. Conclusions show that the space shuttle sortie module is capable of accommodating all biological experiments contemplated at this time except for those involving large specimens or large populations of small animals; however, these experiments can be done with a specially designed module. It was also found that at least two weeks is required to do a meaningful survey of biological effects. E.H.W.

N72-18079*# California Univ., Riverside. Dept. of Geography
PLANT TISSUE AND THE COLOR INFRARED RECORD
Robert W. Pease Feb. 1969 20 p refs
(NASA Order R-09-020-024; Contract DI-14-08-0001-10674)
(NASA-CR-125657; USGS-IR-NASA-147) Avail: NTIS CSCL 06C

Green plant tissue should not be considered as having a uniquely high near-infrared reflectance but rather a low visual reflectance. Leaf tissue without chloroplasts appears to reflect well both visual and near infrared wavelengths. The sensitometry of color infrared film is such that a spectral imbalance strongly favoring infrared reflection is necessary to yield a red record. It is the absorption of visual light by chlorophyll that creates the imbalance that makes the typical red record for plants possible. Reflectance measurements of leaves that have been chemically blanched or which have gone into natural chloride decline strongly suggests that it is the rise in the visual reflectance that is most important in removing the imbalance and degrading the red CIR record. The role of water in leaves appears to be that of rendering epidermal membranes translucent so that the underlying chlorophyll controls the reflection rather than the leaf surface. Author

N72-18080*# Stanford Research Inst., Menlo Park, Calif.
SURVEY OF TECHNIQUES USED TO PRESERVE BIOLOGICAL MATERIALS
E. J. Feinler and R. W. Hubbard Jan. 1972 397 p refs
(Contract NAS2-6201; SRI Proj. LSU-8930)
(NASA-CR-114422) Avail: NTIS HC $6.00/MF $0.95 CSCL 06C

The techniques used to preserve biological materials are documented and summarized. The report is presented in a handbook format that categorizes the most important preservation techniques available, and includes a representative sampling of the thousands of applications of these techniques to biological materials and organisms. Details of the information coverage and method of approach are outlined. Data are given in tabular form, and an index and extensive bibliography are included. Author

N72-18081*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. Biotechnology and Power Dept.
RESULTS OF POST-TEST PSYCHOLOGICAL EXAMINATIONS OF THE CREWMEN FROM THE 90-DAY MANNED TEST OF AN ADVANCED REGENERATIVE LIFE SUPPORT SYSTEM
J. S. Seeman and T. G. MacFarlane (Humboldt State Coll.) Feb. 1972 20 p
(Contract NAS1-10717)
(NASA-CR-112019; MDC-G2827) Avail: NTIS CSCL 06S

The following material presents the results of two temporally remote administrations of an identical projective personality assessment device (Rorschach Inkblot) using crew members aboard the 90-day test. The first administration took place during preselection crew psychodiagnostic testing in the period extending from mid-December, 1969 through mid-January 1970. Second administration took place in late May and early June, 1971, approximately one year after termination of the test. During the 90-day program duration, the subjects participated in the crew training program, were selected and served as onboard crew during the 90-day test. The testing was undertaken in order to determine the character and extent of change (if any) in basic personality dynamics accompanying or caused by participation in

the 90-day test program. Results indicate that significant personality changes occurred in three of the four onboard crew members. A detailed discussion of the results is provided. Objective scores which served as the basis for the discussion are presented in the Appendix. Author

N72-18082# Joint Publications Research Service, Arlington, Va.
SOME RESULTS OF WORK IN THE FIELD OF SPACE HYDROBIOLOGY AT DNEPROPETROVSK UNIVERSITY (1961-1970)
L. M. Antsyshkina, N. W. Kirilenko, V. Ya. Mamontov, G. B. Melnikov, F. P. Ryabov, and V. T. Khlebas 28 Feb. 1972 9 p refs Transl. into ENGLISH from Gidrobiol. Zh. (Kiev), no. 5, Nov. - Dec. 1971 p 123-127
(JPRS-55284) Avail: NTIS

The problem of creating a closed ecological system (CES) in the cabin of a space ship is discussed. The concept is based on the closed cycle of matter and is connected with the fact that it is advisable to create the foundation for the autotrophic link of the CES on the basis of microscopic unicellular algae. It is concluded that the unification in a single complex of aqueous autotrophic and heterotrophic links of the CES will provide an effective system for sustaining space crews in a closed spacecraft. Author

N72-18083# Joint Publications Research Service, Arlington, Va.
STRESS IN FLIGHT
V. L. Marishchuk, K. K. Platonov, and Ye. A. Pletnitskiy 29 Feb. 1972 103 p refs Transl. into ENGLISH of the book "Napryazhennost v Polete" Moscow, Military Publishing House, 1969 116 p
(JPRS-55306) Avail: NTIS

Certain causes for the occurrence of flight stress are reviewed. Ways of overcoming it are suggested, which were checked in practice. Methods of evaluating the emotional stability of flight personnel are discussed. Author

N72-18084*# Techtran Corp., Glen Burnie, Md.
HEAVY WORK IN MINING FIELDS IN A HOT, DAMP CLIMATE
L. Parmeggiani and C. Sassi Washington NASA Feb. 1972 42 p refs Transl. into ENGLISH from Med. Lavoro (Milan), v. 46, no. 5, May 1955 p 295-324
(Contract NASw-2037)
(NASA-TT-F-14121) Avail: NTIS CSCL 06S

The physical modalities of acclimatization of miners working in extremely hot and humid conditions normally considered impossible to work in are investigated. While individual variations exist, miners adapt themselves to dehydration, work rhythms, water intake, leanness, nakedness, and restricted sweat production which combine to permit effective work. Author

N72-18085# Maryland Univ., College Park. Computer Science Center.
EDGE AND CURVE DETECTION FOR VISUAL SCENE ANALYSIS, 2
Azriel Rosenfield, Mark Thurston, and Yung H. Lee Aug. 1971 87 p ref
(Contract F19628-70-C-0208; AF Proj. 5628)
(AD-733711; SR-5; AFCRL-71-0457) Avail: NTIS CSCL 06/16

Further work is described on simple sets of parallel operations that detect 'texture edges' (abrupt discontinuities in the average values of local picture properties), as well as spots or streaks that are texturally different from their surrounds. GRA

N72-18086# Naval Medical Research Inst., Bethesda, Md.
ULTRASOUND DOSAGE FOR EXPERIMENTAL USE ON HUMAN BEINGS Interim Report
Wesley D. Ulrich Aug. 1971 16 p refs
(AD-731075; NAVMED-M4306-01-1010BXK9-2) Avail: NTIS CSCL 06/18

The safety zone for continuous wave ultrasound lay below a log/log line connecting 1 microsec of 1 kw/sq cm ultrasound with 200 seconds of 100 mw/sq cm ultrasound. An ultrasonic intensity of 100 mw/sq cm or less was also safe for at least 10,000 seconds. Pulsed wave ultrasound was safe for doses in which the average intensity multiplied by the total exposure time lay within this safety zone. The safety zone was valid for 0.5 to 15 MHz and for all anatomic sites except the eyes. Re-exposures were limited to 10 per month and 30 per year. Author (GRA)

N72-18087# School of Aerospace Medicine, Brooks AFB, Tex.
THE EFFECT OF 6-MeV X-RAY ON PLASMA-REDUCING SUBSTANCES IN THE PRIMATE (MACACA MULATTA) Final Report, Oct. 1970 - Mar. 1971
Fred N. Beckman Aug. 1971 16 p refs
(AD-731091; SAM-TR-71-28) Avail: NTIS CSCL 06/18

Experiments were undertaken which demonstrate an early rise (30 to 50 mg. %) of plasma-reducing substances within 14 minutes after the onset of 165 rads/min. of 6-MeV X-irradiation and blockage of this rise by diphenhydramine and alpha-chloralose. It is postulated that the early hyperglycemic response observed in the primate is much more closely related to the cardiovascular changes which occur immediately following ionizing radiation exposure than they are to gluconeogenesis and glycogenesis. Author (GRA)

N72-18088# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
HYPOTENSION DURING BROMOTRIFLUOROMETHANE EXPOSURE Final Report
Ethard W. VanStee and Kenneth C. Back Aug. 1971 23 p refs
(AD-731549; AMRL-TR-68-182) Avail: NTIS CSCL 06/20

Cardiac output and mean arterial blood pressure measurements were performed on anesthetized dogs during exposure to bromotrifluoromethane. Left ventricular end diastolic pressure was recorded from anesthetized open-chested dogs and monkeys during exposure to CBrF3. A significant decrease in total peripheral resistance and myocardial contractility were shown to combine to produce a reversible hypotension during exposure to CBrF3. Author (GRA)

N72-18089# RAND Corp., Santa Monica, Calif.
ON PULSATILE, NON-NEWTONIAN FLOW IN THE MICROCIRCULATION
Jerome Aroesty, Carol Gazley, Jr., and Joseph Gross Dec. 1970 13 p refs Presented at Conf. on the 6th European Microcirculation Soc., Aalborg, Denmark, 22-26 Jun. 1970
(AD-731276; P-4516) Avail: NTIS CSCL 06/16

The flow of a Casson fluid was examined under periodic pressure gradient in a rigid tube, at the low frequency limit. Results show that the quasi-steady solution, where time acts as a parameter and not as an independent variable, can be used to construct accurate solutions for such a flow. These solutions are applicable to the flow of blood in small vessels at low shear rates. As an illustration, the flow under a sinusoidal pressure gradient was computed based on quasi-steady theory. The nonlinear relation between flow and instantaneous pressure gradient was shown by blunting of the flow rate curve, which occurs when the magnitude of the pressure gradient is small. Author (GRA)

N72-18090# Armed Forces Inst. of Pathology, Washington, D.C.
[MILITARY-SPONSORED RESEARCH IN PATHOLOGY] Annual Research Progress Report, 1 Jul. 1970 - 30 Jun. 1971
Bruce H. Smith Jun. 1971 182 p refs

(AD-730340; RCS-MEDDH-288(R1)) Avail: NTIS CSCL 06/5

Summaries are given of the following projects. Studies on pathogenic amebae; quantitative cytology with the electron microscope: study of malaria growth cycle; research in geographic pathology; urease inhibition; relation to hepatic coma; the biomolecular structure of normal, injured and diseased muscle cells; etiology of viral transitional L forms of the alpha hemolytic streptococcus and chronic stress as etiologic agents; nephropathology research laboratory-experimental study of acute renal failure; effects of prolonged exposure of the retina to low intensity CW laser; and immunopathologic studies of malaria.

GRA

N72-18091# Road Research Lab., Crowthorne (England). Driver Aids and Abilities Section.

SMALL EYE MOVEMENTS AND VISUAL EFFICIENCY

D. C. West 1971 60 p refs

(PB-202995; RRL-LR402) Avail: NTIS CSCL 06P

Previous work by Foley-Fisher showed a close relationship between the frequency of small involuntary eye-movements (saccades) and vernier acuity. The present research is an extension of this work, using randomly selected untrained subjects rather than experienced observers. It was hoped that research would show the saccade frequency/acuity relationship to be good enough for prediction of acuity once the eyemovement parameters were established by objective measurement. The relationships found were so poor that this was not possible. However, the general trend of the results was in agreement with previous work, the best indicator of good vernier acuity being the frequency of inter-saccadic intervals longer than about 1 sec.

Author (GRA)

N72-18092# Naval Submarine Medical Center, Groton, Conn.

HYPERBARIC AIR AND CORNEAL VASCULARIZATION Final Report

Robert J. Kaiser and Donald W. Klopp 24 Jun. 1971 11 p refs

(AD-732398; NSMRL-668) Avail: NTIS CSCL 06/5

Hypoxia is one of the factors postulated as promoting vascularization of the cornea. However, previous experiments designed to increase tissue oxygen for short or intermittent periods have had no effect in retarding neovascularization. The present study utilized rabbit exposure to hyperbaric air for continuous periods of up to two weeks to increase tissue oxygen, and demonstrated no effect on the neovascularization caused by sodium hydroxide burns of the cornea. This confirms previous experimental results and tends to rule out inadequate time periods or intermittency of exposure as factors in previous negative results.

Author (GRA)

N72-18093# Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex.

COMPARATIVE EFFECTS OF HYPEROXIA AND HYPERBARIC PRESSURE IN TREATMENT OF PRIMARY BLAST INJURY Progress Report

Edward G. Damon and Robert K. Jones Washington Defense Nucl. Agency 1 Mar. 1971 51 p refs

(Contract DA-49-146-XZ-372; DASA Proj. NWER-XAXM)

(AD-731396; DASA-2708) Avail: NTIS CSCL 06/5

Guinea pigs and rabbits were exposed to lethal reflected pressures in an air-driven shock tube and were subsequently treated in a hyperbaric chamber in which the oxygen tension (PO2) and chamber pressure were independently varied. Treatments involving increases in PO2 resulted in increased survival times of guinea pigs whereas pressurization for 30 minutes at 36 or 72 p.s.i.g. with the PO2 retained at the normal ambient level by use of an N2-air mixture had no detectable effect on survival times of the animals. To study the effects of prolonged hyperbaric oxygenation in treatment of blast injury, guinea pigs and rabbits were treated on a 29-hour schedule having an initial 3-hour hold-time at the pressure-treatment level followed by 26 hours for decompression. In rabbits, an initial PO2 of 17.5 p.s.i.a., achieved either by air pressure at 72 p.s.i.g. or by pressurization to 15 p.s.i.g. with 65-percent O2, 35-percent N2, resulted in full survival and recovery of all treated animals. In guinea pigs, treatment with 100-percent O2 at 5.5 p.s.i.g. (PO2 – 17.5 p.s.i.a.) or at 12 p.s.i.g. (PO2 – 24 p.s.i.a.) resulted in increased survival times with no increase in overall survival and recovery in the first case and significantly increased survival and recovery compared to that of untreated controls in the second case. The pathophysiology of primary blast injury is discussed with special reference to the roles of air embolism and cardiopulmonary pathology in the etiology of death.

Author (GRA)

N72-18094# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

COMBINED EFFECTS OF NOISE AND VIBRATION ON MENTAL PERFORMANCE Final Report, Sep. 1970 - Feb. 1971

C. Stanley Harris and Henry C. Sommer Aug. 1971 22 p refs (AF Proj. 7231)

(AD-731146; AMRL-TR-70-21) Avail: NTIS CSCL 05/10

Two experiments were conducted to determine the combined effects of noise and vibration on mental performance. In experiment 1, ten subjects were tested on a combination short term memory and subtraction task during exposure to four different intensities of broadband noise. Another group of ten subjects was tested using the same noise intensities in combination with 0.25g (peak) vertical vibration at 5Hz. Noise alone, and vibration with low level noise (80 dB and 90 dB re 0.0002 dyne/sq cm) had no adverse effects on task performance while the highest level of noise (110 dB) combined with vibration to produce a significant reduction in the number of correct responses. In experiment 2, the second group of subjects used in experiment 1 was tested during exposure to the following conditions: no vibration (control), vibration at 5 Hz - 0.25g, 7 Hz - 0.30g, and 11 Hz 0.50g, all combined with 80 dB noise. Subsequently these same vibration conditions were presented with 107 dB noise. High intensity noise and vibration combined to produce a greater decrement in performance than either stressor alone. Vibration at 5 Hz was a more sensitive frequency for mental subtraction performance than 7Hz and 11 Hz when the three frequencies were presented in conjunction with high intensity noise.

Author (GRA)

N72-18095# School of Aerospace Medicine, Brooks AFB, Tex.

EUSTACHIAN TUBE FUNCTION TESTING USING AN ACOUSTIC IMPEDANCE BRIDGE Final Report

Harrell C. Sutherland, Jr., Vernon C. Bragg, and Frederick G. Collins Jun. 1971 25 p refs

(AD-731126; SAM-TR-71-21) Avail: NTIS CSCL 06/19

A procedure for comprehensive testing of eustachian tube function was devised. The test battery was administered to 13 apparently normal subjects, 5 subjects with clinically identified eustachian tube malfunction, and 3 subjects who had experienced ear blocks in an altitude chamber. Results were examined to find what, if any, portions of the test might predict ability to undergo rapid barometric pressure change without experiencing ear block. Neither the whole nor any portion of the procedure was found suitable for screening purposes. However, the tests appear useful in clinical evaluation of eustachian tube function.

Author (GRA)

N72-18096# Naval Aerospace Medical Inst., Pensacola, Fla.

EFFECTS OF DIFFERENT ALCOHOL DOSAGES AND DISPLAY ILLUMINATION ON TRACKING PERFORMANCE DURING VESTIBULAR STIMULATION

Richard D. Gilson, David J. Schroeder, William E. Collins, and Fred E. Guedry, Jr. 26 Jul. 1971 15 p refs

(AD-732444; NAMRL-1140; USAARL-72-2) Avail: NTIS CSCL 06/19

A previous investigation showed that alcohol impairs the

ability to suppress vestibular nystagmus, thus degrading visual compensatory tracking performance during angular acceleration. Reduced display illumination, independently, has also been shown to degrade tracking performance during vestibular stimulation. The present study investigated the way in which low and moderate dosages of alcohol and two levels of instrument-display illumination combined to affect tracking performance a) in a static (no motion) environment, and b) in a dynamic (whole-body motion) environment. Mean blood-alcohol levels as low as 0.027 per cent significantly (p-.05) decreased tracking performance during whole-body motion, yet caused little change in performance in a stationary environment. Impairment was much more pronounced with dim display lighting (0.1 ft-L) than with bright lighting (1.0 ft-L). These results suggest that serious problems may even be encountered by the pilot who drinks lightly and who considers flying, expecially at night.
Author (GRA)

N72-18097# Naval Aerospace Medical Inst., Pensacola, Fla.
NYSTAGMUS RESPONSES DURING TRIANGULAR WAVEFORMS OF ANGULAR VELOCITY ABOUT THE Y AND Z AXES
Richard D. Gilson, Charles W. Stockwell (AERL), and Fred E. Guedry, Jr. Jul. 1971 16 p refs
(AD-731380; NAMRL-1138; USAARL-72-1) Avail: NTIS CSCL 06/19

Nystagmus response parameters were estimated by a test procedure using short triangular waveforms of angular velocity. Mean estimates were determined as follows: II/delta = 15.5 seconds and Kn(phi/delta) = 8.0 seconds for the horizontal semicircular canals, and II/delta = 6.8 seconds and Kn(phi/delta) = 5.4 seconds for the vertical semicircular canals. The II/delta values are consistent with results obtained by other methods. Values of Kn(phi/delta) have not been heretofore assessed. Determination of the effects of stimulus distortion on the values of the response parameters and estimates of intersubject and intrasubject variability are included. Also included are nomograms that permit a simple and accurate method for calculating II/delta and Kn(phi/delta). Author (GRA)

N72-18098# Naval Air Development Center, Johnsville, Pa. Aerospace Medical Research Dept.
EMPIRICAL LAWS FOR BRIGHTNESS DISCRIMINATION THRESHOLDS AS A FUNCTION OF TIME BETWEEN TWO IDENTICAL FLASH INCREMENTS
Robert M. Herrick 30 Dec. 1970 54 p refs
(Bumed Proj. MF12524004)
(AD-731376; NADC-MR-7021) Avail: NTIS CSCL 06/16

Visual displays of radar, sonar, and other weapons systems devices provide signals that vary in their temporal characteristics. Typically, these temporal characteristics may be manipulated by the operator of the display device to achieve optimal detection or identification of signals. The aim of the research reported here is to determine how two successive visual signals, displayed upon various background fields, interact to influence detectability. The general laws that were devised to describe the results of the experiments have application to any display in which two temporally-spaced signals occur. Author (GRA)

N72-18099# Denver Univ., Colo.
STUDIES IN INTERSENSORY PROCESSES: EFFECTS OF TIME HISTORY VISUAL DISPLAYS ON BISENSORY INFORMATION PROCESSING Quarterly Report
Joseph Halpern 15 Nov. 1971 4 p
(Contract N00014-67-A-0394-0001; NR Proj. 144-222)
(AD-733092) Avail: NTIS CSCL 05/10

Pilot studies were undertaken to provide some basic parametric information on the Time History Display to permit the development of a series of films which contained no stimuli with easily discriminable cues. The report reviews these studies.
GRA

N72-18100# California Univ., Los Angeles. Brain Research Inst.
CHEMICAL INDEX TO FITNESS Final Report, Sep. 1970 - Aug. 1971
Robert T. Rubin (Pennsylvania State Univ., Hershey) Aug. 1971 4 p
(Contracts N00014-69-A-0200-4030; NR Proj. 108-912)
(AD-732554) Avail: NTIS CSCL 05/10

An investigation of the interrelationships of anterior pituitary hormones in stress situations is presented. The study concerns the release of anterior pituitary hormones in normal young adult men during all-night sleep and dreaming. Plans to continue and extend these studies to determine the characteristics of the release of each of the anterior pituitary hormones in human subjects under a number of conditions of central nervous system activity, including field stress situations are in progress. These studies will also encompass the circadian rhythms of the release of these hormones, an important aspect of anterior pituitary physiology. GRA

N72-18101# North American Rockwell Corp., Los Angeles, Calif.
LIFE SUPPORT SYSTEM REQUIREMENTS. VOLUME 3: SECTION 3: ENVIRONMENT DESCRIPTION Final Report
Marvin N. Goldberg, William J. Adams, James W. Raeke, J. R. Plant, and C. E. Jones Wright-Patterson AFB, Ohio ASD Nov. 1970 245 p refs Supersedes AD-880015
(Contract F33657-70-C-0374; AF Proj. 412)
(AD-732015; NA-70-397-Vol-3; ASD-TR-70-47-Vol-3) Avail: NTIS CSCL 06/11

The volume identifies pertinent characteristics of the operational environment, the natural world-wide environment and the induced environment. Data are presented in a manner to clearly define areas having life support systems design implications. Author (GRA)

N72-18102*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HUMAN PERFORMANCE CAPABILITIES IN A SIMULATED SPACE STATION-LIKE ENVIRONMENT. 1: FIXED BEAM LUMINANCE AND LOCATION
Richard F. Haines, Albert E. Bartz (Concordia Coll.), and Joseph R. Zahn (San Jose State Coll.) Jan. 1972 105 p refs
(NASA-TM-X-62101) Avail: NTIS CSCL 05E

The effects of a fixed, intense, one-foot diameter beam of simulated sunlight imaged within the field of view, upon responses to a battery of visual, body balance and stability, eye-hand coordination, and mental tests were studied. Each subject's electrocardiogram and electro-oculograms (vertical and horizontal) were recorded throughout each two-hour testing period within the space-station-like environment. It is possible to say that both subjects adapted to the brightly illuminated white panels in approximately 30 seconds after their first exposure each day and thereafter did not experience ocular fatigue, eye strain, or other kinds of disturbances as a result of these viewing conditions. Author

N72-18103*# Battelle Memorial Inst., Columbus, Ohio.
DATA COLLECTION AND PREPARATION OF AUTHORITATIVE REVIEWS ON SPACE FOOD AND NUTRITION RESEARCH Summary Report, 22 Mar. 1971 - 22 Jan. 1972
22 Jan. 1972 38 p refs
(Contract NAS9-11634)
(NASA-CR-115414) Avail: NTIS CSCL 06H

The collection and classification of information for a manually operated information retrieval system on the subject of space food and nutrition research are described. The system as it currently exists is designed for retrieval of documents, either in hard copy or on microfiche, from the technical files of the MSC

Food and Nutrition Section by accession number, author, and/or subject. The system could readily be extended to include retrieval by affiliation, report and contract number, and sponsoring agency should the need arise. It can also be easily converted to computerized retrieval. At present the information retrieval system contains nearly 3000 documents which consist of technical papers, contractors' reports, and reprints obtained from the food and nutrition files at MSC, Technical Library, the library at the Texas Medical Center in Houston, the BMI Technical Libraries, Dr. E. B. Truitt at MBI, and the OSU Medical Libraries. Additional work was done to compile 18 selected bibliographies on subjects of immediate interest on the MSC Food and Nutrition Section. Author

N72-18104*# Physiometrics, Inc., Malibu, Calif.
TOLERENCE FOR WORK-INDUCED HEAT STRESS IN MEN WEARING LIQUIDCOOLED GARMENTS Final Report
W. Vincent Blockley and Herman P. Roth Dec. 1971 31 p refs
(Contract NAS9-10961)
(NASA-CR-115420) Avail: NTIS CSCL 05E

An investigation of the heat tolerance in men unable to dispose of metabolic heat as fast as it is produced within the body is discussed. Examinations were made of (a) the effect of work rate (metabolic rate) on tolerance time when body heat storage rate is a fixed quantity, and (b) tolerance time as a function of metabolic rate when heat loss is terminated after a thermal quasi-equilibrium was attained under comfortable conditions of heat transfer. The nature of the physiological mechanisms involved in such heat stress situations, and the possibility of using prediction techniques to establish standard procedures in emergencies involving cooling system failures are also discussed. E.H.W.

N72-18105*# Whirlpool Corp., St. Joseph, Mich. Life Support Systems Group.
DEVELOPMENT OF FREEZE DRIED VEGETABLES
Robert W. Larson Oct. 1970 13 p
(Contract NAS9-9032)
(NASA-CR-115429) Avail: NTIS CSCL 06H

The development of freeze dried vegetables to be used in the Apollo food system is discussed. After the initial selection and screening of vegetables, several types of freeze dried vegetables were prepared in small batches. From these small batches, two vegetables were judged satisfactory for further testing and evaluation. These vegetables, mashed potatoes and asparagus, were subjected to storage at 100 deg plus or minus 5 F. for two weeks and then taste tested. The vegetables were also tested to determine if they complied with the microbiological requirements for Apollo food. The space food prototype production guide for the vegetables is submitted. Author

N72-18106*# Southwest Research Inst., San Antonio, Tex.
SOUTHWEST RESEARCH INSTITUTE ASSISTANCE TO NASA IN BIOMEDICAL AREAS OF THE TECHNOLOGY Final Report, 25 Aug. 1970 - 24 Aug. 1971
David F. Culclasure and Linda Eckhardt 24 Aug. 1971 111 p
(Contract NASw-1867; SwRI Proj. 13-2538)
(NASA-CR-125616) Avail: NTIS CSCL 06B

Significant applications of aerospace technology were achieved. These applications include: a miniaturized, noninvasive system to telemeter electrocardiographic signals of heart transplant patients during their recuperative period as graded situations are introduced; and economical vital signs monitor for use in nursing homes and rehabilitation hospitals to indicate the onset of respiratory arrest; an implantable telemetry system to indicate the onset of the rejection phenomenon in animals undergoing cardiac transplants; an exceptionally accurate current proportional temperature controller for pollution studies; an automatic, atraumatic blood pressure measurement device; materials for protecting burned areas in contact with joint bender splints; a detector to signal the passage of animals by a given point during ecology studies; and special cushioning for use with below-knee amputees to protect the integrity of the skin at the stump/prosthesis interface. Author

N72-18107*# National Aeronautics and Space Administration, Washington, D.C.
HEAVY WORK IN MINE STOPES WITH HOT, HUMID CONDITIONS. FIRST REPORT: FUNCTIONAL ADAPTATION, THERMOREGULATION, AND WATER BALANCE
L. Parmeggiani and C. Sassi Feb. 1972 40 p refs Transl. into ENGLISH from Med. Lavoro (Milan), v. 46, no. 5, May 1955 p 295-324
(NASA-TT-F-14043) Avail: NTIS CSCL 06S

The clinico-functional pattern, particularly the water balance, of 54 miners was studied by means of investigations repeated through different seasons of the year. Pulse, blood pressure and breath were measured at the beginning, after four hours, and at the end of the working shift. Relatively slight modifications were found. Sweating during 8 hours of work reached a maximum of 6.875 kg, varying from a maximum of 1.194 kg to a minimum of 120 g per hour of actual work. In the conditions of elevated humidity considered, the production of sweat is excessive to the effects of thermoregulation. The quantity of sweat is correlated with the quantities of liquid intake during work. Diuresis during work was reduced to very low values, varying from a maximum of 340 ml to a minimum of 0. Density of the urine increases through the effect of work, but the pH presents no significant variations. Urine urea elimination is very low. Creatinine concentration increases in the urine, but the total quantity eliminated is not above the normal. Author

N72-18108*# Environmental Research Associates, Essex, Md.
HYBRID WATER IMMERSION SIMULATION OF MANUAL IVA PERFORMANCE IN WEIGHTLESSNESS
Harry L. Loats, Jr. and G. Samuel Mattingly 15 Dec. 1971 72 p refs
(Contract NAS9-12122)
(NASA-CR-115436; ERA-71-3) Avail: NTIS CSCL 06P

A description is given of the development, tests, and analysis of a manual simulator. The simulator was developed to test mass handling and translation under weightlessness conditions by a test subject. The system is composed of a hybrid simulator with a combination of water immersion and mechanical, Peter Pan, simulation. The concept operates on the equivalence principle, with the subject and the cargo remaining quasi-stationary. Movement is effected through a moving device controlled through force by the subject. Motion response is determined through computations of the inertial movement under such conditions. E.H.W.

N72-18109# Joint Publications Research Service, Washington, D.C.
SELECTION, TRAINING AND COMPATIBILITY OF SPACESHIP CREWS
A. A. Leonov 29 Feb. 1972 6 p Transl. into ENGLISH from Aviatsiya i Kosmonavtika (Moscow), no. 1, 1972 p 30-32
(JPRS-55305) Avail: NTIS

The unusual environment in which space crews live and work determines astronaut selection, training, and compatibility evaluation. Control problems arising in the interaction between man and automatic systems effect task distributions between crew members and personnel selection criteria. Compatibility and mutual understanding are basic for the organization of the spaceship crew. G.G.

N72-18110*# Scientific Translation Service, Santa Barbara, Calif.
SPECTRAL ANALYSIS OF AN ELECTROENCEPHALOGRAM

DURING SLEEP AND WAKEFULLNESS
T. N. Oniani, P. P. Molnar, and I. K. Badridze Washington NASA Mar. 1972 6 p refs Transl. into ENGLISH from Soobshch. Akad. Nauk Gruz SSR (USSR), v. 57, no. 1, 1970 p 173-176
(Contract NASw-2035)
(NASA-TT-F-14172) Avail: NTIS CSCL 06B

Different cortical rhythms, recorded with the use of chronically implanted electrodes in several phases of the sleep-arousal continuum, were investigated by the method of spectral analysis and integration. During spontaneous, as well as evoked (by alimentary conditioned signal or by electrical stimulation of the reticular formation) arousal, high voltage slow waves (delta, theta and alpha) were found to be inhibited in different enocortical territories, and for a short period in the hippocampus as well. In place of the generally reported increase of the low voltage fast activity components a decrease in these rhythms was found. Author

N72-18111*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONVERSION OF CARDIAC PERFORMANCE DATA IN ANALOG FORM FOR DIGITAL COMPUTER ENTRY
Robert L. Miller Washington Mar. 1972 9 p refs
(NASA-TM-X-2519; E-6731) Avail: NTIS CSCL 06B

A system is presented which will reduce analog cardiac performance data and convert the results to digital form for direct entry into a commercial time-shared computer. Circuits are discussed which perform the measurement and digital conversion of instantaneous systolic and diastolic parameters from the analog blood pressure waveform. Digital averaging over a selected number of heart cycles is performed on these measurements, as well as those of flow and heart rate. The determination of average cardiac output and peripheral resistance, including trends, is the end result after processing by digital computer. Author

N72-18112# Civil Aeromedical Inst., Oklahoma City, Okla.
DISCRIMINATION OF SHORT DURATION (TWO PULSE) FLASHES AS A FUNCTION OF SIGNAL LUMINANCE AND METHOD OF MEASUREMENT
Henry W. Mertens and Mark F. Lewis Nov. 1971 6 p refs
(FAA-AM-71-42) Avail: NTIS

The detection of the minimum-duration dark interval between signal light pulses was investigated as a function of signal luminance and the psychophysical method of measurement. The theory of signal detectability (TSD) prediction that observer sensitivity is independent of the psychophysical method was tested. Discrimination with the forced choice procedure was studied at three luminance levels: 31.8, 318, and 3183 candelas per square meter. Author

N72-18113# Civil Aeromedical Inst., Oklahoma City, Okla.
AIR TRAFFIC APTITUDE TEST MEASURES OF MILITARY AND FAA CONTROLLER TRAINEES
Bart B. Cobb Oct. 1971 32 p refs
(FAA-AM-71-40) Avail: NTIS

This study concerns the experimental use of seven commercially published aptitude tests at air traffic control training schools, the determination of relationships between the aptitude scores and training-course performance measures of Army, Air Force, Marine Corps, and Navy students, and an assessment of the potential with which such aptitude measures might be used to improve the military ATC-selection programs. Results indicate that a composite score involving only four of the tests could have been used with considerable effectiveness to predict military ATC-training performance. However, other findings illustrate that such tests are of relatively little value for secondary screening purposes compared to a simple change in the military-screening-and-classification standards; specifically precluding the selection of Army, Navy, and Marine Corps personnel having MSC aptitude indexes below 115 and of Air Force candidates having a general index of less than 70. Author

N72-18114*# Hayes International Corp., Huntsville, Ala.
BIODETECTION GRINDER Final Report
C. D. Shaia and G. H. Jones 21 Dec. 1971 34 p refs
(Contract NAS8-21809)
(NASA-CR-123539; TR-MD-518) Avail: NTIS CSCL 06B

Work on a biodetection grinder is summarized. It includes development of the prototype grinder, second generation grinder, and the production version of the grinder. Tests showed the particle size distribution was satisfactory and biological evaluation confirmed the tests. Author

N72-18115# Illinois Univ., Urbana. Aviation Research Lab.
EFFECTS OF THE MAN ON THE TASK IN COMPLEX MAN-MACHINE SYSTEMS
Charles L. Hulin and Kenneth M. Alvares Feb. 1971 14 p refs
(Contract F41609-70-C-0027; AF Proj. 1123)
(AD-732613; AFHRL-TR-71-7) Avail: NTIS CSCL 05/8

This research tested the hypothesis that in a complex man-machine system one of the many influences on the system is the man's constant reorganization of the tasks which constitute the system. The performances of 67 male college students receiving basic flight training were assessed by means of check rides at three different points of training. Factor analyses of each set of check ride data indicated systematic changes occurred in the structure of the task. A three-factor solution appeared in the 10-hour data, two factors were being assessed by the 25-hour point, and only one general factor appeared in the 35-hour data. This finding indicates that future man-machine systems research should no longer be designed under a fixed-task assumption. It is speculated that this assumption may be one cause of the generally found weak prediction of system performance effectiveness over meaningful intervals of time.
Author (GRA)

N72-18116# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
MATHEMATICAL SIMULATION OF DAISY TRACK HUMAN VOLUNTEER TESTS Final Report, Aug. 1969 - Dec. 1970
D. H. Robbins, R. G. Snyder, and V. L. Roberts Jul. 1971 64 p refs
(Contract DOT-FH-11-6962)
(PB-203717; HSRI-Bio-M-71-6; DOT-HS-800573) Avail: NTIS CSCL 13L

A study has been conducted as an initial step in determining the differences observed between the motions of a living human impact sled test subject and a dummy test subject. A series of measurements were taken on human test subjects including classical and non-classical anthropometric measurements, range of motion measurements for the joints, and maximum foot force measurements. A series of mathematical expressions have been used to predict body segment weight, centers of gravity, and moments of inertia using the results of the various body measurements. A computer simulation of an impact sled test involving a human volunteer was made. Author

N72-18117# Smith-Kline Instruments, Inc., Palo Alto Calif.
DEVELOPMENT OF MINIATURE CAPACITANCE PRESSURE TRANSDUCERS Annual Report, Jul. 1968 - Dec. 1970
T. Rees, D. Russell, D. Woody, T. Finnegan, and M. Kientiz 25 Mar. 1971 97 p refs
(Contract PH-43-68-666)
(PB-201938; PH-43-68-666-F) Avail: NTIS CSCL 06B

Techniques were developed to simplify the manufacture of ultraminiature capacitive pressure transducers for physiological measurements. The transducers are of two types. The first is .046 inches in diameter, (1.17 mm), and is mounted at the tip of a four-foot catheter cable. An airway inside the catheter allows the direct measurement of relative pressures. Significant advances were made on all parts of the system. Author (GRA)

N72-18118# Navy Clothing and Textile Research Unit, Natick, Mass.
MECHANISM OF THE BRADY CARDIA OF THE DIVING SYNDROME AS SEEN IN DIVERS USING SCUBA IN WATER OF 55, 45, AND 35 DEG F
Dale A. Reins Aug. 1971 18 p refs
(AD-731675; TR-96) Avail: NTIS CSCL 06/19

Physiologists monitored heart rates of test subjects using SCUBA gear under water. Comparisons were made between heart rates immediately before and after subjects entered the water, and at 5-minute intervals while they were immersed in water. Data showed a difference in percent of decrease when initial heart rates were 90 and above or less than 90. However, data showed the decrease to be maximal within 5 minutes of submersion within a return towards presubmersion levels after 30 minutes. It is believed that initial heart rate changes were brought about immediately by a reflex vagal response to immersion. Increased venous return due to water pressure is the apparent cause of the longer term effect. A physiological adaptation to the pressure allowed return towards control values by the end of the 30-minute period. Author (GRA)

N72-18119# TRW Systems Group, Redondo Beach, Calif.
MARINE RESOURCES SPECTROMETER EXPERIMENT Final Report
R. C. Ramsey 29 Nov. 1971 89 p
(Contract N62306-71-C-0153)
(AD-733685) Avail: NTIS CSCL 06/3

Spectral contrast ratios in the visible region of the spectrum between the radiance from fish schools and adjoining water, were obtained by an airborne spectrometer. Most of the data presented are of menhaden just after capture in a purse seine, and of natural mullet schools. These data were taken from a helicopter near the Mississippi Delta. Additional data for natural anchovy schools were obtained off the9 coast of Southern California from a seaplane. A repeatable signature for the mullet was definitely established. Useful contrast ratios were not obtained for the menhaden or anchovy schools. For the menhaden, this was due to the muddy water caused by seining operations. Author (GRA)

N72-18120# Dunlap and Associates, Inc., Santa Monica, Calif. Western Div.
HUMAN FACTORS RESEARCH ON CARRIER LANDING SYSTEM PERFORMANCE Final Report, 1966 - 1971
Clyde A. Brictson Jul. 1971 22 p refs
(Contract N00014-70-C-0202; NR Proj. 197-007)
(AD-733703) Avail: NTIS CSCL 05/9

A five-year program of human factors research on carrier landing performance is summarized. Empirical measures of day and night final approach to landing were recorded and used to describe differences in landing performance across a wide variety of aircraft, ship, pilot, LOS and environmental conditions. The empirical data were used to develop carrier landing performance criteria which were applied to evaluate and assess the relative influence of system components on carrier landing system effectiveness. Carrier landing accident data for 1965-1970 are briefly reviewed and referenced. Studies covering the prediction of touchdown performance from approach data and pilot night landing proficiency from training measures are also summarized. A listing of all technical reports published during the research program is provided. Author

N72-18121# Royal Naval Personnel Research Committee, London (England).
THE PREDICTION OF SAFE EXPOSURE TIMES FOR MEN WORKING IN THERMALLY SEVERE ENVIRONMENTS
C. R. Bell, M. J. Crowder, and J. D. Walters Oct. 1970 43 p refs Prepared for the Environ. Subcomm. of the Roy. Naval Personnel Res. Comm.
(AD-732019; ES-5; NSTIC-31267) Avail: NTIS CSCL 06/19

From a series of investigations begun in 1962 data have been collected on the times to imminent heat collapse of engine-room personnel, dressed in underpants, denim overalls, socks and shoes, and working at approximately 310 J/sec in extremely hot environments. The knowledge gained about individual differences in times to imminent heat collapse enabled nomograms and tables to be produced which permit durations of exposure to be determined within which a known proportion of exposees would be safe from the hazards of imminent heat collapse. Author (GRA)

N72-18122# Illinois Univ., Urbana. Aviation Research Lab.
AN EVALUATION OF THREE POSSIBLE EXPLANATIONS OF THE TEMPORAL DECAY IN PREDICTING PILOT PROFICIENCY
Charles L. Hulin and Kenneth M. Alvares Feb. 1970 25 p refs
(Contract F41609-70-C-0027; AF Proj. 1123)
(AD-731191; AFHRL-TR-71-5) Avail: NTIS CSCL 05/9

The fact that Air Force pilot selection tests do not adequately predict pilot success in operational tactical units is consistent with the generally reported finding that correlations between ability measures and performance decrease over time. This effort investigated the validity of three explanations for this predictive decay: tasks are restructured during training, basic abilities are altered as a function of training, and both of these changes occur. Two groups of students were administered an extensive battery of ability tests at the beginning and again at the end of a 16-week period. The experimental subjects received basic flight training during this interval, whereas the control subjects did not. Support for the third hypothesis resulted from appropriate comparisons between the groups: pretest and posttest scores on ability measures, as well as analysis of the experimental group's flight training performance. The implication of this finding for both selection and training research is discussed.
Author (GRA)

N72-18123# School of Aerospace Medicine, Brooks AFB, Tex.
HEARING OF YOUNG AIRMEN ENTERING NOISE EXPOSURE CAREER FIELDS Progress Report, Nov. 1970 - Jun. 1971
Harrell C. Sutherland, Jr., Donald C. Gasaway, and James F. Boyer, Jr. Aug. 1971 12 p refs
(AF Proj. 7755)
(AD-731131; SAM-TR-71-36) Avail: NTIS CSCL 06/14

Median hearing levels were determined for 225 young airmen who were entering training for occupations involving exposure to potentially hazardous noise. The values were extracted from hearing conservation data forms received from Sheppard AFB, Texas. The medians were compatible with those reported for three other groups of young adult men. These median hearing levels were determined to establish an appropriate reference for assessing the hearing of individuals exposed to potentially hazardous noise. Author (GRA)

N72-18124# Human Engineering Labs., Aberdeen Proving Ground, Md.
REACTION TIME: A BIBLIOGRAPHY WITH ABSTRACTS. SUPPLEMENT 1, WITH INDEX FOR ENTIRE BIBLIOGRAPHY Technical Report, period ending 31 Dec. 1970
Lawrence E. Symington Jul. 1971 103 p refs
(AD-731471) Avail: NTIS CSCL 05/10

The bibliography is an extension of A. S. Kamlet, and L. J. Boisvert, Reaction Time: A bibliography with abstracts. It is a compilation of 351 abstracted references dealing with reaction time in selected human information-processing tasks through December 1970. The references are arranged in alphabetical order by author. An alphabetic index of pertinent parameters of investigation for the 891 references of both this extension and the original bibliography is also provided. Author (GRA)

N72-18125# Systems Technology, Inc., Hawthorne, Calif.
DISPLAY FORMAT EFFECTS ON PRECISION TRACKING PERFORMANCE, DESCRIBING FUNCTIONS, AND REMNANT Final Report, Aug. 1969 - Mar. 1971
Henry R. Jex, R. Wade Allen, and Raymond E. Magdaleno Aug. 1971 145 p refs
(Contract F33615-69-C-1808; AF Proj. 7184)
(AD-731580; STI-TR-191-1; AMRL-TR-71-63) Avail: NTIS CSCL 05/10

As part of a program to develop a comprehensive theory of manual control displays, six display formats were used by three instrument-rated pilots to regulate against random disturbances with a controlled element of Y sub c = K/s(s + 2), under both foveal and 10 deg parafoveal viewing conditions. The six display formats were: CRT line, CRT thermometer bar, 14-Bar quantized on a CRT, a rotary dial and pointer, and two variations of a moving scale tape-drive (C-141 VSI). All were scaled to equivalent movement and apparent brightness. Measures included overall performance, describing functions, error remnant power spectra, critical instability scores, and subjective display ratings. Other controlled elements and parafoveal angles were partially investigated. The results show that the main effect of display format is on the loop closure properties. Author (GRA)

N72-18126# Illinois Univ., Urbana. Aviation Research Lab.
THREE EXPLANATIONS OF TEMPORAL CHANGES IN ABILITY-SKILL RELATIONSHIPS: LITERATURE REVIEW AND THEORETICAL ANALYSIS
Charles L. Hulin and Kenneth M. Alvares Williams AFB, Ariz. AF Human Resources Lab. Feb. 1971 25 p refs
(Contract F41609-70-C-0027; AF Proj. 1123)
(AD-732612; AFHRL-TR-71-6) Avail: NTIS CSCL 05/9

The empirical and theoretical literature relevant to the temporally decreasing predictive relationship between ability measures and complex motor task performance are reviewed. An extensive historical review of complex motor skill learning revealed that two distinct theoretical models have been advanced. Both of these models, the changing task and the changing subject models, adequately account for this predictive decay. One model assumes that changes occur within the task structure. The other assumes that the ability levels themselves change within a fixed task structure. A third model is presented, a combination of the first two, and the need for empirical evidence allowing a choice among the three models is discussed. Author (GRA)

N72-18127# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
BIOELECTRIC CONTROL: MAN AND AUTOMATIC SYSTEMS (SELECTED ARTICLES)
E. A. Andreeva, M. A. Alekseev, A. M. Eliner, L. V. Ckhaidze, and B. V. Petrovskii 24 Sep. 1971 199 p refs Transl. into ENGLISH from the book "Bioelektricheskoe Upravlenie. Cheloveki Avtomaticheskie Sistemy" Moscow, Izd-vo Nauka, 1970 p 57-66, 241-264, 278-308, 501-573
(FTD Proj. 60101)
(AD-734053; FTD-MT-24-28-71) Avail: NTIS CSCL 05/8

Contents: A study of the mechanisms of control of muscular activity; The characteristics of control of the successive systems of the motor reactions of man; The prediction of the results of action in the control of complex biomechanical systems; The question of differential equations of movements of the extremities of man under the conditions of weightlessness and during overloads; Providing the vitally important functions of an organism as the basis of automatic control of an artificial heart; Biological control of artificial respiration and blood circulation; The development of methods for the construction and evaluation of systems of information presentation; The principles of construction of complexes for continuous control of the human body and automatic normalization of its states; Human engineering problems in the construction of major systems; The heuristic aspects of the problem man and major systems: Heuristic programs for the making of decisions. GRA

N72-18261# National Research Council of Canada, Ottawa (Ontario). Control Systems Lab.
NONIONIZING ELECTROMAGNETIC RADIATION AND POLLUTION OF THE ATMOSPHERE c04
J. A. Tanner and C. Romero-Sierra (Queens Univ., Kingston, Ontario) *In its* Div. of Mech. Eng. and the Natl. Aeron. Est. 31 Dec. 1971 p 37-45 refs
Avail: NTIS

The side effects and some of the advantages of the interaction between electromagnetic radiation and living organisms are examined. Results show harmful side effects are: (1) demyelination of peripheral nerves in cats, (2) changes in EEG patterns in domestic fowl, (3) physical collapse in young chickens, and (4) wilting and death of plants. One advantage of electromagnetic radiation is that under short and low intensity exposure, egg production in chickens is increased. The possible effects on human systems are also explored. E.H.W.

N72-19069*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 96
Dec. 1971 148 p refs
(NASA-SP-7011(96)) Avail: NTIS CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N72-19070*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 97
Jan. 1972 95 p refs
(NASA-SP-7011(97)) Avail: NTIS CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N72-19071*# Stanford Univ., Calif. Instrumentation Research Lab.
CYTOTOXICITY ASSAY AUTOMATION Final Report, 17 Jun. 1969 - 31 Oct. 1971
Elliott C. Levinthal and Rose O. Payne 31 Oct. 1971 45 p refs
(Grant NGR-05-020-004; Contract AI-69-2064; Grant AI-17367)
(NASA-CR-125590; IRL-1129) Avail: NTIS CSCL 06M

The design and construction of a system to automatically test HLP antigens are described. Major efforts were made to test and evaluate the performance of such a system, and compare its performance with nonautomatic tissue typing techniques. The system is based on the fluorochromatic cytotoxicity assay. Results show the system will work but is subject to malfunctions after a few samplings, and poses problems in showing correctly the necessary readings. E.H.W.

N72-19072*# Comar Space/Defense Corp., Birmingham, Mich.
RESEARCH TO DETERMINE THE ROLE OF GRAVITY IN NEUROSECRETORY PHYSIOLOGY Final Report
L. E. Clemens and J. S. Life 31 Jan. 1972 23 p refs
(Contract NASw-2196)
(NASA-CR-125689; TR-72-101) Avail: NTIS CSCL 06P

In an effort to determine the effects of gravity in regulating the synthesis, transport, storage, and release of octopeptides from the hypothalamo-neurophypophyseal system, the teleost fresh water fish was studied. A labyrinthectomized fish was subjected to a gravitational orientation of -G sub z for three days. Results show the fish had reduced levels of adenyl cyclose activity in its kidneys when compared to labyrinthectomized and unoperated fish exposed to normal gravitational orientation (+G sub 2) for the same period of time. Efforts were also made to determine the presence of vasopressin in the neurophypophysis and peripheral target organs. E.H.W.

N72-19073*# Texas A&M Univ., College Station. Dept. of Biochemistry and Biophysics.
THE EFFECTS OF SPACECRAFT ENVIRONMENTS ON SOME HYDROLYTIC ENZYME PATTERNS IN BACTERIA Final Report
J. M. Prescott and B. G. Foster 29 Sep. 1971 34 p refs
(Contract NAS9-7951)
(NASA-CR-125805) Avail: NTIS CSCL 06M

The effects of space flight on the production and characteristics of proteolytic enzymes are studied for a number of bacterial species isolated from crew members and spacecraft. Enzymatic make-up and cultural characteristics of bacteria isolated from spacecraft crew members are determined. The organism Aeromonas proteolytica and the proteolytic enzymes which it produces are used as models for future spacecraft experiments. Author

N72-19074# Joint Publications Research Service, Washington, D.C.
BIOLOGICAL EFFECT OF EXTREME ENVIRONMENTAL FACTORS
6 Mar. 1972 165 p refs Transl. into ENGLISH from Arkh. Anat., Gistol. Embriol. (Leningrad), v. 61, no. 11, Nov. 1971 p 5-127
(JPRS-55341) Avail: NTIS

Morphological effects of the space flight environment on biological, organic, vascular, muscular, and nervous systems are considered from the anatomic and cytochemical standpoints.

N72-19075# Joint Publications Research Service, Washington, D.C.
SOME OF THE RESULTS AND PROSPECTS IN SPACE ANATOMY OF THE VASCULAR SYSTEM
M. G. Prives *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 1-16 refs
Avail: NTIS

Adaptation of the vascular human mechanism to weightlessness and the reverse process of readaptation to earth's gravity is studied by observing: the influence of stress factors induced by high altitude and space flights; the discovery of the patterns of such influences on the structure of the vascular and nervous system; and the development of conditioning regimes to prevent pathologic anatomical changes. The need to combine physiological data about the effects of gravitational stress on the vascular system with anatomical data is pointed out for the locomotor system whose function is constricted in hypokinesia and hypodynamia, the cardiovascular system, and the human body as a whole. Under the influence of g forces, macro- and microscopic changes in the structure of the vascular system consist of irregular constriction or dilation, increased vascular wall permeability, and slower formation of blood and lymph collaterals. G.G.

N72-19076# Joint Publications Research Service, Washington, D.C.
THE EFFECT OF G FORCES ON THE MICROCIRCULATORY SYSTEM
V. V. Kupriyanov and V. G. Petrukhin *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 17-33 refs
Avail: NTIS

The various morphological effects of gravitational forces on animal microcirculatory systems are attributed to the possible role of adaptational vascular mechanisms for preventing pathological manifestations of the functional disorders. It is shown that animal training prior to gravitational stress as a positive factor increases resistance to physical stress, alleviates the degree of morphological changes, and prevents possible breakdown of the circulatory system. G.G.

N72-19077# Joint Publications Research Service, Washington, D.C.
THE CONDITION OF NEURONS IN THE AUTONOMOUS NERVOUS SYSTEM GANGLIA FOLLOWING EXPOSURE TO G FORCES
Ye. A. Dyskin and L. P. Tikhonova *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 34-41 refs
Avail: NTIS

Gravitational stress effects on the neurons of some ganglia of the autonomous nervous systems in animals were studied by observing respiration and EKG tracings of cats during hypergravitation and by studying the paravertebral and prevertebral ganglia of their sympathetic nervous systems as well as the nodose ganglion of the vagus nerve after sacrifice. Some of the nerve cells underwent vacuolization and different sized vacuoles appeared in their cytoplasms. In some neurons, different sized vacuoles filled the entire cytoplasms. In other neurons, the nuclei *often occupied eccentric positions and were markedly enlarged.* Considerably more altered neurons in the nodose ganglion of the vagus indicate that the afferent neurons of the vagal ganglion are involved more than the efferent neurons of the cranial cervical ganglion. It is concluded that the above described changes cannot be attributed solely to gravitational force effects and could also be secondary to hemodynamic disturbances. G.G.

N72-19078# Joint Publications Research Service, Washington, D.C.
THE EFFECT OF TRANSVERSE G FORCES ON ATRIAL NERVE CELLS (EXPERIMENTAL MORPHOLOGICAL INVESTIGATION)
S. S. Mikhaylov, V. M. Klebanov, and S. I. Yevloyev *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 42-54 *refs*
Avail: NTIS

Changes in the nerve cells of the atrium following accelerations, the possibility of developing tolerance and adaptation to gravitational stress, as well as accumulation of gravitational factors were studied on dogs. It was found that the neurons of the heart's nervous system demonstrate the greatest reactions to acceleration. Even at 9 g, there was a reversible neuronal reaction which reverted to normal within a rather short *time after the experiment ended. Single massive (21.7 g) or* multiple accelerations (up to 9 g) induced considerably greater morphological changes in the nervous system of the heart and some neurons perished. However, because of the development of compensatory processes, nerve structures were restored and cardiac function was completely normalized after 1 to 2 months. G.G.

N72-19079# Joint Publications Research Service, Washington, D.C.
THE EFFECT OF TRANSVERSE G FORCES ON NERVE ELEMENTS OF THE RAT'S PHARYNGEAL AND ESOPHAGEAL NERVE ELEMENTS FOLLOWING PRELIMINARY

EXPOSURE TO A CONSTANT MAGNETIC FIELD

V. P. Golev and G. V. Chepelenko *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 55-58 refs

Avail: NTIS

Morphological findings are reported on nerve elements of the rat's pharynx and esophagus following exposure to a magnetic field and additional exposures to transverse accelerations. Reactive, dystropnic, and destructive changes indicate a protective stage of the reactive process in the neuroplasma. Intensities of these processes are relative to force and duration of exposure to physical factors, and also to prior excitation of the nervous system. G.G.

N72-19080# Joint Publications Research Service, Washington, D.C.

CHANGES IN TROPIC FUNCTION OF THE EMBRYONIC LIVER UNDER THE INFLUENCE OF TRANSVERSE G FORCES (PLUS G x)

S. K. Konshina, V. I. Stepantsov, and A. V. Yeremin *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 59-65 refs

Avail: NTIS

The glycogen synthesizing function of the embrionic mouse liver after transverse acceleration stress was observed. Comparative quantitative assays of glycogen content in the livers of various animals revealed dilated, plethoric hepatic vessels with a decrease in glycogen mainly due to disappearance of large clumps of glycogen from the periphery of the lobes. Glycogen replenishment started one day after exposure and complete reaccumulation of glycogen occurred on the third day. Livers of embryos whose mothers were exposed to accelerations revealed high glycogen contents in all hepatic lobes. These findings are interpreted as protective reactions against exogenous factors. G.G.

N72-19081# Joint Publications Research Service, Washington, D.C.

THE EFFECT OF CHEST-BACK G FORCES ON TELENCEPHALIC VESSELS

N. I. Zotova *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 66-71 refs

Avail: NTIS

Gravitational stress in the chest-back direction induced morphogical changes in the entire vascular system of the rabbit telencephalon. Functionally tolerable g forces constricted arteries and dilated veins as a result of venous stasis. Maximum tolerable and intolerable forces induced more severe changes in the vessels and are indicative of impairment of the adaptational reflex mechanism of the vascular system. Forces constituting 10 units used for 25 to 45 minutes were at the upper tolerance limit for the animals and ultimately caused their death. G.G.

N72-19082# Joint Publications Research Service, Washington, D.C.

THE EFFECT OF BACK-CHEST G FORCES ON METENCEPHALIC AND MESENCEPHALIC BLOOD VESSELS

I. N. Preobrazhenskaya *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 72-77 refs

Avail: NTIS

Gravitational stress in the chest-back direction introduced very definite morphological changes in the structures of blood vessels of the rabbit medulla, pons, and mesencephalon. Constrictions of the arteries and considerable dilation of the brain stem veins were observed. It is concluded that stasis of the brain stem characterized the effect of ventral gravitational stress. G.G.

N72-19083# Joint Publications Research Service, Washington, D.C.

THE EFFECT OF ACCELERATOR TRAINING ON THE RABBIT'S RETINAL VESSELS

L. I. Savinova *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 78-84 refs

Avail: NTIS

Compensatory reactions of rabbit retinal vessels to repeated acceleration exposures indicated increased resistance to gravitational stress as a result of training. The quality of the retinal vascular bed improved, filling was more even and complete, there were many capillaries, and the outlines of the vessels became more clearcut. A complete correlation between the degree of resistance to gravitational stress and morphological observations of the retinal vascular system was not obtained. G.G.

N72-19084# Joint Publications Research Service, Washington, D.C.

THE EFFECT OF ACCELERATOR TRAINING ON SPLENIC RETICULAR TISSUE

S. G. Guseynova *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 85-89 refs

Avail: NTIS

The reticular tissue of the spleen changes under the effect of gravitational stress, depending on the magnitude, direction, and duration of such exposure. Under the effect of longitudinal accelerations the changes in architectonics of reticular tissue amount to increased density of networks, new formation and tortuosity of fibers with degenerative areas. Under the effect of transverse accelerations the architectonics of reticular tissue do not differ markedly from normal. These changes are apparently compensatory in nature. Author

N72-19085# Joint Publications Research Service, Washington, D.C.

CHANGES IN SKELETAL MUSCLES ASSOCIATED WITH INACTIVITY

G. S. Katinas and A. N. Potapov *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 90-99 refs

Avail: NTIS

Although it is often considered that weightlessness during an actual spaceflight and hypokinesia have much in common, the results of this study indicate that restricted movement in space (hypokinesia proper) and decreased force of muscular contractions do not have the same effect on skeletal muscles. In a series of experiments, qualitative changes of a histochemical nature were prominent; these were not observed following amputation. In both cases there was a consistent change in size of muscle fibers and muscle weight related to the biomechanical conditions. Author

N72-19086# Joint Publications Research Service, Washington, D.C.

STRUCTURAL AND CYTOCHEMICAL CHANGES IN THE RAT'S SKELETAL MUSCLES ASSOCIATED WITH RESTRICTED MOBILITY

V. V. Portugalov, Ye. I. Ilina-Kakuyeva, V. I. Starostin, K. D. Rokhlenko, and Z. F. Savik *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 100-111 refs

Avail: NTIS

Muscular fiber degeneration and marked decrease in enzyme activity constitute impairment of the metabolic processes in rat skeletal muscles exposed to hypokinesia. Atrophy of soleus muscle fibers was observed after 30 days confinement, whereas signs of hypertrophy were demonstrated before this time. Hypokinetic side effects on the structure of striate muscles are: local disturbances in blood supply concurrent with pathological changes, perivascular round cell infiltration primarily around the arteries, vacuolar degeneration, and necroses in the peripheral parts of the muscles. G.G.

N72-19087# Joint Publications Research Service, Washington, D.C.

THE EFFECT OF HYPOKINESIA AND HYPODYNAMIA ON INTRAORGANIC CARDIAC ARTERIES

L. A. Aleksina *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 112-116 refs

Avail: NTIS

The effects of hypodynamia and hypokinesia on rabbit cardiac arteries are studied in an effort to evaluate possible morphological changes in the vascular beds of the hearts of patients who have been on prolonged bed rest, and in astronauts during space flight associated with restricted movement and weightlessness. It was found that after two weeks of restricted motor activity, the myocardial capillaries constricted considerably and the arterioles were dilated. All of the described changes progressed during prolonged immobility and resulted in impairment of myocardial structures. It was concluded that the degree of change in the vascular bed is related to the duration of the restricted motor activity. G.G.

N72-19088# Joint Publications Research Service, Washington, D.C.

MORPHOLOGICAL CHANGES IN BRONCHIAL VESSELS ASSOCIATED WITH EXPERIMENTAL HYPODYNAMIA AND HYPOKINESIA

V. S. Baybara *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 117-121 ref

Avail: NTIS

Hypodynamia and hypokinesia induced changes in rabbit bronchial vessels produced degeneration in the capillary region, edema of muscle cells, hemostatis and microvaricosities. It is shown that morphological reactions in the bronchial microcirculatory bed depend on the duration of hypodynamia and hypokinesia. G.G.

N72-19089# Joint Publications Research Service, Washington, D.C.

THE EFFECT OF GENERALIZED HYPODYNAMIA AND HYPOKINESIA ON THE PORTAL SYSTEM OF THE LIVER

A. V. Drozdova *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 122-127 refs

Avail: NTIS

Generalized hypodynamia and hypokinesia of the organism lasting one week to six months induced morphological changes in the portal system of the liver. This was manifested by constriction of small branches of segmentary and interlobular veins in the marginal segments or in the form of foci in different lobes. The segmentary and main branches of the portal vein dilated somewhat or else did not change. These phenomena progressed up to the 4th-6th week, then became stabilized.

Author

N72-19090# Joint Publications Research Service, Washington, D.C.

THE EFFECT OF HYPODYNAMIA AND HYPOKINESIA ON THE ARTERIAL BED OF THE RABBIT'S HIND LEGS

Z. A. Saryyeva *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 128-134 refs

Avail: NTIS

Prolonged hypodynamia and hypokinesia induces body weight loss with considerable atrophy of the leg muscles. During the first two weeks of hypodynamia and hypokinesia there is a change in architectonics of the arterial bed, as manifested by visible constriction of secondary and tertiary branches of major vessels of both the anterior and posterior femoral muscle groups, as well as leg muscles. The arteries become straighter and extended. The intramuscular network appears to be constricted. After 24 weeks, against a background of considerable atrophy of anterior and posterior femoral muscle groups, the major vessels appear wider than normal. Their secondary and tertiary branches, however, are extended and constricted. Anastomoses are poorly demonstrable between the branches. The intramuscular network is scanter, and the fine vessels are constricted. Author

N72-19091# Joint Publications Research Service, Washington, D.C.

THE EFFECT OF HYPODYNAMIA AND HYPOKINESIA AND SUBSEQUENT HYPERGRAVITATION ON THE BLOOD VESSELS OF THE CAPSULE OF THE RABBIT'S KNEE JOINT

A. G. Lubeyev *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 135-141 refs

Avail: NTIS

It is demonstrated that hypodynamia and hypokinesia affect the vascular system of the rabbit's knee joint capsule and, within the first few weeks, lead to vascular dystonia, hypostasis, and, later on, to onset of hypertensive form of hemodynamic disorders. Hypergravitation following hypokinesia leads to destructive changes in the vascular system of the knee joint capsule. The results of these experiments supplement data obtained previously and furnish information about the effect on the organism of two stress factors: hypergravitation, hypodynamia and hypokinesia. Author

N72-19092# Joint Publications Research Service, Washington, D.C.

AGE RELATED CHANGES IN VASCULARIZATION OF THE RAT'S SKELETAL MUSCLES AS RELATED TO NATURE OF EXERCISE

G. N. Lenskaya *In its* Biol. Effect of Extreme Environ. Factors 6 Mar. 1972 p 142-150 refs

Avail: NTIS

In the rat's skeletal muscles the mean diameter of muscle fibers increases with age. With increase in size of muscle fibers in the course of ontogeny, there is a decrease in number of capillaries per unit of cross section area of muscle and increase in quantity of capillaries per muscle fiber. There is almost no change in correlation between total capillary and fiber perimeters with age. Moderate physical loads induce insignificant changes in blood supply to the rat's skeletal muscles. Increased loads induce an increase in number of capillaries, increase in capillary diameter and their total area. Thus, different training regimens in the form of swimming induced different intensities of reorganization of the blood supply system of muscles. Author

N72-19093*# Aerojet Medical and Biological Systems, El Monte, Calif.

DEVELOPMENT OF A TAPE TRANSPORT BACTERIAL DETECTION SYSTEM *Final Report*

S. Witz and W. H. Hartung 25 Feb. 1972 107 p refs

(Contract NAS9-11644)

(NASA-CR-115457; Rept-1102F) Avail: NTIS CSCL 06M

The feasibility of a tape transport chemiluminescence system for bacterial monitoring of regenerated water was demonstrated using a manually operated laboratory breadboard. The principle of detection is based on measuring the increase in chemiluminescence produced by the catalytic action of bacterial porphyrins on a luminol-hydrogen peroxide mixture. Viable organisms are distinguished from nonviable by comparing the signals of incubated and unincubated water samples. Using optimized protocols, sensitivities were obtained with 400 ml suspensions of E. coli and Cl. sporogenes. The sensitivity of the unincubated cycle E. coli (aerobe) was found to be 30 to 35 cells/ml, and that of the Cl. sporogenes (anaerobe) was 1000 to 10,000 cells/ml. The lower sensitivity toward Cl. sporogenes is attributed to several factors, namely the lower cytochrome content, the tendency to sporulate, long lag periods and the lower growth rate of Clostridia in general. The operational procedures used for processing the incubated and unincubated samples involved the following sequence: (1) concentrating the sample by filtration through a membrane filter, (2) washing with Dextrose-Thioglycollate Broth (3) incubating (0 to 4 hrs as

required), (4) washing with 4M Urea, and (5) reacting with reagent in front of a photomultiplier tube. The signal output was recorded on a strip chart recorder. Author

N72-19094*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY QUARANTINE Semiannual Review, 1 Jul. - 31 Dec. 1970
[1971] 143 p refs Sponsored by NASA
(NASA-CR-125688; JPL-900-484) Avail: NTIS CSCL 06M

Methods for presterilization cleaning or decontamination of spacecraft hardware to reduce microbial load, without harming materials or spacecraft components, are investigated. Three methods were considered: (1) chemicals in liquid form, relying on physical removal as well as bacterial or bacteriostatic action; (2) chemicals used in the gaseous phase, relying on bacterial activity; and (3) mechanical cleaning relying on physical removal of organisms. These methods were evaluated in terms of their effectiveness in microbial burden reduction and compatibility with spacecraft hardware. Results show chemical methods were effective against spore microorganisms but were harmful to spacecraft materials. Mechanical methods were also effective with the degree depending upon the type of instrument employed. Mechanical methods caused problems in handling the equipment, due to vacuum pressure damaging the very thin layered materials used for shielding, and the bristles used in the process caused streaks or abrasions on some spacecraft components. E.H.W.

N72-19095# Public Health Service, Washington, D.C.
HEALTH ASPECTS OF SMOKING IN TRANSPORT AIRCRAFT
Dec. 1971 93 p refs
Avail: NTIS

An investigation was conducted to define the levels of certain combustion by-products of tobacco produced by passengers' smoking; to determine passengers' subjective reaction to tobacco smoke; and to obtain passenger opinion on the need for regulatory change regarding the control of smoking in commercial passenger airplanes. The study involved (1) the collection of samples to determine the environmental exposure levels to carbon monoxide, particulate matter, polynuclear hydrocarbons, ammonia, and ozone, and (2) the use of a questionnaire. The results of environmental sampling revealed very low levels of each contaminant measured, much lower than those recommended in occupational and environmental air quality standards. These combustion products were judged not to represent a hazard to the nonsmoking passengers. However, an evaluation of the results of the questionnaire indicated that a significant proportion of the nonsmokers (over 60%) were bothered by tobacco smoke and suggested that corrective action be taken such as segregation of the smokers. Furthermore, over 70% of the nonsmokers who had history of respiratory conditions expressed annoyance by tobacco smoke. Author

N72-19096# Joint Publications Research Service, Washington, D.C.
DYNAMICS OF CHANGES IN THE COMPOSITION OF THE ESCHERICHIA IN PERSONS PARTICIPATING IN A MEDICAL-TECHNICAL EXPERIMENT
M. P. Bragina, N. V. Anikeycheva, V. M. Shilov, and D. G. Kublay 15 Feb. 1972 10 p refs Transl. into ENGLISH from Zh. Mikrobiol. Epidemiol. i Immunobiol. (Moscow), no. 12, 1971 p 23-28
(JPRS-55191) Avail: NTIS

Changes in the composition of normal intestinal microflora were investigated in relation to cosmonaut confinement in a hermetically sealed cabin during long space flights. Cultures of E. coli were used in tests of antagonistic activity; these were excreted from persons who participated in the year-long experiment. The purpose of the investigations was to study the dynamics of compositional changes in Escherichia in persons confined in sealed chambers with limited volume. The colicinogenic Escherichia were typed and the spectrum of sensitivity of the strains to various colicins was determined. It was concluded that colicinogenicity can be used in the study of quantitative and qualitative changes in intestinal microflora. An intensive exchange of flora was observed to take place under the conditions of the experiment. K.P.D.

N72-19097# Royal Aircraft Establishment, Farnborough (England).
ANTHROPOMETRY OF FLYING PERSONNEL IN THE ROYAL SWEDISH AIR FORCE
B. Andrae, J. Ekmark, and H. Laestadius Sep. 1971 57 p refs Transl. into ENGLISH of "Kroppsmatt foer Flygande Personal" Inst. of Aviation Med., Malmslaett, Sweden, Rept-68:9, 1968
(RAE-Lib-Trans-1502; BR27943; Rept-68:9) Avail: NTIS

During the year 1967-8 detailed anthropometry was carried out on a total of 240 flying personnel born 1925-7, 1939-40 and 1944. Factors influencing the general growth of the body are discussed and examples given from the study of increase in stature of Swedish inductees for military service during the last century. The measurements obtained and subsequent analysis have resulted in (1) suggested changes in standard requirements and enrollment regulations for flying personnel and (2) recommendations concerning future measurements and pattern for experiments. Author

N72-19098*# Scientific Translation Service, Santa Barbara, Calif.
THE NERVOUS SYSTEM AND STRESS (THE PRINCIPLE OF DOMINANCE IN PATHOLOGY)
G. I. Kositskiy and V. M. Smirnov Washington NASA Mar. 1972 274 p refs Transl. into ENGLISH of "Nervnaka Sistema i stress (O Printsipe Dominanty Patol.)" Moscow, Nauka Press, 1970
(Contract NASw-2035)
(NASA-TT-F-653) Avail: NTIS CSCL 06S

Results are given of experimental investigations indicating that the action of supplementary nonspecific stimuli on the organism produces a significant increase in the resistance of the organism to pathogenic stimuli, which is of great importance in the prophylaxis of disease. A critical role in the development of these phenomena is assigned to the phenomena of the inhibition of pathological processes by the creation of a nonspecific focus of the dominant stimulus. Author

N72-19099*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif. Biotechnology and Power Dept.
SEVENTEEN KETOGENIC STEROIDS EXCRETION IN CREWMEN IN A 90-DAY MANNED TEST OF AN ADVANCED REGENERATIVE LIFE SUPPORT SYSTEM
D. J. Myers and J. R. Wamsley Feb. 1972 31 p refs
(Contract NAS1-10717)
(NASA-CR-112020; MDC-G2828) Avail: NTIS CSCL 06P

Seventeen KGS (17-Ketogenic steroids) and Na/K were determined in 19 urine specimens collected by each of 4 crewmen during the 90-day test. The specimens represented 10% aliquots of 24-hour collections stored frozen onboard the simulator until passthrough. Electrolytes were analyzed immediately after sample passthrough while the steroids were determined post-test on aliquots of the original sample held at 203 K. Steroid data was corrected for body weight and also for analytical variation in the laboratory urine pool control. Long-term nonspecific responses to low-level stress appear to be reflected by the individual and group mean 17-KGS excretion patterns. The first 39 and the last 20 days of the test were significantly different--and presumably more stressful to the crew--than the period from days 39 to 67. Reduction of adrenocortical function during the mid-test phase is attributed to either an adaptation to chronic or intermittent stress or was the result of an actual

reduction in the operational demands of the test during this time. Most remarkable of the metabolic findings is the prevalance of high Na/K ratios and an abrupt peak on day 74 for all 4 crewmen. Author

N72-19100*# Scientific Translation Service, Santa Barbara, Calif.
THE PROPERTIES OF CARBOXYPEPTIDASE C FROM ORANGE LEAVES
B. Sproessler, H. Heilmann, E. Grampp, and H. Uhlig Washington NASA Mar. 1972 15 p refs Transl. into ENGLISH from Z. Physiol. Chem. (W. Berlin), v. 352, Nov. 1971 p 1524-1530
(Contract NASw-2035)
(NASA-TT-F-14186) Avail: NTIS CSCL 06A

A carboxypeptidase was isolated and purified from orange leaves. Using Z-Leu-Phe as the substrate, the specific activity of the purified enzyme was 2,500 mU/mg protein; pH optimum 5.3; maximum stability at pH 5.0; optimum temperature 40 - 50 C. The molecular weight determined by gel chromatography on Sephadex G-200 was 175,000 plus or minus 10,000. The isolectric point lay at pH 4.5 as determined by disc-electrofocusing. The enzyme preparation possessed esterase activity, but it was free from endopeptidase and aminopeptidase activity. Carboxypeptidase C has the combined substrate specificities of carboxypeptidases A and B. It removes the C-terminal aromatic, neutral, and acidic amino acids, but in addition it also removes the basic amino acids. Furthermore, proline bonds are hydrolyzed on both the amino and carboxyl side. Glycine is attacked slowly and Z-Gly-Pro is not hydrolyzed. Author

N72-19101*# Scientific Translation Service, Santa Barbara, Calif.
CHANGES IN SERUM ENZYME ACTIVITY AFTER A PHYSICAL LOAD
V. Krampl, M. Hubach, and I. Borsky Washington NASA Mar. 1972 12 p refs Transl. into ENGLISH from Pracovni Lekar. (Prague), v. 18, 1966 p 150-153
(Contract NASw-2035)
(NASA-TT-F-14187) Avail: NTIS CSCL 06S

The activity of the glutamo-oxalacetic-, the glutamopyruvic transaminase, and aldolase in serum was investigated experimentally after a physical, dynamic, and static load. The activity increased significantly immediately after work approximately in an equal value regardless of the degree and the kind of load. After a greater load, the increase peak was reached in the 5th recovery minute; the result was significant in comparison with the initial value. In the 5th recovery minute a significant difference of activity of the enzyme investigated was observed between the smaller and the greater physical load.
Author

N72-19102*# BioTechnology, Inc., Falls Church, Va.
HUMAN FACTORS ASPECTS OF AIR TRAFFIC CONTROL
Harry J. Older and Bernard J. Cameron Washington NASA Feb. 1972 172 p refs
(Contract NAS1-9125)
(NASA-CR-1957) Avail: NTIS CSCL 05E

An overview of human factors problems associated with the operation of present and future air traffic control systems is presented. A description is included of those activities and tasks performed by air traffic controllers at each operational position within the present system. Judgemental data obtained from controllers concerning psychological dimensions related to these tasks and activities are also presented. The analysis includes consideration of psychophysiological dimensions of human performance. The role of the human controller in present air traffic control systems and his predicted role in future systems is described, particularly as that role changes as the result of the system's evolution towards a more automated configuration. Special attention is directed towards problems of staffing, training, and system operation. A series of ten specific research and development projects are recommended and suggested work plans for their implementation are included. Author

N72-19103# California Univ., Berkeley. Lawrence Radiation Lab.
INVESTIGATIONS OF BONDING, STRUCTURE, AND QUANTITATIVE ANALYSIS IN BIOLOGICAL SYSTEMS BY MEANS OF X-RAY PHOTOELECTRON SPECTROSCOPY Ph.D. Thesis
Leo Nichols Kramer Jul. 1971 114 p refs
(Contract W-7405-eng-48)
(LBL-306) Avail: NTIS

X-ray photoelectron spectroscopy (XPS) has been used to obtain information concerning the structure and bonding in several biological and biologically related systems; it has also been shown to be useful for quantitative analysis of grain proteins. Correlations between charge and Fe3P and S2P electron binding energies have been established for a series of iron and sulfur compounds. These correlations, along with the XPS spectra of model iron-sulfur complexes have been used to help interpret the XPS spectra of the nonheme iron proteins. The resulting evidence supports postulated structures. In a similar manner the bonding and nature of the Prussian blue complexes were investigated. It was concluded that the Prussian blues are covalently bonded supercomplexes rather than ionic compounds. The nature of magnesium in chlorophyll found in photosynthetic membranes is also investigated. Author

N72-19104# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
THE DYNAMIC BIOMECHANICAL NATURE OF SPINAL FRACTURE AND ARTICULAR FACET DERANGEMENT Final Report
Leon E. Kazarian, Dale D. Boyd, and Henning E. vonGierke Aug. 1971 49 p refs
(AF Proj. 7231)
(AD-731148; AMRL-TR-71-17) Avail: NTIS CSCL 06/5

The application of appropriate scaling laws, animal experiments, particularly on primates, have been shown to be of value to explain hard tissue injury mechanisms and individual organ injury potential in man exposed to impact forces. In support of this approach rhesus monkeys were anesthetized, radiographed, positioned in an impact carriage, restrained by lap belt, torso harness, and limb retention straps, and exposed to -Gz seated rectangular acceleration time histories from predetermined drop heights. Shortly following impact all primates were radiographed, killed, and a necropsy performed. Attempts were made by means of an injury classification system to determine injury potential as a function of plateau acceleration and pulse duration for the spinal column. Type, frequency, and severity of vertebral body centrum fractures along with injury to the vertebral appendages were classified. Vertebral articular facets-apophyseal joints disorders and derangements proved difficult to identify radiographically due to poor X-ray film resolution, overlying soft tissue, and bony margin shadows. Necropsy demonstrated a large percentage of primates exhibited this type of lesion. Injury probabilities for the vertebral column established by radiographic and gross necropsy examination supplement and explain available knowledge on spinal injury mechanisms observed in the rhesus monkey. Applicability of these data to man will be discussed. Author (GRA)

N72-19105# School of Aerospace Medicine, Brooks AFB, Tex.
MEASUREMENT OF ELECTROMAGNETIC FIELDS WITHIN BULK MATERIALS BY MEANS OF THE MOESSBAUER EFFECT Final Report, Mar. - Apr. 1970
John Taboada Apr. 1971 23 p refs
(AF Proj. 7757)
(AD-731119; SAM-TR-71-10) Avail: NTIS CSCL 06/18

The internal electromagnetic field of bulk objects being irradiated with radiofrequency (RF) radiation is often a necessary parameter for assessing potential radiation damage, particularly in the case of biologic entities. At present, most methods of measurement require some form of communication leads to an embedded probe; however, since these leads may serve as antennas, the local RF fields are frequently disturbed. Another

approach could be the implantation of an intermediate frequency transmitter to telemeter the probe measurement. Excessive size makes such devices impractical. The shortcomings of the use of probes can be overcome by an application of the Mossbauer effect. Presented in this report are a description of the Mossbauer effect and how it can be applied to RF field measurement, a system design for establishing the Mossbauer effect experiment, and some preliminary results. Author (GRA)

N72-19106# School of Aerospace Medicine, Brooks AFB, Tex.
AEROMEDICAL REVIEWS: GRADES OF DECOMPRESSION SICKNESS IN UNPRESSURIZED AIRCRAFT
Thomas H. Allen Jun. 1971 26 p refs
(AD-731118; SAM-Review-4-71; SAM-TR-71-26) Avail: NTIS CSCL 06/19

The purpose of this study is to show with available evidence how to set forth the incidence of the several grades of bends that could arise, persist, and perhaps influence the success of sorties at altitudes above 20,000 ft. Author (GRA)

N72-19107# BioTechnology, Inc., Falls Church, Va.
EFFECTS OF 72-HOUR PARTIAL SLEEP DEPRIVATION HUMAN BEHAVIORAL AND PHYSIOLOGICAL RESPONSE MEASURES Final Report
Thomas W. Frazier (Walter Reed Army Inst. of Res.), Vernon A. Benignus (Behavioral Technol. Consultants, Inc.), Martin G. Every, and James F. Parker, Jr. Aug. 1971 50 p refs
(Contract DADA17-69-C-9010)
(AD-732872) Avail: NTIS CSCL 06/19

Ten adult males were subjected to partial sleep deprivation experiments in order to study the effects of progressive sleep deprivation on the basic biological rhythms underlying performance on signal detection tasks and to assess the value of using change in biological rhythms as an objective measure of human response to such types of stress. The data obtained were subjected to a power density spectral analysis with a program based upon the Fast Fourier Transform. The results show that signal detection measures, response latency, and heart rate are all highly sensitive in reflecting progressive loss of performance capability. Power spectral data also show changes as a function of sleep deprivation, indicating that one feature of this type of stress may be an alteration of basic human biorhythms.
Author (GRA)

N72-19108# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
DYNAMIC SEQUENTIAL PATTERN RECOGNITION APPLIED IN MEDICAL DIAGNOSIS
Eric Persoon Jul. 1971 87 p refs
(Grants AF-AFOSR-1776-69; NSF GK-18225; AF Proj. 9769)
(AD-734292; TR-EE71-24; AFOSR-71-3047TR) Avail: NTIS CSCL 06/5

In medical diagnosis the cost of the feature measurements is important. Therefore sequential classifiers which take in account the costs of the features have to be used. In the first part of the report methods are investigated to reduce the computations as much as possible. In the cases where still too much computation time is required, suboptimal procedures must be used. Data are available on patients with pancreas cancer, patients with liver cancer and healthy people. In the last chapter some comments are given about interaction of the physician with the algorithm and topics for further research are listed.
Author (GRA)

N72-19109# Texas Technological Univ., Lubbock. Center of Biotechnology and Human Performance.
AN ANNOTATED BIBLIOGRAPHY OF SELECTED WORKS IN AMBIGUITY AND ITS EFFECT ON DECISION MAKING
V. P. Luchsinger Dec. 1971 58 p refs
(Contract DAAD05-69-C-0102; DA Proj. 1T0-14501-B-81-A)
(AD-734348) Avail: NTIS CSCL 05/10

The bibliography represents the results of research efforts over several years. The chief thrust was to study the effects of ambiguity or uncertainty on the decision making behavior of humans operating individually or as groups. Author (GRA)

N72-19110# Cincinnati Univ., Ohio. Coll. of Medicine.
RADIATION EFFECTS IN MAN: MANIFESTATIONS AND THERAPEUTIC EFFORTS Annual Report, 1 May 1969 - 30 Apr. 1970
Eugene L. Saenger, Edward B. Silberstein, Bernard S. Aron, Harry Horwitz, James G. Kereiakes, I-Wen Chen, Carolyn Winget, and Goldine C. Gleser Dec. 1970 92 p refs
(Contract DASA01-69-C-0131; DASA Proj. NWER-XAXM)
(AD-732025; DASA-2599) Avail: NTIS CSCL 06/18

The goal of the program was to obtain new information regarding the pathophysiologic, psychologic, immunologic, hematologic, and biochemical effects of total- and partial-body irradiation in human beings. Irradiated patients all of whom have inoperable, metastatic carcinoma but are in relatively good health, provide the opportunity to study multiple facets of the effects of radiation in man rather than in experimental animal. The extrapolation of results from laboratory animals to man is fraught with error. Biochemical and psychological studies have extended the findings of previous report in depth and scope. Several new biological dosimeters are under evaluation.
Author (GRA)

N72-19111# Office of Naval Research, London (England).
BIOENERGETICS AND TEMPERATURE REGULATION SYMPOSIUM
Albert R. Dawe 20 Oct. 1971 12 p Symp. held at Dublin, 19-23 Jul. 1971
(AD-733401; ONRL-C-22-71) Avail: NTIS CSCL 06/16

Representatives of 23 countries attended this symposium concerned with bioenergetics and temperature regulation. The symposium was one of several 'satellite' symposia given both prior to and after the 25th International Physiological Congress held in Munich the following week. Author (GRA)

N72-19112# Arizona State Univ., Tempe.
VISUAL EVOKED POTENTIAL CHANGES IN HYPERBARIC ATMOSPHERES
Charles R. Larson, Dwight Sutton, Eugene M. Taylor, and Jerry D. Burns 1 Nov. 1971 17 p refs
(Contract N00014-68-A-0150; NR Proj. 196-077)
(AD-733416; TR-71-02) Avail: NTIS CSCL 06/19

The visual evoked potential (VEP) in chloralose-anesthetized cats decreased in amplitude as a function of increasing pressure. This was true for compression with pO2 = 200 or 1,000 mm Hg. Maintained pressure, while changing pO2 from 200 to 1,000 mm Hg or from 1,000 to 200, had little effect. If pO2 = 1,000 mm Hg was used in a session, variability in VEP measurements was extremely high, i.e., the VEP amplitude dropped to zero at 100 FSW for some cats, while other cats showed little effect at 500 FSW. Limited information on decompression indicates the VEP may be recovered from its depressed state at 500 FSW by slow decompression. Rapid decompression results in the VEP remaining depressed or being reduced in amplitude even further. The VEP was not a reliable index for determining decompression stops. Author (GRA)

N72-19113# Arizona State Univ., Tempe.
A CONCENTRATION-DEPENDENT ATTENUATION OF TOXIC OXYGEN EFFECTS IN THE MOUSE
Jerry D. Burns 15 Oct. 1971 14 p refs
(Contract N00014-68-A-0150; NR Proj. 196-077)
(AD-733418; TR-71-03) Avail: NTIS CSCL 06/19

Ninety male albino mice were exposed to 4, 6, or 8 atm oxygen partial pressure in 100%, 50%, or 25% dilutions. Tolerance was measured in terms of times to convulsion and

times to death. Results indicated (a) both convulsion times and death times tended to increase with decreases in concentration, (b) the degree of change in tolerance as a function of concentration was greater for the low partial pressures, and (c) convulsion times and death times showed significant correlation only in the 4 atm partial pressure condition. The results further indicate a distinct decrease in susceptibility to toxic oxygen effects with increases in absolute pressure at fixed pO2.
Author (GRA)

N72-19114# University of Southern Calif., Los Angeles.
NEURAL ENCODING OF SENSORY INFORMATION Final Report, 1 Sep. 1969 - 31 Aug. 1970
Lewis G. Bishop Nov. 1971 5 p refs
(Grant AF-AFOSR-1869-70; AF Proj. 9777)
(AD-733421; AFOSR-71-2970TR) Avail: NTIS CSCL 06/16

Recordings of several directionally selective motion detectors were made in the optic lobe. Object wavelength and velocity relationships were determined and compared with optomotor response and it was concluded these neurons were part of the neural system underlying flight control. Spectral sensitivity measurements were then made on these units to determine how the system is organized to distinguish color. It was found that these units receive information from all described photopigments but do not distinguish color. Hence, the color channel and movement channel are separate which is surprising in the context of economy of neuron and in knowledge of neuroanatomy. Two papers have been published as a result of this research.
Author (GRA)

N72-19115# Brown Univ., Providence, R.I. Div. of Engineering.
ELASTIC ANALYSIS OF A SKULL
Claude H. Hardy and Pedro V. Marcel Nov. 1971 29 p refs
(Contract N00014-67-A-0191-0007; NR Proj. 064-512)
(AD-734176; TR-8) Avail: NTIS CSCL 06/2

A finite element elastic analysis is made of a skull. Measurements were made of the geometry and thickness of a skull. The skull was then idealized with a doubly curved and arbitrary triangular shell element. Results suggest that the skull is well built for resistance to front loads. The importance of using a composite material through the thickness of the shell was established. On the basis of tensile cracking at maximum elastic stress, loads of 3,500 lbs. and 1,400 lbs. were predicted for the first cracking of the skull due to front and side loading respectively.
Author (GRA)

N72-19116# Eye Research Foundation of Bethesda, Md.
THE STUDY OF RETINAL BURN: A METHOD FOR TRAINING AND MEASURING VISUAL ACUITY IN RHESUS MONKEYS Final Report, 1 Mar. 1969 - 30 Sep. 1971
David O. Robbins and Carl Richard Cavonius Nov. 1971 17 p refs
(Contract N00014-69-C-0240; NR Proj. 105-530)
(AD-733488) Avail: NTIS CSCL 06/16

A testing paradigm has been established to permit rapid and consistent measures of visual acuity in Rhesus monkeys. This method seems especially suited to studies requiring rapid measures of sensory function since the amount of time that elapses between the performance of the subject and the determination of the animal's acuity is minimal. The basic paradigm is a modification of the von Bekesy 'tracking' task in which the animal's task is to constantly adjust the stimulus value around his threshold level. Ten animals have been trained by this method and measures of their visual acuity ranged from 20/17 to 20/14, consistent with that of well corrected human.
Author (GRA)

N72-19117# Texas Technological Univ., Lubbock.
VIGILANCE AND MOTIVATION: A THEORETICAL NOTE
Peggy J. Blackwell and C. G. Halcomb 1970 16 p refs
(Contract DAAD05-69-C-0102; Proj. Themis)
(AD-733483) Avail: NTIS CSCL 05/10

A review suggests that the motivational aspects of performance have not been a central theoretical feature in vigilance and complex monitoring literature. Rather, the study of motivational variables has focused on task and environmental variables and, for the most part, has ignored motivational variables. A definition of motivation which is suitable for the context of vigilance and complex monitoring is presented, and theories which are centered about motivational aspects are reviewed. The authors suggest that an adaptation-level model of reinforcement may provide the necessary dynamic framework to promote systematic investigations of the complex monitoring problem.
GRA

N72-19118# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
IMPACT TOLERANCE: ABDOMINAL INJURY Final Report, 1 Jul. 1970 - 30 Jun. 1971
D. L. Beckman, J. H. McElhaney, V. L. Roberts, and R. L. Stalnaker 30 Jun. 1971 318 p refs
(Contract DOR-FH-11-7608)
(PB-204171; HSRI-71-102; DOT-HS-800-549) Avail: NTIS CSCL 13L

In order to provide data on human tolerance to blunt abdominal impact a literature study and laboratory tests were carried out to determine the major causes of abdominal injury, injury mechanisms, a quantitative relationship between input and occurrence of trauman and to develop the criteria to recommend performance requirements for materials which often produce blunt abdominal injury. An extensive analysis of case reports indicated that the most frequent causes of blunt abdominal injury were the steering wheel, seat belt and various protruding objects in a vehicle; the organs most often injured were the liver, pancreas, spleen and intestine.
Author (GRA)

N72-19119# Advisory Group for Aerospace Research and Development, Paris (France).
LINEAR ACCELERATION OF IMPACT TYPE
26 Feb. 1971 466 p refs In ENGLISH and FRENCH
Presented at the Aerospace Med. Panel Specialist Meeting, Oporto, Portugal, 23-26 Jun. 1971
(AGARD-CP-88-71) Avail: NTIS HC $6.00/MF $0.95

Recent aviation and automobile accidents are reviewed in an effort to reduce the human injury. The biodynamics, physiology, pathology, and clinical aspects of linear acceleration impact are discussed.

N72-19120# Royal Air Force, Farnborough (England).
TECHNICAL EVALUATION OF THE AEROSPACE MEDICAL PANEL SPECIALISTS MEETING ON LINEAR ACCELERATION (IMPACT TYPE)
D. H. Glaister *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 4 p
Avail: NTIS HC $6.00/MF $0.95

Crash injury research is discussed, including biodynamics of impact, injury mechanisms and pathology, and techniques for impact attenuation. Impact forces related to seat ejection, facilities for impact studies, impact protection (restraint system), and head protection devices are considered. Recommendations for additional research are presented for crashworthiness, standardization, head and neck protection, ejection injury to the spine, and soft tissue injury mechanisms.
J.A.M.

N72-19121# Army Aeromedical Research Lab., Fort Rucker, Ala.
SYMPOSIUM ON LINEAR ACCELERATION OF IMPACT TYPE INTRODUCTORY REMARKS
Edward J. Baldes *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 5 p refs
Avail: NTIS HC $6.00/MF $0.95

Biodynamic and bioengineering applications to operational problems in the interface of man machine relationships are reviewed. Safety principles are discussed for reducing injuries. Data are presented on accidents in aircraft training programs and on highways. Author

N72-19122# Laboratoire UTAC, Montlhery (France).
ECONOMIC PROCEDURES FOR SIMULATING THE EFFECTS OF LINEAR COLLISIONS IN VIEW OF STUDIES OF RESTRAINING DEVICES FOR THE PROTECTION OF AUTOMOBILE OCCUPANTS [PROCEDES ECONOMIQUES PUR SIMULER LES EFFETS DE COLLISIONS LINEAIRES EN VUE DE L'ETUDE DES DISPOSITIES DE RETENUE OU DE LA PROTECTION DE OCCUPANTS D'UN VEHICULE AUTOMOBILE]
E. Chapoux and H. LeGuen *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 16 p In FRENCH

Avail: NTIS HC $6.00/MF $0.95
An apparatus was designed and perfected for collision studies, which involves stopping of passenger movement. The equipment described is being used in many European laboratories and provides many advantages at a minimal cost price.
Transl. by K.P.D.

N72-19124# Royal Air Force Inst. of Pathology and Tropical Medicine, Aylesbury (England).
HISTOPATHOLOGICAL RESPONSES TO DECELERATION
J. K. Mason *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 6 p refs
Avail: NTIS HC $6.00/MF $0.95
Personal observations of 340 fatal aircraft accidents are used to study simple confirmation of lacerations to victims. The physical changes are described with reference to quantitation and differential diagnosis from natural disease. The significance of pulmonary tissue embolism is emphasized. Author

N72-19125# Michigan Univ., Ann Arbor. Inst. of Science and Technology.
MAN'S SURVIVABILITY OF EXTREME FORCES IN FREE FALL IMPACT
Richard G. Snyder *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 13 p refs
Avail: NTIS HC $6.00/MF $0.95
Exposure to extreme forces greater than experimentally tolerable were studied through human accidental or suicidal free-falls. Examples selected from nearly 30,000 free-fall cases illustrate the range of injury and fatality limits found under various conditions. Terminal velocity free-falls 53.64 m/sec (120 mph) without benefit of parachute were survived by Soviet, French, United Kingdom, and U.S. pilots and paratroopers under emergency ejection or evacuation conditions. Biophysical, biomechanical, and biomedical variables are discussed. Results indicate that there is a complex balance between factors of magnitude, calculated rate of onset and event duration, body axis orientation, force distribution, and properties of the impacted surface. Author

N72-19126# Association Peugeot-Renault, la Garenne-Colombes (France). Lab. de Physiologie et de Biomecanique.
COMPARISON OF THE EFFECTIVENESS OF TWO PASSIVE RESTRAINT SYSTEMS [EFFICACITE COMPAREE DE DEUX SYSTEMES DE RETENUE PASSIVE]
Claude Tarriere *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 13 p refs In FRENCH

Avail: NTIS HC $6.00/MF $0.95
Safety belts are discussed in regard to the optimization of webbing rigidity and the utilization of shock absorbers at chest level. Performance level is compared to that of inflatable bags. Completely passive, automatic belts are considered. Experimental data are presented in terms of improving global efficacy, various highway accident types, and the cost/efficiency ratio.
Transl. by K.P.D.

N72-19127# National Institutes of Health, Bethesda, Md. National Inst. of Neurological Diseases and Stroke.
PROTECTION OF THE BRAIN FROM INJURY DURING IMPACT: EXPERIMENTAL STUDIES IN THE BIOMECHANICS OF HEAD INJURY
Ayub K. Ommaya and Arthur E. Hirsch (Natl. Highway Traffic Safety Admin.) *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 19 p refs
Avail: NTIS HC $6.00/MF $0.95
Experimental data on head injury are summarized in three subhuman primate species undergoing controlled direct head impact and indirect impulsive head loading (whiplash). Testing of Holbourn's rotational hypothesis and the translation/cavitation hypothesis revealed discrepancies. Data are presented to show that a combination of heat rotation and skull distortion mechanisms are most injurious for brain damage during both direct and indirect impact. Current mathematical models with simultaneous experimental testing in development are reviewed. Author

N72-19128# Rochester Univ., N.Y. School of Medicine.
BIODYNAMICS OF SPORTS INJURIES
John D. States *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 6 p refs
Avail: NTIS HC $6.00/MF $0.95
Helmets and restraint systems used in automobile racing, modified football shoe cleats, and release ski bindings have reduced the injury risks in these sports. Knowlege of human injury tolerance was gained through the study of sports accidents, particularly the determination of injury mechanisms. Injury tolerance data determined in the laboratory was also useful in designing sports safety equipment. Author

N72-19130# Birmingham Univ. (England). Dept. of Transportation.
AN ASSESSMENT OF ACTIVE AND PASSIVE RESTRAINTS IN SERIOUS INJURY EUROPEAN CAR OCCUPANT COLLISIONS
G. Murray Mackay *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 12 p refs
Avail: NTIS HC $6.00/MF $0.95
A field study of road accidents numbering 105 vehicles selected from the severe and fatal injury end of the injury spectrum are examined. The incidence of various crash configurations is outlined, together with the objects struck, and the rate with which the passenger compartment is penetrated. The relative frequencies of side impacts, and multiple and complex collisions are described. Each collision is examined in terms of the reduction in injuries to front seat occupants which might be obtained if an airbag was present. In a similar manner each collision is examined to assess the benefit if a lap/diagonal seat belt were worn. An overall judgement is therefore obtained on the relative benefits obtainable from airbags and belts. Belts are shown to be superior because they provide protection in a greater range of collision types. If a belt wear rate exceeding some 63% for drivers and 85% for front passengers were obtained then belts provide greater benefits than airbags. The importance of intrusion into the passenger compartment, especially in fatal collisions is emphasized as a restriction on restraint effectiveness in present day European car designs. Author

N72-19131# Naval Aerospace Medical Research Lab., New Orleans, La.
HUMAN DYNAMIC RESPONSE TO MINUS GX IMPACT ACCELERATION
Channing L. Ewing and Daniel J. Thomas *In* AGARD Linear

Acceleration of Impact Type 26 Jun. 1971 12 p refs

Avail: NTIS HC $6.00/MF $0.95

The purposes of the study were fourfold: (1) to measure precisely the complete input acceleration to the head and neck measured at the first thoracic vertebra; (2) to measure precisely the dynamic response of the head and neck to the input acceleration; (3) to develop a method of obtaining the data in such a form that automatic data processing may be used; and (4) to develop and validate a general method for the experimental measurement of the bioengineering characteristics of the human body with such precision, accuracy, and repeatability that a mathematical model of the human dynamic response to impact acceleration can be constructed. Author

N72-19132# Naval Aerospace Medical Research Lab., New Orleans, La.

THEORETICAL MECHANICS FOR EXPRESSING IMPACT ACCELERATIVE RESPONSE OF HUMAN BEINGS

Daniel J. Thomas and Channing L. Ewing *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 7 p refs

Avail: NTIS HC $6.00/MF $0.95

The theoretical requirements for expressing the kinematics of human impact acceleration experimentation are presented. Two basic coordinate systems for expression of the kinematic information are identified as: (1) the body reference frame, defined in terms of the experimental subject's anatomy; (2) the laboratory reference frame. A general set of rules for deriving these coordinate systems is described. Variables and parameters are defined in terms of the general set of rules. The resulting descriptions are compared with definitions for use in prolonged acceleration. Author

N72-19133# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Biodynamics and Bionics Div.

BIODYNAMIC MODELS AND THEIR APPLICATIONS

Henning E. vonGierke *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 18 p refs

Avail: NTIS HC $6.00/MF $0.95

Progress in modeling the mechanical response of man exposed to various environmental forces is discussed. Starting with a mathematical description of the mechanical and physical characteristics of the integument, soft and hard tissue, the numerous approaches taken and the results obtained from modeling various integrated elements such as the human vertebral column under vibration and impact loads, the chest and respiratory system under vibratory and blast loads and of the whole body system for selected force input conditions and locations are reviewed. To derive a capability of modeling specific injury modes or experimentally observed probabilities of injury curves for various parenchymatous and hollow organs as a function of the force input variables, more detailed and specialized models are being used such as, for example, the lumped parameter, discrete parameter, and continuum model of the spine or models considering nonlinear tissue behavior. The status and value of these models for studying the body's physical and physiological response, for understanding and predicting injury mechanisms and probability of injury, for scaling the results of animal experiments, and for applying the models in protection engineering, such as escape and restraint systems design, are demonstrated. There is need for further experimental, as well as theoretical work, in support of these practical biomedical and hardware requirements. Author

N72-19134# Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex.

THE BIODYNAMICS OF AIR BLAST

Clayton S. White, Robert K. Jones, Edward G. Damon, E. Royce Fletcher, and Donald R. Richmond *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 21 p refs Sponsored by DASA and AEC

Avail: NTIS HC $6.00/MF $0.95

After pointing out that accelerative and decelerative events are associated with the direct and indirect effects of exposure to blast-induced winds and pressure variations, some of the relevant biophysical parameters were selectively noted and discussed. These included the pressure-time relationship; species differences; ambient pressure effects; the significance of positional (orientational) and geometric (situational) factors as they influence the wave form, the pressure dose and the biologic response; and data bearing upon the etiology of blast injury. The consequences of pressure-induced violent implosion of the body wall and the significance of the associated variations in the internal gas and fluid pressures were described and emphasized, as were alternating phases of forced hemorrhage and arterial air embolization, fibrin thrombi, coagulation anomalies, and renal, cardiac and pulmonary sequelae. Tentative biomedical criteria consistent with recent interspecies scaling and modeling studies for assessing primary blast hazards were presented. Author

N72-19135# Department of Transportation, Washington, D.C. Natl. Highway Traffic Safety Administration.

LETHAL EFFECTS ON MAN OF UNDERWATER DETONATION OF A FIRECRACKER

Arthur E. Hirsch and Ayub K. Ommaya (NIH) *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 5 p refs

Avail: NTIS HC $6.00/MF $0.95

A firecracker exploded in contact with the skin within six inches of the skull base in a young man while he was swimming underwater. The resultant severe head injury and death appeared to be directly related to this underwater explosion. Reconstruction of the mechanics of this injury indicate that when the head is subjected to impact energies between 440 to 1800 in-lb and impact impulse between 1.8 to 3.5 lb.sec., both skull fracture and brain injury can occur. Author

N72-19136# Institutes fuer Wehrmedizin und Hygiene, Koblenz (West Germany).

HUMAN STRESS LOADS INDUCED THROUGH SIMULATED PRESSURES ON UNDERGROUND SHELTERS

G. Kleinhanss and H. Dupuis (Technischen Univ., Munich) *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 9 p refs

Avail: NTIS HC $6.00/MF $0.95

Within the constraints of a simulated nuclear strike, the human stress loads to be expected were assessed through physical measurements taken on dummies placed in an underground shelter. Results verified that under the given conditions, exposure to shock would not cause detrimental effects to the health or a reduction in efficiency, due to physical factors, of operators manning control desks in the underground shelter. It is pointed out that results obtained on dummies may be applied analogously to man only to a limited extent, since no dummies showing human physiological and dynamic behavior were available. The assessment results apply only to the *movement vectors observed during this test on shelter floor and* walls. Conceivably, other vector variations may produce fundamentally different results. The measuring data related to three different seating arrangements indicate technical possibilities for shock reduction. Author

N72-19137# Army Aeromedical Research Lab., Fort Rucker, Ala. Bioengineering and Evaluation Div.

PARACHUTING IMPACT INJURIES AT HIGH DROP ZONE ELEVATIONS: ENVIRONMENTAL EFFECTS

Stanley C. Knapp and George R. McCahan, Jr. *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 9 p refs

Avail: NTIS HC $6.00/MF $0.95

A review of parachuting injuries that are directly related to accelerative forces and impact is presented. The available and valid injury prediction statistics for a wide variety of parachuting activities is discussed. The environmental effects of wind shear, wind velocity, wind thermals, density altitude, terrain and topography, increased rates of descent, and temperature variations upon injury morbidity are analyzed. These effects were determined during experiments at 6,000 and 10,000 feet drop zone altitudes using the 32 feet parabolic-apex vented-static line deployed parachute. Injury rates were four times greater than those expected or experienced at sea level elevations. The conclusions and recommendations will be of practical value in the training and outfitting of parachutists for jumps into high elevation drop zones. Author

N72-19138# Italian Air Force Aerospace Medical Center, Rome.

BEHAVIOUR OF SOME SERUM ENZYME ACTIVITIES IN MAN, AFTER CRASH ACCIDENTS, CAUSING MASSIVE INJURIES c04

G. Paolucci, G. Blundo, and A. Balla *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 5 p refs

Avail: NTIS HC $6.00/MF $0.95

Observations were made of blood serum enzyme activities in an effort to verify the fact that such activity causes massive injuries and fractures to the human body. Several people involved in severe road accidents were observed for activities of the following enzymes: (1) Giutamic oxalacetic transaminase (GOT), (2) Glutamic pyruvic transaminase (GPT), (3) Lactate and Malate dehydrogenase (LDP, MHD), (4) Adalose (ALD), (5) Alkaline phosphates (ALKP), (6) Acid phosphate (AcP). Results show some enzyme activities increase in the most severely injured subjects and that a correlation exists between some enzyme activities and body damage. Results also indicate the possibility of evaluating the degree of body damage from certain enzyme activities and that some enzymes analyses, especially GOT, may be useful for diagnosis and medico-legal judgements. Author

N72-19139# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

THE DYNAMIC BIOMECHANICAL NATURE OF SPINAL FRACTURES AND ARTICULAR FACET DERANGEMENT

Leon E. Kazarian, Dale D. Boyd, and Henning E. vonGierke *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 25 p refs

(AMRL-TR-71-17) Avail: NTIS HC $6.00/MF $0.95

Through the application of appropriate scaling laws, animal experiments, particulary on primates, are shown to be of value in explaining hard tissue injury mechanisms and individual organ injury potential in man exposed to impact forces. In support of this approach rhesus monkeys were anesthetized, radiographed, positioned in an impact carriage, restrained by lap belt, torso harness, and limb retention straps, and exposed to +Gz seated rectangular acceleration time histories from predetermined drop heights. Shortly following impact all primates were radiographed, killed, and a necropsy performed. Attempts were made, by means of an injury classification system, to determine injury potential as a function of plateau acceleration and pulse duration for the spinal column. Type, frequency, and severity of vertebral body centrum fractures along with injury to the vertebral appendages were classified. Vertebral articular facets-apophyseal joints disorders and derangements proved difficult to identify radiographically due to poor X-ray film resolution, overlying soft tissue, and bony margin shadows. Necropsy demonstrated a large percentage of primates exhibited this type of lesion. Injury probabilites for the vertebral column established by radiographic and gross necropsy examination supplement and explain available knowledge on spinal injury mechanisms observed in the rhesus monkey. Author

N72-19140# Strathclyde Univ., Glasgow (Scotland). Bioengineering Unit.

THE MECHANICAL AND STRUCTURAL CHARACTERISTICS OF CONNECTIVE TISSUE c04

Bryan Finlay, John H. Evans, James F. North, Tom Gibson, and Robert M. Kenedi *In* AGARD Linear Acceleration of Impact Type 26 Feb. 1971 10 p refs

Avail: NTIS HC $6.00/MF $0.95

A range of test procedures is described in detail and typical data are given for human skin to illustrate the rate sensitive non-linearities that may be encountered with these materials. Criteria used to assess the 'failure' of a tissue are considered on the basis of impairment of physiological function. The normal structure of skin and its response to stress is illustrated by the use of the scanning electron microscope and the construction of a tendon model is described before finally assessing the whole process of tissue modelling. Author

N72-19142# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

AUTOMOBILE STRUCTURAL CRASHWORTHINESS CONCEPTS FOR CRASH PROTECTION

Patrick M. Miller *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 16 p refs

(Contract DOT-FH-11-6918)

Avail: NTIS HC $6.00/MF $0.95

A series of full scale automobile crash tests were conducted to determine the structural crashworthiness performance of conventional automobiles and to evaluate the performance of structural concepts designed to provide protection during frontal and laterial impacts with fixed objects. Conditions believed to be representative of severe single vehicle accidents, where automobiles impact narrow obstacles, were developed and used in the study. The objectives of the structural modifications were to produce a more uniform energy absorption, i.e., more uniform decelerations near 40 g's and 20 g's, respectively, for frontal and lateral collisions. The frontal structural modifications considered both front and rear engine vehicle designs and were evaluated under impacts with a rigid pole barrier where the collision speeds ranged from 35 MPH to 63 MPH. These structural modifications were designed so that the entire distance in front of the passenger compartment could be used for energy absorption. The results demonstrated that the modifications when coupled with this restraint system provide for a force limiting system on the occupant for this range of impact conditions. Author

N72-19143# Wright Co., Kettering, Ohio.

ARMOR MATERIALS FOR LIFE SUPPORT

Robert Fred Rolsten, Joseph G. Dunleavy, and Edward G. Bodine *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 14 p refs

Avail: NTIS HC $6.00/MF $0.95

A historical review of armor personnnel protective devices is presented together with the philosophy of the use/disuse of armor. The current levels of protection, armor designs, and materials state-of-the-art are discussed. Author

N72-19144# Deputy Inspector General for Inspection and Safety (Air Force), Norton AFB, Calif.

OPERATIONAL ASPECTS OF FORCES ON MAN DURING EJECTION/EXTRACTION ESCAPE IN THE US AIR FORCE, 1 JANUARY 1968 - 31 DECEMBER 1970

Robert H. Shannon *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 8 p

Avail: NTIS HC $6.00/MF $0.95

A study of 468 ejections in the United States Air Force (USAF) reported during the period 1 January 1968 to December 1970 disclosed that one in nine crew members involved received major or fatal injuries as a result of forces encountered from system initiation to parachute opening. In 49 cases the injuries received were classified as major (nonfatal), and three crew members were fatally injured. The majority of the major injuries were attributed to the initial forces of ejection and were primarily compression fractures of the vertebral column. These injuries

continue to occur with consistent frequency in spite of the fact that the maximum accelerations of the catapults in use today are well below human tolerances. The major factors which influence the incidence of ejection force injuries are the type catapult used, ejection posture, and age of the individual involved. Of the three, ejection posture appears to be the single most critical factor. The correlation of the individual's weight, by type catapult, was not remarkable. The frequency of injuries attributed to G-forces showed a significant increase over previous studies of USAF ejection escape experience. Although the incidence of high speed ejections has increased only slightly, G-force injuries occurred in 4 percent of all nonfatal ejections and accounted for 12 percent of the total major injuries. Author

N72-19145# Loughborough Univ. of Technology (England). Dept. Ergonomics and Cybernetics.
MEASUREMENT OF HUMAN RESPONSES DURING IMPACT
J. Sandover *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 12 p refs
Avail: NTIS HC $6.00/MF $0.95

In response to a need for information on the dynamic properties of man when using ejection seats, equipment has been developed to simulate the transient acceleration of ejection. The equipment, and the data acquisition and processing systems, are described. The apparatus was used for mechanical impedance studies, and performs adequately up to 30 Hz. The present experimental program is designed to provide information on the variations of mechanical response of individual subjects, and between subjects, in a relatively restrictive experiment (e.g. hard seat, upright posture, low acceleration levels). The experiments so far, indicate the existence of a series resonance at 9 to 10 Hz. The use of mechanical impedance techniques leads to accurate measurement of mechanical response at the input to the body, but does not offer a great deal of evidence for the postulation of detailed models. For this reason, internal and external transmissibility measurements are advocated. Some preliminary transmissibility measurements are recorded. Considered of the literature, and the transmissibility measurements indicates deficiencies in many models of the body, and the need for a simple, direct approach. Author

N72-19146# Centre d'Essais en Vol, Bretigny-sur-Orge (France). Lab. de Medecine Aerospatiale.
EJECTION ACCELERATION: PHYSIOLOGICAL EFFECTS, TOLERANCE [ACCELERATIONS A L'EJECTION: MOYENS D'ETUDE: EFFETS PHYSIOLOGIQUES, TOLERANCE]
R. Auffret, H. Seris, J. Demange, and R. P. Delahaye *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 6 p refs In FRENCH
Avail: NTIS HC $6.00/MF $0.95

The physiological effects of acceleration and ejection on man are studied with the aid of a centrifuge. Major efforts were made to establish human tolerance to different acceleration stresses and determine the occurence of lumbosacral spinal injuries, particularly intervertebral disks. The characteristics and performance of the centrifuge are included. Transl. by E.H.W.

N72-19147# Royal Aircraft Establishment, Farnborough (England). Human Engineering Div.
BLAST TESTING AIRCREW ESCAPE EQUIPMENT INCLUDING AN ACCOUNT OF A NEW TRANSONIC TEST FACILITY
J. M. Rayne *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 8 p refs
Avail: NTIS HC $6.00/MF $0.95

The design of a facility and its performance in determining the effectiveness of aircrew equipment to air blasts up to Mach 1.3 are discussed. In this device the air speed decay profile is programmed and can be made to simulate a range of post ejection conditions from sea level to altitude. Tests on a protective helmet demonstrate that it will probably be practicable to give head protection up to about 700 kt at sea level. However, failures of the visor which have occurred, show that explosive disintegration of the whole helmet follows at air speeds from 600 kt upwards. Helmet and visor failures usually occur within 100 msec of exposure and the blast effect can be regarded as an impact. In testing helmets therefore, the total duration of exposure to severe blast does not appear to be important. On the other hand, fabric is destroyed by the effects of flutter and the extent of damage seems to be time dependent. Therefore, in testing fabric protective equipment the shape of the air flow decay curve may well be important. Author

N72-19148# Centre d'Essais en Vol, Bretigny-sur-Orge (France).
RADIOLOGICAL STUDY OF SPINAL INJURIES TO PILOTS UNDERGOING SUDDEN EJECTION [ETUDE RADIOLOGIQUE DES LESIONS DU RACHIS CHEZ LES PILOTES AYANT SUBI UNE EJECTION]
R. P. Delahaye, H. Seris, R. Auffret, G. Gueffier, and P. J. Metges *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 8 p refs In FRENCH
Avail: NTIS HC $6.00/MF $0.95

Spinal injuries to pilots, caused by sudden ejection, are studied radiologically. The study was made in an attempt to determine the exact traumatic injury, the vertebrae involved, the localization, and the type of fractures. The fractures caused by the propulsion of the ejection seat are also studied. It was determined that the ejection seat usually caused injuries to the 6th, 7th, and 8th vertebrae. It was also determined that the position of the pilot upon ejection contributes to spinal injuries. Transl. by E.H.W.

N72-19149# Hellenic Air Force General Hospital, Athens (Greece). Orthopaedic Dept.
SOME OBSERVATIONS ON COMPRESSION FRACTURES OF THE SPINE IN EJECTED GREEK PILOTS **c04**
Pan. P. Symeonides *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 3 p refs
Avail: NTIS HC $6.00/MF $0.95

The causes of compression fractures in Greek pilots during the decade 1960-1969 were investigated. Resumption of duties by pilots with such fractures was studied. It was found that 18 percent of the ejected pilots sustained compression fractures of the spine. All fractures occurred during ejection and were located at the dorsolumbar region of the spine (T10 to L3). There was sufficient evidence that excessive tightening of the ejection seat belts (shoulder-buttocks) produces a permanent flexion of the spine which thus becomes more vulnerable during ejection. If the wedging of a vertebra following a fracture does not exceed 1/3 of the height of the vertebral body and the symptoms are mild enough, the pilot may return to the active service as jet pilot. If wedging is greater than 1/3, he should not resume his previous duties either as jet or helicopter pilot because the created local kyphosis of the spine renders the neighboring vertebrae more vulnerable. Author

N72-19155# National Bureau of Standards, Washington, D.C.
THE MATHEMATICS OF IMPACT, AND CRASH TESTS OF AIRPLANE AIRBAG RESTRAINT SYSTEMS
Carl C. Clark *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 8 p refs
Avail: NTIS HC $6.00/MF $0.95

The r sub x, g sub y, and g sub z linear acceleration and r dot sub x, r dot sub y, and r dot sub z angular acceleration terminology (the latter representing radians/sec sq) is reviewed. It is urged that the representation of human acceleration environments by accelerometers be filtered to be flat (with less than 0.5 db variation) in response from 0 to 240 Hertz, and then attenuated above 240 Hz at 12 db per octave, in preference to the more common representation by ac accelerometers (flat from about 10 to 2000 Hertz). This latter representation often obscures biologically important accelerations in metal ringing spikes. Illustrations are drawn from crash studies of airplane

airbag restraint systems and from mathematical representations of passenger compartment loads for automobile crashes of various types. Author

N72-19156# Michigan Univ., Ann Arbor.
BIOMECHANICS OF RESTRANT AND IMPACT ATTENUATION SYSTEMS
Verne L. Roberts and James H. McElhaney *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 9 p refs

Avail: NTIS HC $6.00/MF $0.95

The methodology and results from research program concerning the protective aspects of passive restraint systems are provided. The criteria which should be used in the evaluation of passive restraints are provided and the experimental and analytical tools to define restraint performance are discussed. Research indicates that passive restraints can provide protection equal to that provided by belt systems and that a passive restraint must be carefully integrated with the vehicle interior to provide optimum protection. Author

N72-19157# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
RESTRAINT DESIGN: LABORATORY TEST AND EVALUATION OF OPERATIONAL EFFECTIVENESS
James W. Brinkley and John T. Shaffer *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 7 p refs

Avail: NTIS HC $6.00/MF $0.95

Methods used to design contemporary personal flight equipment, such as restraint systems and ejection seat cushions, are presented. Emphasis is placed on the acceleration protection aspects of the design. Both analytical modeling and experimental determination of material characteristics are discussed. Experimental results of laboratory impact test evaluations of three items of personal equipment using human subjects are presented. These experiments include an evaluation of three operational restraint harnesses at -g sub x acceleration levels up to 15 g, a study of the acceleration transmission characteristics of ejection seat cushions, and work completed in the study of acceleration protection provided by rapidly deployed air bag restraint systems. The implications of the experimental findings are discussed and related to operational experience. Author

N72-19158# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
A CASE FOR THE NEGATIVE-G STRAP
R. C. Reader *In* AGARD Linear Acceleration of Impact Type refs
Avail: NTIS HC $6.00/MF $0.95

The addition of a negative-g strap is proposed in order to overcome some of the inadequacies of current restraint harnesses. The effects of aerobatics, vertical vibration, and crash impact on a harness are detailed, and the way in which the negative-g strap improves restraint is described. The advantages and disadvantages of negative-g straps in harnesses are discussed, and details of construction, location, and fitting are presented. Author

N72-19159# Max-Planck-Institut fuer Arbeitsphysiologie, Dortmund (West Germany).
SEVERE FRONTAL COLLISIONS AND RESULTING INJURIES WITH AND WITHOUT RESTRAINING DEVICES
W. Lange *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 10 p refs
Avail: NTIS HC $6.00/MF $0.95

The results of simulated frontal collisions are briefly described. Types and magnitudes of injuries sustained by cadavers depended on (1) whether or not they were restrained by safety belts; (2) type and stiffness of belts; (3) absence or presence of steering assembly and instrument panel; and (4) interactions between body, harness and structures in the driver's space. Two pilot studies with air bags yielded conflicting results. Author

N72-19160# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
PROTECTION OF THE HEAD
J. A. Gillies *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 3 p
Avail: NTIS HC $6.00/MF $0.95

The protective helmets developed to ameliorate the effects of impact on the head improve survival and reduce injury in aircraft accidents. However they would be aided by improvements in restraint systems and better work space design. Aircrew protective helmets should continue to be designed to deal with high energy, rather than repetitive low energy, blows. The multiple functions of helmets make it difficult to meet all requirements without excessive size and weight. Reduction in both weight and size would be desirable, but current standards of protection should be maintained. The impact test method used in helmet development should take accident findings into account and should involve a small number of high energy blows. Author

N72-19161# Michigan Univ., Ann Arbor. Biomechanics Dept.
THE BIOMECHANICAL ASPECTS OF CRASH HELMET DESIGN
James H. McElhaney, Verne L. Roberts, and Richard L. Stalnaker *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 8 p refs
Avail: NTIS HC $6.00/MF $0.95

A head injury model capable of predicting head injury through a maximum strain criteria was developed. This model is coupled to a helmet model and the combination allows the prediction of optimum helmet performance characteristics within a given set of constraints including size and weight. Several model exercises consisting of varying coupling parameters are presented. It was concluded that helmet performance is improved by decreasing elastic stiffness and increasing damping properties. Author

N72-19162# M. L. Aviation Co., Ltd., Maidenhead (England).
THE DESIGN AND DEVELOPMENT TESTING OF AIRCREW PROTECTIVE HELMETS
J. Gregory *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 7 p
Avail: NTIS HC $6.00/MF $0.95

Problems of design resolution are discussed for effecting a compromise between conflicting requirements for flight helmets. There is the need to protect flight crew members from all possible consequences of a hostile environment, while allowing him to carry out his primary purpose of flying or operating the aircraft efficiently without hindrance from equipment. Stages of helmet design and component assembly testing are shown in sequences to indicate development, from initial shape/size conception and testing of individual components to full evaluation and testing of complete prototypes. Reference is made to the design development and testing of a general purpose military aircrew protective helmet/mask assembly nearing completion in the U.K. Particular attention was paid to keeping the all up weight of the assembly under 1800 g and, in addition to conventional helmet facilities, incorporating an automatically lowering visor for air blast protection. Author

N72-19163# Snell Memorial Foundation, Sacramento, Calif.
EVALUATION AND TESTING OF PROTECTIVE HEADGEAR
George G. Snively *In* AGARD Linear Acceleration of Impact Type 26 Jun. 1971 7 p
(Grant EC-00013)
Avail: NTIS HC $6.00/MF $0.95

Review is made of factors which must be considered in evaluating the performance of protective headgear. Standards of performance are considered, and an analysis is presented of techniques utilized in helmet testing. Special attention is given to tests for penetration resistance, retention harness strength, and protection against impact. Author

N72-19164# Joint Publications Research Service, Arlington, Va.
STUDIES OF MAN-MACHINE RELATIONSHIPS
17 Feb. 1972 21 p refs Transl. into ENGLISH from Prib. Sist. Upr. (Moscow), no. 7, 1971 p 6-12
(JPRS-55216) Avail: NTIS

Man machine interactions and their optimizations are considered for operators working at keyboard devices of data collecting systems, monitors of industrial processes, and managerial personnel of information displays.

N72-19165# Joint Publications Research Service, Arlington, Va.
A STUDY OF OPERATOR'S WORK WITH DATA INPUT DEVICES
R. O. Yakerevich, R. S. Grayfer, and M. I. Abezgauz *In its* Studies in Man-Machine Relationships 17 Feb. 1972 p 1-6 refs
Avail: NTIS

Tests were made on operators working at keyboard devices of data collection and recording to determine the parameters characterizing the operator's performance in the data input regime, and also to investigate the effectiveness of different techniques of raising data reliability. Statistical distributions of mutual conversions of symbols found the highest probabilities of conversions characteristics for symbols lying side by side on the keyboard and also for symbols similar in shape. Use of a more complex full keyboard data input system ensured greater reliability compared with 10 key devices. Author

N72-19166# Joint Publications Research Service, Arlington, Va.
SELECTION OF OPERATIONAL CHECK POINTS
I. M. Panasenko *In its* Studies on Man-Machine Relationships 17 Feb. 1972 p 7-14 refs
Avail: NTIS

A working model is formulated for determining the minimum number of check points required for the human operator for operational monitoring of an industrial process where the monitored parameters which characterize events that require intervention are regarded as operational check points. Graphs of the most indicative parameters interconnections which affect external influences are developed whose vertices are the working parameters of the installation, and whose arcs are the gain factors characterizing the variation of each successive parameters as a function of the preceding one. Knowing the gain factors of each influence on each parameter and by imposing external constraints that are associated with the correct installation operation, the single parameters necessary for operational monitoring are obtained. G.G.

N72-19167# Joint Publications Research Service, Arlington, Va.
INFORMATION DISPLAY METHOD IN DISCRETE-PRODUCTION AUTOMATIC CONTROL SYSTEMS
M. I. Abezgauz, Yu. A. Golant, Ye. P. Tereshko, and A. S. Grinberg *In its* Studies on Man-Machine Relationships 17 Feb. 1972 p 15-20
Avail: NTIS

The organizational structure of a complex of documents that enables dispatcher personnel to conveniently use the documentation is considered. Codograms for an information resources scheme and the structure of documents for display are developed from interconnected events within the limits of competence for a given managerial worker, and also by the number of controlled events reflected by the given complex of documents. The final form-regulation report determines the makeup of the codograms which reflect the activities of other workers included in the group. G.G.

N72-19168*# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
UNIVERSITY ROLE IN ASTRONAUT LIFE SUPPORT SYSTEMS: EXTRAVEHICULAR GUIDANCE AND STABILIZATION IN SPACE
Lonnie C. VonRenner Washington NASA Mar. 1972 73 p refs
(Grant NGR-22-009-312)
(NASA-CR-1919) Avail: NTIS CSCL 05E

Two problem areas are reviewed: (1) the nature of and approach to the EVA mission and (2) the guidance and stabilization required of such a mission. The report indicates several broad areas in which additional research is needed to provide an advance to the state-of-the-art. Moreover, the research problems cited were chosen from among many as those most amenable to research and study in the university environment. Author

N72-19169*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DEVELOPMENT OF SKYLAB EXPERIMENT T020 EMPLOYING A FOOT CONTROLLED MANEUVERING UNIT
Donald E. Hewes and Kenneth E. Glover Washington Mar. 1972 61 p refs
(NASA-TN-D-6674; L-8045) Avail: NTIS CSCL 05E

A review of the plans and preparations is presented for Skylab experiment T020, entitled Foot-Controlled Maneuvering Unit (FCMU). The FCMU is an experimental system intended to explore the use of simple astronaut maneuvering devices in the zero-gravity environment of space. This review also includes discussions of the FCMU concept and experiment hardware systems, as well as supporting experiment definition and development research studies conducted with the aid of zero-gravity simulators. Author

N72-19170*# Stanford Research Inst., Menlo Park, Calif.
EXPERIMENTAL STUDY OF VISUAL ACCOMMODATION
Tom N. Cornsweet and Hewitt D. Crane Washington NASA Mar. 1972 55 p refs
(Contract NAS2-5097)
(NASA-CR-2007) Avail: NTIS CSCL 16P

A summary report of a research effort related to the human visual accommodation system is presented. A theoretical study of the accommodation system was made. Subsequent effort was aimed at the development of specialized instrumentation for experiments designed to lead to understanding the nature of the control system in human accommodation. The necessary instrumentation consisted primarily of: (1) an automatic optometer to measure the state of eye focus, (2) a focus stimulator device to control the apparent optical distance to any target, and (3) a two-dimensional eye tracker. The concepts and designs of the first two instruments have been published in the open literature, but this report contains the first detailed treatment of the Purkinje eye tracker developed under this program. The report also discusses an accommodation lag model to explain the

ability of the eye to apparently know the polarity of focus error even though the blur on the retina is to a first-approximation an even function. The interaction of the accommodation and eye movement systems is also discussed, as is the ability to train the visual accommodation system to a surprisingly responsive condition in only a few hours of training. Author

N72-19171*# Scientific Translation Service, Santa Barbara, Calif.
LIFE-SUPPORT SYSTEMS FOR INTERPLANETARY SPACECRAFT AND SPACE STATIONS OPERATING FOR A LONG PERIOD OF TIME
B. A. Adamovich Washington NASA Mar. 1972 71 p refs Transl. into ENGLISH from the book "Osnovy Kosmicheskoy Biologii i Meditsiny" Moscow, Acad. of Sci. USSR, 1970 p 1-70
(Contract NASw-2035)
(NASA-TT-F-14211) Avail: NTIS CSCL 06K

The selection and construction of life-support systems are discussed for prolonged space flights, based on regenerative physical-chemical systems. Particular methods of evaluating the *reliability of these complex systems are noted. Details of a* year-long sealed cabin experiment using regenerated water and oxygen are given. Author

N72-19172# Joint Publications Research Service, Arlington, Va.
ENGINEERING PSYCHOLOGY IN RADAR
G. P. Popov and V. I. Nikolayev, ed. 23 Mar. 1972 139 p refs Transl. into ENGLISH of the book "Inzhenernaya Psikhologiya V Radiolokatsii (Sistema Indikator-Operator)" Moscow, Sovetskoye Radio Publishing House, 1971 144 p
(JPRS-55522) Avail: NTIS

Problems of the application of engineering psychology data in the investigation and evaluation of the capabilities of circular-scanning radar sets (RLS) and of devices for representing information are considered. Special attention is devoted: to the statistical analysis of the process of detection of signals by the RLS operator; to a description of methods of calculating the characteristics of the detection of signals, with consideration of the psychophysiological features of the operator; and methods of *finding optimum forms of communication in the indicator-operator* link. The book is intended for the general circle of specialists interested in the designing and operation of indicator devices for RLS and devices for representing (displaying) information, as well as graduates and students specializing in the field of radar and automation of control. Author

N72-19173# BioTechnology, Inc., Falls Church, Va.
USE OF SPECTRAL ANALYSES IN THE STUDY OF HUMAN BEHAVIORAL AND PHYSIOLOGICAL RESPONSE MEASURES *Final Report*
Thomas W. Frazier (Walter Reed Army Inst. of Res.), Vita West, Martin G. Every, and James F. Parker, Jr. Jun. 1971 79 p refs (Contract DADA17-69-C-9010)
(AD-732951) Avail: NTIS CSCL 05/10

In assessing changes in behavior, such as those found with sleep loss, the principal problem is one of measurement. The objective of the series of studies described in the report was to develop and validate a measurement and analysis technique for examining human responses occurring through time. In the six studies reported, power spectra were computed for experimental data, along with coherence analyses and tests of significance. Behavioral results were compared with one another and with simultaneously recorded physiological data. The data from these studies indicate there are several rather stable biological rhythms, or oscillations, which occur in performance patterns. Several oscillations were identified in addition to the large (1.1 cycles/day) oscillation which corresponds to circadian rhythm. Oscillations of weaker intensities were found at 4.5, 9.0 (close to the work/rest cycle), and 18 cycles/day. The imposition of mild stress conditions was found, in many instances, to have a significant effect on the character of the basic biorhythms. It is felt that the use of time series data, in which rhythmicities in performance are identified and studied as the organism is exposed to unusual or stressful environments, represents a relatively new and potentially fruitful approach to behavioral research. Author (GRA)

N72-19174# Human Factors Research, Inc., Goleta, Calif.
DESIGN CHARACTERISTICS OF A GENERALIZED FIRE CONTROL SYSTEM MAINTENANCE TRAINER, GFCSMT Final Report, 1970 - 1971
John F. Depauli Sep. 1971 54 p
(Contract N61339-70-C-0249; VAVTRADEVCEN Proj. 8126-2)
(AD-733963; NAVTRADEVCEN-70-C-0249-1) Avail: NTIS CSCL 05/9

The purpose of investigation was to develop detailed design *characteristics for a generalized fire-control system maintenance* trainer (GFCSMT) to support training in basic maintenance and calibration of U.S. Navy underwater fire-control systems. The objective of the project was to refine the functional design characteristics presented in an earlier report and to establish an optimal physical configuration for the trainer. Perspective and plan-view drawings depicting various training features and trainer configurations were developed and used as the focal point for interviews with fire-control instructor personnel. The design presented in the report reflects a consensus of instructors and HFR personnel regarding the optimal physical configuration for a GFCSMT. GRA

N72-19175# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
PROTOCOL ANALYSIS AS A TASK FOR ARTIFICIAL INTELLIGENCE
Don A. Waterman and A. Newell 24 May 1971 31 p refs Submitted for publication
(Contract F44620-70-C-0107; Grant MH-07722; ARPA Order 827-6)
(AD-734286; CMU-CS-71-108; AFOSR-71-3071TR) Avail: NTIS CSCL 06/4

An attempt is being made to automate protocol analysis, which is a form of data analysis in psychology for inferring the information processes used by a human from his verbal behavior while solving a problem. The paper discusses protocol analysis as a task in artificial intelligence. The discussion is based on (but broader than) our current program, PAS-I, which creates a *description of a subject's changing knowledge state from his* verbal behavior. Author (GRA)

N72-19176# *Aerospace Medical Research Labs., Wright-*Patterson AFB, Ohio. Biological Acoustics Branch.
EFFECTS OF NOISE ON SERIAL SEARCH PERFORMANCE Final Report, Oct. 1970 - Mar. 1971
C. Stanley Harris and George W. Filson Jul. 1971 34 p refs (AF Proj. 7231)
(AD-731184; AMRL-TR-71-56) Avail: NTIS CSCL 05/10

To evaluate Broadbent's statements concerning the necessary conditions for demonstrating an adverse effect of noise on human performance, 70 subjects were tested on a serial search task. Performance was measured during broadband noise exposure at an overall level of 105 dB re 0.0002 dyne per square centimeter. The performance of one group of subjects was measured for 36 minutes with two 3-minute interpolated rest periods, while another group was tested for 36 consecutive minutes with no rest periods. The performance of these groups was compared with the performance of comparable control groups. In all groups, performance was measured for 5 days. Noise produced a statistically significant reduction in the number

completed for the rest group for the first 12 minutes of testing on each day. There were no significant differences between the noise and control group during the last 24 minutes of testing. For the no rest groups, noise resulted in a smaller number of items completed on the last two days of testing and the difference was statistically significant. On these days the effect was constant throughout the 36 minutes of testing. These results are interpreted as generally supporting Broadbent's position. Author (GRA)

N72-19177# Texas Univ., Austin. Social Psychology Lab.
DIAGNOSIS AND PREDICTION: A STUDY OF DAILY BEHAVIOR PATTERNS IN TEKTITE 2
Roger Bakeman and Robert Helmreich Sep. 1971 48 p refs
(Contract N00014-67-A-0126-0001; NR Proj. 171-804)
(AD-733443; TR-17) Avail: NTIS CSCL 05/9

Systematic observations of daily behavior of 10 teams of Aquanauts living for a total of seven months in an underwater habitat are reported. Behavior was coded into objective categories by teams of observers monitoring activity 24 hours a day. Correlations between these categories for individual summary data are contrasted with the corresponding pooled within-class correlations. The latter are used here as a statistic measuring associative strength between time series variables both within and across individuals. The use of both Pearson and pooled correlations provides a more complete picture of daily behavioral patterns. Pooling correlations of lagged variables then allows exploration of causal linkages. Systematic observations and self-report measures are contrasted in their ability to account for variance in behavior. The potential application of this methodology to a variety of social psychological investigations is discussed. Author (GRA)

N72-19178# Battelle Memorial Inst., Columbus, Ohio.
CONSTRUCTION OF A PROTOTYPE FLEXIBLE RECOMPRESSION CHAMBER Task Report, Dec. 1969 - Mar. 1971
P. S. Riegel and J. S. Glasgow 3 Dec. 1971 23 p ref
(Contract N00014-70-C-0072)
(AD-733704) Avail: NTIS CSCL 06/12

Divers operating in remote locations are just as subject to decompression sickness as those working near well-equipped decompression facilities. It is for this reason that, over the years, a number of small, portable 1-man recompression chambers have been designed, built, and sold to the diving community. Because of the imperative need for fast treatment of decompression sickness, it is mandatory that an injured diver be gotten into compression just as soon as possible after he is injured. The objective of the task was to design and fabricate all of the necessary hardware associated with a non-man-rated, flexible recompression chamber, and to verify the feasibility of the concept. GRA

N72-19179# Air Force Human Resources Lab., Williams AFB, Ariz. Flying Training Div.
MULTI-MEDIA IN USAF PILOT TRAINING
Milton E. Wood Oct. 1971 15 p refs
(AF Proj. 1123)
(AD-732611; AFHRL-TR-71-14) Avail: NTIS CSCL 05/9

The flight-line portion of flying training has traditionally required large amounts of airborne practice under an apprenticeship form of instruction. New developments in educational technology, from both a philosophical and device point of view, provide new opportunities to train airborne skills in a ground environment. Through the use of multi-media instructional techniques, within the context of a systematic approach to training, much can be done to improve the overall efficiency of actual airborne practice. Author (GRA)

N72-19180# Bunker-Ramo Corp., Westlake Village, Calif. Human Factors Dept.
COMPARATIVE ANALYSIS OF HUMAN RELIABILITY Final Report
David Meister 30 Nov. 1971 583 p refs
(Contract N00024-71-C-1257)
(AD-734432; L0074-1U7) Avail: NTIS HC $6.00/MF $0.95 CSCL 05/8

The purpose of the study was to describe, analyze and compare available models and methods for making quantitative predictions of human performance in man-machine systems. The 22 methods reviewed were divided into those relating to operability and maintainability; operability models further subdivide into analytic (non-simulation) and simulation models. Each model was analyzed in terms of goals, assumptions, scope, parameters, data requirements, procedures and validation/application studies. The report provides requirements for development of input data banks and data presentation formats. The most recent studies and the state of the art of human reliability prediction are reviewed. Recommendations for further research are made, centering around a survey of user needs for predictive data. GRA

N72-19181# Franklin Inst., Philadelphia, Pa. Research Labs.
NON-NEWTONIAN FLOW FOR HUMAN IMPACT PROTECTION Final Report, 14 Dec. 1970 - 14 Sep. 1971
Francis Cooke, Georgina M. Overall, William B. Tarpley, Jr., and Roger C. May 16 Dec. 1971 40 p refs
(Contract N00156-71-C-0745)
(AD-734423; FIRL-F-C2976; NADC-CS-7124) Avail: NTIS CSCL 01/3

The energy absorption characteristics of a number of dilatant suspension systems were evaluated using a modified pendulum impact tester. Two systems which were found to have superior impact energy absorption properties are 50% corn starch - 2% SPAN 20 in a concentrated (26.5%) NaCl solution and 70.5% glass microbeads (29 mu) in water. The impact properties of all the dilatant systems were found to be significantly better than currently available ejection seat cushion materials. A qualitative correlation between the impact parameters measured in this investigation and the forces experienced during simulated ejection tests was made. GRA

N72-19182# Navy Clothing and Textile Research Unit, Natick, Mass.
PHYSIOLOGICAL EVALUATION OF A COMMERCIALLY AVAILABLE ABANDON-SHIP SURVIVAL SUIT
James C. Shampine and Dale A. Reins Nov. 1971 27 p refs
(AD-734136; TR-97; Rept-1-71) Avail: NTIS CSCL 06/17

Navy Clothing and Textile Research Unit (NCTRU) personnel have tested a commercially available abandon-ship survival suit in water at 35 F temperature, which is comparable to that found in various oceans throughout the world. Test results indicate that this suit will give protection from exposure to cold water for periods of 13 hours and more when worn over any of the ensembles studied during this test providing no other stresses are present which could influence the user's tolerance time. This suit can be donned quickly but cannot be worn over bulky cold-weather clothing. GRA

N72-19183# Uniroyal, Inc., Naugatuck, Conn.
LIGHTWEIGHT INSULATED FOOTWEAR Final Report, Jul. 1969 - Nov. 1971
R. A. Mazzeo Sep. 1971 88 p refs
(Contract DAAG17-70-C-0003; DA Proj. 1J6-62713-DJ-40)
(AD-734934; C/PLSEL-TR-72-9-CE) Avail: NTIS CSCL 15/5

Compound formulations having good low temperature flexibility were developed for the outsole, upper and outer skin of the lightweight insulated boot. The proper insulation thickness

for the entire boot was determined from foot insulation test data to produce a boot having sufficient overall insulation. In an attempt to improve traction, a Vibram type outsole design was used. Susceptibility to puncture from ground objects was reduced by redesign of the outsole, and by spraying a thicker outer skin at the base of the boot. The ankle portion of the last was redesigned to provide a snugger fit and eliminate slippage at the heel while walking. A nylon sock lining to permit ease of donning and doffing was developed. Author (GRA)

N72-19184# Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
COMPUTER PROGRAM FOR AN AIR BAG RESTRAINT SYSTEM Final Report, Jul. 1970 - Sep. 1971
Robert H. Dufort Sep. 1971 89 p
(Contract DOR-FH-11-7574; CAL Proj. YB-2985-V)
(PB-20417; CAL-YB-2985-V-2; DOT-HS-800-541) Avail: NTIS CSCL 13F

A simulation model was developed to provide an analytical tool for rapidly and inexpensively exploring the approximate performances of an air bag system. Acceleration and rebound of the impacting body are the principal measures of performance; how they are influenced by system design variations are the principal results. Typical design parameters which can be evaluated are inflation pressure, bag size, gross bag shape, vent area, vent actuation pressure as well as other system variables. The basic model air bag consists of a fabric type container having a cylindrical center section with hemispherical ends. A rigid body, corresponding to the size and weight of the torso of a vehicle occupant, is assumed to impact the air bag at the center and normal to the longitudinal axis. A deformed shape profile is postulated which maintains the longitudinal section periphery and the cross section contour lengths constant and equal to their initial values. All output parameters are provided as functions of time; these include acceleration, velocity, displacement, internal pressure, volume, pressure-force area, gas flow and residual gas weight. The report contains the equations and flow charts which describe the model. A program listing in BASIC + is presented as are examples for the solution of cylindrical and customized air bags. Author (GRA)

N72-19387# Montana Univ., Missoula. Dept. of Botany.
EFFECTS OF AIR POLLUTION ON INDIGENOUS ANIMALS AND VEGETATION **c04**
C. C. Gordon *In* Environ. Protection Agency Helena Valley, Mont., Area Environ. Pollution Study Jan. 1972 p 95-112 refs
Avail: NTIS; Office of Tech. Inform. and Publ., Office of Air Programs, Environ. Protection Agency, Res. Triangle Park, N.C. 27711

Investigations were undertaken to document the association between concentrations of lead and cadmium in indigenous vegetation and in animals ingesting such vegetation and to determine whether the accumulation of lead and cadmium in the vegetation surrounding the East Helena smelters results from absorption of the metals through the roots from the soil or through the leaf surfaces from the atmosphere. The effects of sulfur dioxide on plants in the study area were also assessed. The extent of accumulation of lead and cadmium in indigenous animals and in the grasses upon which they feed was determined and a quantitative study of the lead and cadmium content of garden vegetables was conducted. A third study involved transfer of East Helena soil from several sites to Missoula, where vegetables (primarily lettuce) were grown and then assayed for lead and cadmium. A fourth study involved the feeding of rabbits with lettuce grown in several locations to determine the amount of accumulation of lead and cadmium in rabbit tissues as related to the food source. Indigenous conifer vegetation was examined for damage produced by air pollution. Author

N72-19388# Environmental Protection Agency, Research Triangle Park, N.C. National Environmental Research Center.
EFFECTS OF AIR POLLUTION ON LIVESTOCK AND ANIMAL PRODUCTS **c04**
Trent R. Lewis *In its* Helena Valley, Mont., Area Environ. Pollution Study Jan. 1972 p 113-124

Avail: NTIS; Office of Tech. Inform. and Publ., Office of Air Programs, Environ. Protection Agency, Res. Triangle Park, N.C. 27711

The effects of air pollution on livestock and consumable products derived from livestock were assessed. Two questions were of significance: (1) what was the primary effect of air pollution on the health of the livestock per se and (2) what was the health hazard to humans who ingested meat, milk, and eggs from such farm animals? Author

N72-19389# Environmental Protection Agency, Research Triangle Park, N.C. National Environmental Research Center.
TRACE-METAL CONCENTRATIONS IN HUMAN HAIR **c04**
D. I. Hammer, J. F. Finklea, R. H. Hendricks, C. M. Shy, and R. J. N. Norton *In its* Helena Valley, Mont., Area Environ. Pollution Study Jan. 1972 p 125-134 refs
Avail: NTIS; Office of Tech. Inform. and Publ., Office of Air Programs, Environ. Protection Agency, Res. Triangle Park, N.C. 27711

Human scalp hair was collected to determine whether the content of three trace metals, lead, cadmium, and arsenic, reflected environmental concentrations in East Helena, Helena, and Bozeman, Montana. These cities represented an exposure gradient for Pb, Cd, and As as follows: East Helena > Helena > Bozeman. The explicit hypothesis to be tested was that mean hair concentrations of Pb, Cd, and As would reflect this exposure gradient and would differ significantly between cities at the $p < 90.05$ level when tested by a one-way analysis of variance. Logarithmic transformations of trace metal data, often appropriate, were used in this study. Author

N72-19390# Food and Drug Administration, Washington, D.C.
POSSIBLE HAZARDS ASSOCIATED WITH INGESTION OF GARDEN VEGETABLES CONTAMINATED BY TRACE METALS **c04**
Samuel I. Shibko *In* Environ. Protection Agency Helena Valley, Mont., Area Environ. Pollution Study Jan. 1972 p 135-144 refs
Avail: NTIS; Office of Tech. Inform. and Publ., Office of Air Programs, Environ. Protection Agency, Res. Triangle Park, N.C. 27711

Contamination of garden vegetables in the Helena Valley, Montana, area need to be studied in order to assess the adverse effects that could be associated with the inclusion in the human diet of vegetables grown in the valley. Concentrations of the specified trace metals in the vegetables and the daily consumption of these vegetables must first be determined. In addition, the acceptable daily intake of arsenic, cadmium, lead, and zinc must be estimated. The estimates of acceptable dietary intake given were derived from data on the trace metal content of foodstuffs, air, and water, and from data on the rates and routes of excretion of trace metals. Author

Subject Index

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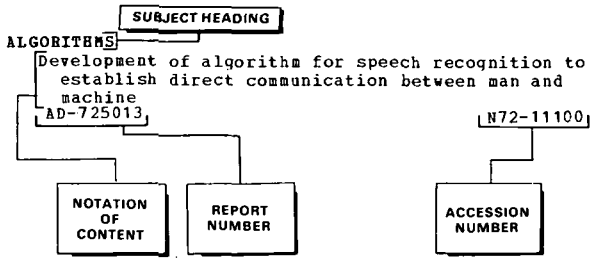

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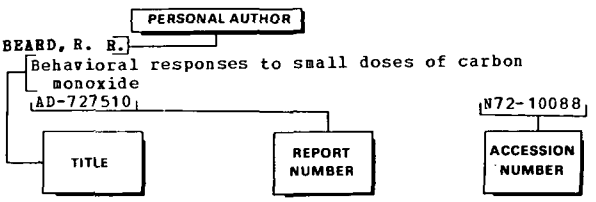

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