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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

(Supplement 104)

JULY 1972

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY
WITH INDEXES

(Supplement 104)

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 June 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 409 reports, articles, and other documents announced during June 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, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects 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.

Two indexes—subject and personal author—are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1972 Supplements.

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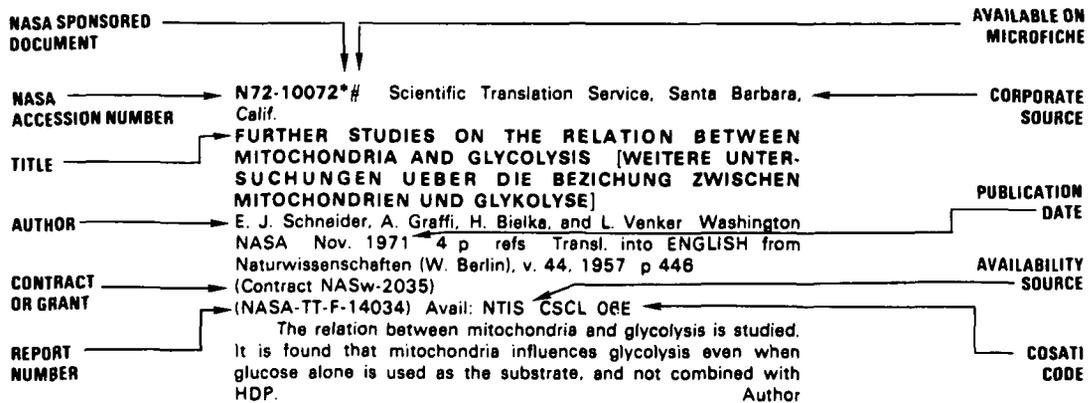
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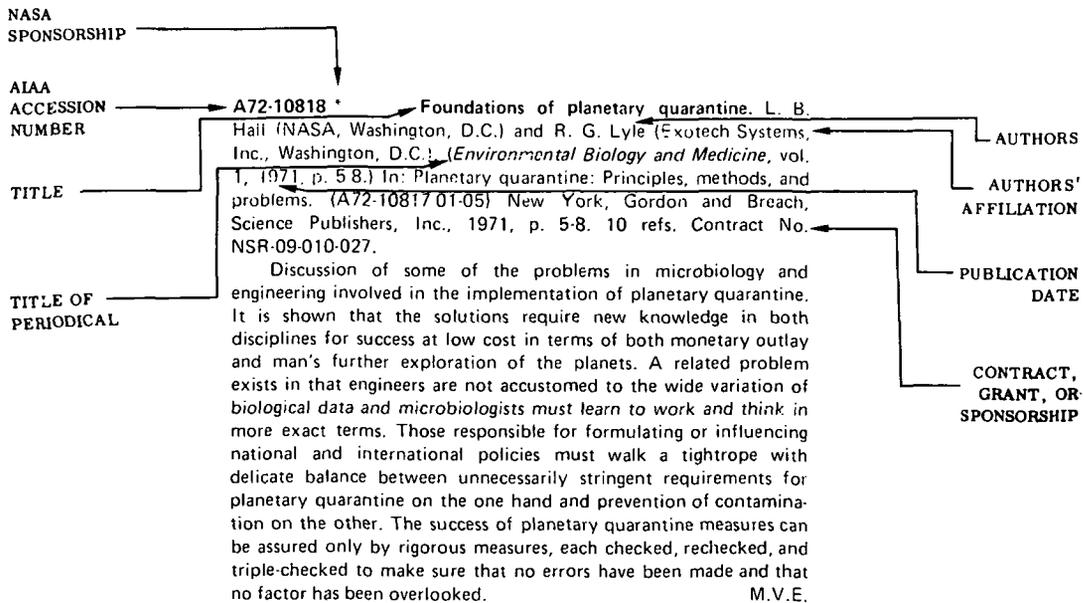
TABLE OF CONTENTS

	Page
IAA Entries (A72-10000)	265
STAR Entries (N72-10000)	301
Subject Index	I-1
Personal Author Index	I-49

TYPICAL CITATION AND ABSTRACT FROM STAR



TYPICAL CITATION AND ABSTRACT FROM IAA





AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 104)

JULY 1972

IAA ENTRIES

A72-25314 # Retinal laser irradiation diameter estimation. G. D. Frisch and A. Dallas (U.S. Army, Munitions Command, Frankford Arsenal, Philadelphia, Pa.). *Applied Optics*, vol. 11, Apr. 1972, p. 939-944. 11 refs.

Eyes of rhesus monkeys were exposed to argon and helium-neon laser radiation, and the resulting image diameters produced were estimated using microphotometer scans of pictures taken. Grids of known dimension were projected onto the retina, and photographs referenced to the optic disk were used to check the results. The eyes were then enucleated, and gross sections were used to measure accurately the optic disk. Relative measurements of image diameters were converted into the corresponding absolute values. The use of grids projected onto the retina and referenced to the optic disk was found to be a good first approximation of the retinal image diameter. The focal length of the rhesus monkey eye was estimated from the retinal image diameter and external laser beam characteristics.

(Author)

A72-25349 The use of visual evoked responses in objective refraction. W. M. Ludlam and R. R. Meyers (New York, Optometric Center, New York, N.Y.). *New York Academy of Sciences, Transactions, Series 2*, vol. 34, Feb. 1972, p. 154-170. 10 refs. Grant No. NIH-EY-00257-06-07.

The relationship between the visual evoked response (VER) and the clarity of the retinal image can now be utilized in clinical applications. Factors necessary to establish VER as a clinical technique are discussed, giving attention to the number of exposures, the working distance, aspects of monitoring, preflash cortical activity, the correction of astigmatism, and problems of electrode placement. The schematic of the instrumentation of the VER acquisition and processing system is considered together with details regarding the procedure, subject reliability, VER refraction, and the measurement of cylinder power and axis.

G.R.

A72-25499 QRS-wave detector evaluation. G. M. Vincent, G. N. Webb, R. S. Ross, and W. H. Guier (Johns Hopkins University, Hospital, Baltimore, Md.). *American Heart Journal*, vol. 83, Apr. 1972, p. 475-480. Contract No. NIH-PH-43-67-1444.

A standardized FM magnetic tape containing various arrhythmias and artifacts was prepared for the purpose of evaluating QRS-wave detectors. The technical aspects of the preparation of the tape and the testing format are described. Two QRS-wave detectors have been tested; the results suggest that in the clinical setting they are capable of performing satisfactorily.

O.H.

A72-25500 * Densitography - A new method for evaluation of cardiac performance of rest and during exercise. R. Chirife and D. H. Spodick (Lemuel Shattuck Hospital; Tufts University; Boston University, Boston, Mass.). *American Heart Journal*, vol. 83, Apr. 1972, p. 493-503. 24 refs. Grant No. NGR-22-012-006.

The validity of the densitographic curves obtained from the pinna of the ear for measuring the systolic intervals has been investigated in 28 subjects. This technique is found to permit the performance of noninvasive physiologic studies during physical activities, exercise tests, flight conditions, and probably long-term monitoring of critically ill patients. Densitographic curves constitute an excellent substitute by which to measure time-base intervals of the cardiac cycle when the carotid pulse tracing is not available. O.H.

A72-25548 Health hazards of asbestos. J. C. Gilson (Llandough Hospital, Penarth, Glamorgan, Wales). *Composites*, vol. 3, Mar. 1972, p. 57-59. 15 refs.

It is shown that inhaled fibers of asbestos can cause fibrosis of the lungs and two kinds of cancer. Practical implications of the biological effects of asbestos are discussed in terms of the size and shape of asbestos fibers, and the types of asbestos and occupations within the industry. It is emphasized that protection of asbestos workers calls for monitoring and controlling their working environment and linking these records with records of their health. O.H.

A72-25549 Safe use of asbestos plastics. S. Holmes (Asbestosis Research Council, Rochdale, Lancs., England). *Composites*, vol. 3, Mar. 1972, p. 60, 61. 11 refs.

The requirements of the Asbestos Regulations, 1969, as far as they affect the handling and manipulation of asbestos-reinforced plastic materials, are summarized. It is shown that handling and manipulation of asbestos-reinforced plastics composites does not present a serious health hazard, and reasonable precautions will ensure that such materials can be handled with complete safety. O.H.

A72-25576 Reactions of pilots to warning systems for visual collision avoidance. P. M. Rich, W. G. Crook, R. L. Sulzer, and P. R. Hill (FAA, Washington, D.C.). *Society of Automotive Engineers, National Business Aircraft Meeting, Wichita, Kan., Mar. 15-17, 1972, Paper 720312*. 24 p. Members, \$1.25; nonmembers, \$2.00.

The FAA conducted a series of six experiments having application to the development of pilot warning instruments (PWI). The experiments were concerned with the effect of warning rates on pilot performance, pilot response to imminent collision threats, the evaluation of scanning patterns, the value of warning-only, the effect of relative motion on pilot performance, and the effect of PWI display sector size. The results of these experiments offer a variety of useful data in the area of visual collision avoidance. (Author)

A72-25585 An energy-absorbing seat design for light aircraft. B. Underhill and B. McCullough (Piper Aircraft Corp., Lock Haven, Pa.). *Society of Automotive Engineers, National Business Aircraft Meeting, Wichita, Kan., Mar. 15-17, 1972, Paper 720322*. 11 p. 5 refs. Members, \$1.25; nonmembers, \$2.00.

Aircraft seats that merely hold the occupants rigidly in place have been satisfactory when considering horizontal or lateral decelerations; but they have not proved sufficient when accidents occur resulting in large vertical deceleration. This deficiency led to the concept of an energy-absorbing seat, which would utilize the space between the seat bottom and the floor to absorb impact energy and reduce accelerations, thereby increasing occupant survival potential. To establish the seat design strength requirements, a maximum tolerable 'g' load was chosen, and the maximum vertical velocity was calculated based on the available arresting distance. The effect of varying passenger weight was investigated, and a weight was chosen for design purposes. This then defined the load-deflection requirements of the seat. Other requirements established that weight and cost be kept to a minimum and that conventional materials and fabrication processes be used. The development and static and dynamic testing leading to the final design of a lightweight, economical, energy-absorbing seat are described. (Author)

A72-25588 Dynamic tests of general aviation occupant restraint systems. H. Daiutolo (FAA, National Aviation Facilities Experimental Center, Atlantic City, N.J.). *Society of Automotive Engineers, National Business Aircraft Meeting, Wichita, Kan., Mar. 15-17, 1972, Paper 720325*. 73 p. 6 refs. Members, \$1.25; nonmembers, \$2.00.

A series of twenty-two dynamic tests were conducted on general aviation occupant restraint systems. These tests utilized lap belt, and lap belt/shoulder harness restraint systems. The Federal Aviation Regulations require only lap belt restraint systems for emergency landing conditions. Based on the longitudinal deceleration/time response of anthropomorphic dummy occupants, it was demonstrated that the lap belt/shoulder harness restraint systems offered occupants successful restraint at occupant inertia force levels substantially above the current regulatory level. The tests, preliminary in nature, warranted continuation of the test program in that the lap belt/shoulder harness restraint systems showed promise for regulatory inclusion by virtue of the fact that results were achieved with restraint systems offered as options in recent years, requiring minimal weight increase with fuselage reinforcement adaptable to retrofit as well as new assembly. (Author)

A72-25728 Stability of human performance under intense noise. S. S. Stevens (Harvard University, Cambridge, Mass.). (*British Acoustical Society, Spring Meeting, Birmingham, England, Apr. 5-7, 1971.*) *Journal of Sound and Vibration*, vol. 21, Mar. 8, 1972, p. 35-56. 6 refs. NIH-supported research.

Glare pollution is as common as noise pollution, and, to a psychophysicist, the eye and the ear are strikingly similar in their reactions to stimulation. It is curious, therefore, that the level of environmental agitation against glare pollution is infinitesimal by comparison with that against noise pollution. Examination of the evidence accumulated to date demonstrates that, apart from causing feelings of annoyance, neither sound nor light does harm, unless the level reaches such a high value that it affects the sense organ itself. Part of this evidence is in unpublished reports and the purpose of this paper is to review its main features, in the context of present-day concern about noise pollution. (Author)

A72-25732 A biologist looks at psycho-acoustics. A. Tumarkin. (*British Acoustical Society, Spring Meeting, Birmingham, England, Apr. 5-7, 1971.*) *Journal of Sound and Vibration*, vol. 21, Mar. 8, 1972, p. 115-126. 15 refs.

To a biologist, a puzzling aspect of psycho-acoustics is the absence of the concept of function. The widespread custom in psycho-acoustics of regarding a living structure as a machine, and consequently describing its behavior in terms of its response to measured inputs, has serious limitations. It is argued that unless these limitations are realized little progress can be made toward a satisfactory understanding of the workings of human sensory systems. (Author)

A72-25801 Effects of lenticular stimulation on unitary and mass responses of the visual cortex to light. I. Kadobayashi (Kyoto Prefectural University of Medicine, Kyoto, Japan). *Pflügers Archiv*, vol. 332, no. 1, 1972, p. 10-20. 32 refs.

Effects of lenticular stimulation on unitary and mass responses of the visual cortex were studied in acutely prepared cats. A conditioning shock applied to the lenticular nucleus (globus pallidus and putamen) resulted in an increase in amplitude of primary components of the photically evoked potential in the lateral gyrus. The increase in amplitude of the evoked potential was observed not only in the ipsilateral visual cortex but also in the contralateral one. Marked increase was noted at several conditioning-test intervals. Unitary responses of visual cortical cells to light were enhanced or inhibited by the conditioning shock to the lenticular nucleus. It is concluded that the lenticular nucleus participates in the visual cortical activity. (Author)

A72-25802 Treadmill exercise in dogs under beta-adrenergic blockade - Adaptation of coronary and systemic hemodynamics. E. Bassenge, M. Kucharczyk, J. Holtz, and D. Stoian (München, Universität, Munich, West Germany). *Pflügers Archiv*, vol. 332, no. 1, 1972, p. 40-55. 21 refs. Research supported by the Deutsche Forschungsgemeinschaft.

Investigation of the role of the beta-adrenergic system in the adaptation of cardiac output and coronary flow to exercise in 9 conscious dogs. The results indicate that submaximal exercise can be tolerated with a diminished cardiac output, coronary flow, and mean arterial pressure, as well as with a substantially slowed adaptation response of these parameters. M.V.E.

A72-25816 Medical and physiological problems for passengers and crews of supersonic transports (Problèmes médico-physiologiques posés aux passagers et aux équipages des avions de transport supersoniques). J. Colin (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France). (*Journées d'Etude des Problèmes Posés par l'Aviation Commerciale Supersonique, Toulouse, France, Apr. 27-29, 1971.*) *L'Aéronautique et l'Astronautique*, no. 34, 1972, p. 57-68. 7 refs. In French.

This paper was read by the author, at the workshop 'Supersonic problems for commercial aviation', held at Toulouse in April 1971. That studious meeting was to evaluate present answers to the new challenges of supersonic transportation. As explained by J. C. Wanner at the same meeting, the sonic boom is experienced on the territory under the supersonic flight and provokes protests of chiefly psychological and social motivation. The most objectively serious problems are about the measurably cumulative cosmic irradiation and the definite risk of sudden decompression from some high altitude leak in the pressurized cabin. But the review conclusions remain generally reassuring for the future of supersonic transportation. (Author)

A72-25851 Serum peptidases in myocardial infarction. A. Szczekliak, A. Szewczuk, H. Nowosad, and B. Kolaczowska (Polska Akademia Nauk, Instytut Immunologii i Terapii Doswiadczalnej; Akademia Medyczna, Wroclaw, Poland). *British Heart Journal*, vol. 34, Mar. 1972, p. 232-237. 19 refs.

Determination of the activities of glycyl peptidase, gamma-glutamyl transpeptidase, and leucine aminopeptidase at regular intervals in the sera of 51 patients with myocardial infarction. All three peptidases studied reached top values at the beginning of the third week and slowly decreased thereafter. Six weeks after myocardial infarction, however, their activities were still significantly high. Clinical observations indicate that determination of serum peptidase activities, particularly that of gamma-glutamyl transpeptidase, may be a useful late enzymatic test for myocardial infarction. F.R.L.

A72-25873 Growth and recovery of temporary threshold shift at 4 kHz due to a steady state noise and impulse noises. A. Okada, K. Fukuda (Sapporo Medical College, Sapporo, Japan), and K. Yamamura (Japan National Railway, Railway Labor Science Research Institute, Tokyo, Japan). *Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie*, vol. 30, no. 2, 1972, p. 105-111. 14 refs.

Seven audiometrically normal, male students were exposed to a steady state noise S of 98 dBA and 2 steady state-impulse combined noises A and B (steady state component of 97 dBA, hammer noise 102 dBA and air exhaustion noise of 118 or 110 dBA) for 40-60 min. The regression line of temporary threshold shift (TTS) growth due to noise A on exposure duration was significantly steeper than that due to noise B. Both the lines were steeper than that due to noise S. The reason of the relatively larger effects of the noises A and B as compared with noise S could be explained by the fact that the noise S did not contain impulse components. The relatively larger effect of the noise A than B might be attributed mainly to the air exhaustion noise. It was suggested that the effect of a steady state noise on hearing might be additive to that of an impulse noise.

(Author)

A72-25874 Impulses and effector measures of thermoregulation during rest and exercise. I, II (Antriebe und effektorische Massnahmen der Thermoregulation bei Ruhe und während körperlicher Arbeit. I, II). J. Kitzing, K. Behling, A. Bleichert, M. Scarperi, and S. Scarperi (Hamburg, Universität, Hamburg, West Germany). *Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie*, vol. 30, no. 2, 1972, p. 119-141. 42 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft.

Extensive experiments have been carried out on a bicycle ergometer which involved a wide range of work load and climatic conditions. The following quantities were measured and/or calculated: deep esophageal temperature, mean skin temperature, oxygen uptake, sweat rate, and heat conductance. Resulting data are presented that can yield correlations between input and output variables in the system of thermoregulation. A corresponding correlation equation is derived and discussed. It is concluded that, during the steady state of rest and exercise, the only systematic input variables of thermoregulation are well characterized by mean skin and core temperature. O.H.

A72-25941 Results of biological investigations undertaken on the Zond-5, Zond-6, and Zond-7 stations. O. G. Gazonko, V. V. Antipov, and G. P. Parfenov. (*Kosmicheskie Issledovaniia*, vol. 9, July-Aug. 1971, p. 601-609.) *Cosmic Research*, vol. 9, no. 4, Mar. 1972, p. 548-554. 20 refs. Translation.

Analysis of the main results of biological experiments performed in spacecraft on various plants, animals, and bacteria. Flight conditions were found to be the cause of specific alterations in the physiological functions and hereditary structures of a number of the investigated objects. Flight conditions are held to be responsible for stimulation of growth and development in wheat and barley seeds

and *Allium cepa* shoots, the induction of chromosome mutations in these objects, and moderate activation of a prophage in lysogenic bacteria. A.B.K.

A72-26015 # Effects of positive acceleration on the electrocardiogram. P. M. Sundaram, S. Krishnamurti, and V. Singh (Indian Air Force, Institute of Aviation Medicine, Bangalore, India). *Aero Medical Society of India, Journal*, vol. 14, Oct. 1971, p. 1-11. 13 refs.

Experimental centrifuge runs were carried out on subjects exposed to varying levels of positive acceleration between 2 to 4.5 G to study its effects on the human cardiovascular system. Observed ECG changes during positive acceleration are discussed in terms of the cardiac rhythm, heart rate, P-R interval, P-wave, QRS-complex, and T-wave and ST segment. O.H.

A72-26016 # Evaluation of impact protection of crash helmets. C. A. Verghese, P. K. Ghosh, and B. V. S. Shetty (Indian Air Force, Institute of Aviation Medicine, Bangalore, India). *Aero Medical Society of India, Journal*, vol. 14, Oct. 1971, p. 12-17. 5 refs.

A test equipment (a vertical drop rig) is described which has been developed for measuring shock attenuation of protective helmets. Shock absorption criteria are discussed. The shock attenuation by a factor of 5.5 is recommended as the requirement for crash helmets. O.H.

A72-26017 # Cardiovascular responses in pressure breathing. M. L. Wadhawan and P. L. N. Rao (Indian Air Force, Institute of Aviation Medicine, Bangalore, India). *Aero Medical Society of India, Journal*, vol. 14, Oct. 1971, p. 18-23. 10 refs.

Cardiovascular responses to pressure breathing have been assessed in 400 healthy subjects by measuring their blood pressure and heart rate. Results of these measurements are discussed in terms of the various age and weight of subjects, their mean pulse rates, and their mean arterial pressures. O.H.

A72-26018 # Some aspects of space ecology and physiology. B. K. Anand (All India Institute of Medical Sciences, New Delhi, India). *Aero Medical Society of India, Journal*, vol. 14, Oct. 1971, p. 24-29.

Several ecological problems characteristic of space flights are discussed, such as hypoxia and dysbarism, temperature ranges of the atmosphere, nonionizing and ionizing radiation in the atmosphere, biological effects of acceleration, deceleration and weightlessness, and physiological stresses. Experience in the field of space ecology obtained from Mercury, Gemini, and Apollo missions is briefly summarized. O.H.

A72-26019 # An episode of disorientation in flight /A case report/. V. S. 'N. Murty (Indian Air Force, Institute of Aviation Medicine, Bangalore, India). *Aero Medical Society of India, Journal*, vol. 14, Oct. 1971, p. 36-41. 5 refs.

A case report is presented of a fighter pilot who had an episode of disorientation during night flying while taking part in an exercise. The investigations did not reveal any apparent reason for the episode; the most probable cause seems to be physiological disorientation, aggravated by psychological stress. O.H.

A72-26020 # Rapid decompression in a supersonic trainer aircraft /A case report/. M. B. Dikshit (Indian Air Force, Delhi,

India). *Aero Medical Society of India, Journal*, vol. 14, Oct. 1971, p. 42-45.

A case report is presented of a sudden failure of cabin pressurization in a pressurized supersonic trainer aircraft at one of the fighter bases. The various aspects of this incident, such as physical effects, time for decompression, safe or unsafe pressurization, decompression sickness and hypoxia, and blast effects are briefly discussed. O.H.

A72-26030 Installation of liquid oxygen systems in civil aircraft. *SAE Aerospace Information Report*, AIR 1223, Nov. 1, 1971. 12 p.

Design and installation considerations are detailed on liquid oxygen supply systems for breathing oxygen for the crew and/or passengers of transport aircraft. The more specific requirements for either a 70 or 300 psig liquid oxygen system are covered. The standard 70 psig nominal pressure is recommended for use except for cases when excessive pressure drop or some continuous flow regulators require the 300 psig nominal pressure system. M.V.E.

A72-26049 # Dynamics of visual sensor signal (*Dinamika zritel'nogo sensor'nogo signala*). I. A. Shevelev. Moscow, Izdatel'stvo Nauka, 1971. 248 p. 640 refs. In Russian.

Study of nerve signal transformation during transfer of light signals from receptors to higher visual centers in acute experiments on 185 anesthetized and not anesthetized cats. The experiments covered the first several hundreds of a millisecond after the reception of light flash signals spreading monocular diffuse light over the entire retina. Electrical recordings of the progress of responses to light stimuli on all levels of the visual projection path showed an increase and time compression of the afferent flow between receptors and visual center. The existence of three interrelated time and amplitude transformation mechanisms in the afferent flow of the visual system is hypothesized on the basis of this study and literature data. This monograph is addressed to neurophysiologists and psychologists working in bionics, neurocybernetics and theory of communications. V.Z.

A72-26067 # Toxicity of powdered metals and their compounds (*Toksichnost' poroshkov metallov i ikh soedinenii*). I. T. Brakhnova. Kiev, Naukova Dumka, 1971. 237 p. 587 refs. In Russian.

The formation of metal aerosols in industrial environments and the physiological effects of industrial dust produced by refractory-compound, chalcogenide and carbonyl powders are discussed. The toxicity of these materials is discussed as a function of the electron configurations in their atoms and of their crystalline structures, showing that their toxicity increases with increasing statistical weight of nonlocalized and unstable electron configurations and decreases with decreasing symmetry of their crystal lattices. Hygienic requirements and recommendations are given for improvement of safety standards in plants applying powder metallurgy. The monograph is addressed to scientists, engineers and physicians concerned with health and safety problems in ferrous, nonferrous and powder metallurgies. V.Z.

A72-26071 Energy balance and temperature control (*Energiehaushalt und Temperaturregulation*). Munich, Urban und Schwarzenberg (*Physiologie des Menschen*. Volume 2), 1971. 201 p. \$4.00. In German.

Detailed reviews are presented dealing with energy conversion processes in the human body, mechanisms by which the body maintains a relatively constant internal temperature, the applicability of similarity theories in comparative studies of organic functions in organisms of different sizes, and the role of chemical secretions in stimulating and maintaining muscle activity in humans. A.B.K.

A72-26072 Energy metabolism (*Energiestoffwechsel*). J. Aschoff (Max-Planck-Institut für Verhaltensphysiologie, Erling-Andechs, West Germany) and K. Kramer (München, Universität, Munich, West Germany). In: *Energy balance and temperature control*. Munich, Urban und Schwarzenberg, 1971, p. 1-42. 39 refs. In German.

Detailed review of energy conversion processes occurring in the human body. A brief history of the development of bioenergetic studies of body metabolism is presented, stressing the thermodynamic nature of metabolic processes and the role of ATP in human metabolism. Direct and indirect calorimetric measurements of the total energy conversion are described, and the effects of body size, food intake, age, sex, and time of day, as well as endocrine and nervous effects, on basic metabolism are discussed. A description is given of the energy conversion which occurs in the human body under normal conditions. A.B.K.

A72-26073 Temperature control (*Temperaturregulation*). J. Aschoff (Max-Planck-Institut für Verhaltensphysiologie, Erling-Andechs, West Germany). In: *Energy balance and temperature control*. Munich, Urban und Schwarzenberg, 1971, p. 43-116. 115 refs. In German.

Discussion of the process by which the human body manages to maintain its internal temperature constant (within a small range of fluctuation) in spite of varying environmental conditions and changes in metabolic rate. Areas of heat formation and heat drop in the body are noted, and the concept of core temperature is explained. Heat removal and heat formation mechanisms in the human body are described, as well as a number of temperature control processes, including skin temperature control through blood circulation, temperature control in a cold environment through shivering and shiver-free heat formation, and temperature control in a warm environment through the production of sweat. The role of nervous stimuli in temperature control processes is considered, as well as the role of hormones and transmitter substances. A study is made of temperature control during fever and during work, and the processes of acclimatization and phylogenetic adaptation are discussed. A.B.K.

A72-26074 Metabolism and body size - Dimensional analysis and similarity theories (*Stoffwechsel und Körpergröße - Dimensionsanalyse und Similaritätstheorien*). B. Günther (Universidad de Chile, Santiago, Chile). In: *Energy balance and temperature control*. Munich, Urban und Schwarzenberg, 1971, p. 117-151. 49 refs. In German.

Consideration of the possibility of developing similarity theories applicable in comparative studies of functions in organisms of different sizes. A brief historical outline is given of the development of similarity principles. The mechanical similarity principles applicable to the classical three-dimensional system are reviewed, showing them to be inadequate for direct application to biology. It is shown how Lambert and Teissier (1927) transformed the postulates of the physical theory of similarity in such a way as to produce an acceptable biological theory. The use of the proposed theory in comparative studies of morphology, hydrodynamics, thermodynamics, and metabolism is illustrated. The relation between metabolism and body weight in hibernating animals is considered, and a phylogenetic study is made of the relation between metabolism and body weight. A.B.K.

A72-26075 Energy conversion in humans during muscle activity (*Energieumsatz des Menschen bei Muskelarbeit*). K. Kramer (München, Universität, Munich, West Germany). In: *Energy balance and temperature control*. Munich, Urban und Schwarzenberg, 1971, p. 153-191. 52 refs. In German.

Review of the biochemical processes underlying human muscle activity. The role of ADP, creatin phosphoric acid, and glycogen as energy sources of active muscles is noted, showing lactic acid formation to be a sign of anaerobic glycolysis in a muscle. Methods

of measuring muscle activity in humans are described, and studies are made of the relation between muscle activity and nutrition, muscle activity and circulation, and muscle activity and respiration minute volume. Limiting factors for maximum muscle activity are noted.

A.B.K.

A72-26095 # Comparisons between bicycle ergometry and treadmill walking maximum capacity tests. S. Taguchi, P. B. Raven, and S. M. Horvath (California, University, Santa Barbara, Calif.). *Japanese Journal of Physiology*, vol. 21, Dec. 1971, p. 681-690. 25 refs. Grant No. AF-AFOSR-69-1653.

Measurements of aerobic capacity by three different work tests were carried out on eight male Japanese students. The maximal oxygen uptake for all three tests was not significantly different. However, ventilatory parameters reflected differing patterns by which the maximal oxygen uptake was obtained. The study data indicated that cycling exercises at a pedaling frequency of 60 rpm produced excessive hyperventilation leading to syncope during recovery from exercise. (Author)

A72-26100 * # Man, space flight and medicine. C. A. Berry (NASA, Washington, D.C.). *AIAA Student Journal*, vol. 10, Feb. 1972, p. 9-19.

Review of experience obtained from space flight to evaluate man's physiological capability to function in space. Results of the Mercury, Gemini, and Apollo programs are presented, with emphasis on the latter. The space medicine requirements which were necessary for assuring man's safe journey into and return from space have resulted in hardware and techniques of great value to terrestrial medicine. The need to monitor the physiologic function of crewmen led to the development of miniaturized, nonirritating, and highly reliable sensors. F.R.L.

A72-26238 Desynchronization of the alpha rhythm of the EEG as a function of intensity of visual stimulation. R. J. Barry and H. C. Beh (Sydney, University, Sydney, Australia). *Psychonomic Science*, vol. 26, Mar. 10, 1972, p. 241, 242. 15 refs.

Magnitude and duration of EEG alpha desynchronization were taken as indicators of the orienting response, and the relationship of these measures to intensity of visual stimulation was investigated. The two measures selected were found to vary with stimulus intensity, although each measure exhibited a different trend over stimulus intensity. (Author)

A72-26391 Active vibration isolation for aircraft seating. P. C. Calcaterra (Barry Wright Corp., Watertown, Mass.). *Sound and Vibration*, vol. 6, Mar. 1972, p. 18-23. 26 refs.

The general nature of human response to vibration is briefly discussed, together with the application of active vibration isolators for protecting aircraft pilots from severe environments, such as turbulence encounters of commercial jet transports and general helicopter missions. It is pointed out that human subjects are most susceptible to vibration in the region from 4 to 10 Hz. Active isolation systems can provide the required degree of vibration isolation and displacement control for personnel seating. Continuing human factors research will provide the necessary data to determine trade-offs between vibration isolation and task performance. G.R.

A72-26451 # Methods of information presentation to operators of automatic control systems and informative value estimates for such methods (Sposoby predstavleniia informatsii operatoru v sistemakh avtokontroliia i ikh informatsionnye otsenki). O. F. Dyssa,

E. I. Mamonova, and F. E. Temnikov. In: Automatic monitoring and electrical measurement methods. Volume 1. Novosibirsk, Izdatel'stvo Nauka, 1971, p. 231-238. 7 refs. In Russian.

Data display techniques used in automatic control systems are assessed in terms of information volume, versatility and operability. Data amount per reading is used as a criterion of informative efficiency of a display technique. More sophisticated displays are shown to enhance the operational speed and precision of a man-operated automatic control system. Lower compressed data amounts are found to contribute to the efficiency of man-operated multiple control systems. V.Z.

A72-26453 # Models and characteristics of olfactory receptors (Modeli oboniatel'nykh retseptorov i ikh kharakteristiki). V. N. Okhotskaia and L. V. Iushina. In: Automatic monitoring and electrical measurement methods. Volume 1. Novosibirsk, Izdatel'stvo Nauka, 1971, p. 252-259. 18 refs. In Russian.

The properties of various olfactory receptor models are assessed. The dependence of olfactory thresholds on the amount of adsorbed odoriferous agent and on the time of exposure is discussed. It is shown that the sensitivity of the Rosano-Scheps model (1964) to higher alcohols and the sensitivity of the Moncrieff model (1961) to acetone are a hundred times that of the olfactory analyzer. The Wilkens-Harman model (1964) is found to have an even higher sensitivity but still incapable of perceiving one or several molecules of an odoriferous agent. V.Z.

A72-26454 # Study of the spatial interaction of retinal nerve cells (Issledovanie prostranstvennogo vzaimodeistviia v nervnykh elementakh setchatki). N. F. Podvigin. In: Automatic monitoring and electrical measurement methods. Volume 1.

Novosibirsk, Izdatel'stvo Nauka, 1971, p. 264-268. 23 refs. In Russian.

Spatial summation of light signals at different neural levels of a frog eye preparation is studied as a function of signal parameters by bioimpulse measurements in 60 experiments. Plots of intracellular electroretinograms are used in the analysis of the results. The distribution of signal perception summation among retinal nerve levels is discussed. V.Z.

A72-26455 # Biocontrol systems in cardiological studies (Sistemy bioupravleniia v kardiologicheskikh issledovaniiaxh). V. S. Gurfinkel', A. V. Khudiakov, A. V. Iakimenko, and V. T. Iashkov. In: Automatic monitoring and electrical measurement methods. Volume 1. Novosibirsk, Izdatel'stvo Nauka, 1971, p. 286-289. In Russian.

A circuit configuration is developed as a basis for cardio-synchronizers which are described as electronic devices controlled by biopulses generated by the myocardium. The principle on which a cardio-synchronizer is based is discussed. The cardio-synchronizer is characterized as the key component of biocontrol systems for cardiological studies and treatment of cardiovascular disorders. V.Z.

A72-26464 # Some results of the development and investigation of devices for checking the cardiovascular system (Nekotorye rezul'taty razrabotki i issledovaniia priborov kontroliia serdечно-sosudistoi sistemy). I. N. Kraev. In: Automatic monitoring and electrical measurement methods. Volume 2. Novosibirsk, Izdatel'stvo Nauka, 1971, p. 190-197. 6 refs. In Russian.

A set of electronic devices developed for obtaining improved information on the functions of the heart is described. It includes a hematocrit, a device for studying the blood coagulation process, an automatic blood pressure meter, and an electromagnetic blood flow meter. V.P.

A72-26468 # Principles of designing the input elements of transistorized amplifiers of biopotentials (O printspakh postroeniia vkhodnykh ustroystv tranzistornykh usilitelei biopotentsialov). V. K. Zaitsev, D. G. Levchenko, and V. M. Nosov. In: Automatic monitoring and electrical measurement methods. Volume 2.

Novosibirsk, Izdatel'stvo Nauka, 1971, p. 287-293. 6 refs. In Russian.

The influence of the individual components of the input element on its noise characteristics is studied for transistorized amplifiers of the type employed in the recording of biopotentials. A method of selecting component parameters to provide minimum noise at a high input impedance is proposed. V.P.

A72-26557 * # Roles of the ground and flight crew in Apollo operations. B. M. Wolfer and W. P. Gatlin (NASA, Manned Spacecraft Center, Houston, Tex.). *American Institute of Aeronautics and Astronautics, Man's Role in Space Conference, Cocoa Beach, Fla., Mar. 27, 28, 1972, Paper 72-236*. 14 p.

The functions performed by ground personnel and flight crews of Apollo missions are reviewed, covering vehicle systems operation and management, Saturn launch vehicle, command-service and lunar modules, lunar rover, communication relay unit and ground-commanded TV assembly. Details of the flight path, scientific experiments, photographic equipment and crew health monitoring are also discussed in terms of these functions. The coordinated combination of large numbers of experts and data processing equipment on the ground with the crew's capabilities to operate the spacecraft and exercise on-the-spot judgements is viewed as the backbone of the successful fulfillment of Apollo missions. V.Z.

A72-26563 A micropower monolithic transmitter for single- or multichannel biomedical telemetry. D. A. Conrad, E. T. Yon, and W.-H. Ko (Case-Western-Reserve University, Cleveland, Ohio). *IEEE Journal of Solid-State Circuits*, vol. SC-7, Apr. 1972, p. 120-124. 6 refs.

Description of a common-collector micropower monolithic transmitter intended for biomedical telemetry in the 100-MHz range. It compares favorably to the performance specification of high-performance hybrid units. The common-collector approach incorporating a self-isolating technique allows the monolithic transmitter to be fabricated with the high-yield processing simplicity of a hybrid transistor. M.V.E.

A72-26564 A monolithic micropower command receiver. P. H. Hudson (U.S. Army Electronics Technology and Devices Laboratory, Fort Monmouth, N.J.) and J. D. Meindl (Stanford University, Stanford, Calif.). *IEEE Journal of Solid-State Circuits*, vol. SC-7, Apr. 1972, p. 125-135. 17 refs. Grants No. PHS-5-PO1-GM17940-02; No. DAAB07-69-C-0192.

Description of the theory of operation, design, fabrication technology, and performance of a micropower command receiver that can extend the operating lifetime of an implanted telemetry system to the shelf life of its battery by disconnecting the power source when the system is not in use. The command receiver consists of an RF amplifier, an AM detector, and an audio amplifier. It has a sensitivity of better than 100 microvolts and a total power dissipation of less than 15 microwatts. It operates from a single 1.35-V mercury cell and is fabricated entirely on a single silicon chip. The only necessary off-the-chip components are the antenna and the battery. (Author)

A72-26594 # Controlling the atmosphere of a sealed cabin by means of potassium superoxide (Contrôle de l'atmosphère d'une cabine étanche par le superoxyde de potassium). H. Ducros (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France). *Revue des*

Corps de Santé des Armées, vol. 13, Feb. 1972, p. 63-80. 11 refs. In French.

Results of an experimental study of the use of potassium superoxide to regenerate the air in confined atmospheres. It is shown that potassium superoxide is very effective for this purpose, since it not only generates oxygen in response to the action of carbon dioxide and water vapor but also absorbs carbon dioxide. The use of potassium superoxide thus makes possible a significant savings in weight and space in a small enclosed cabin. For example, four kilograms of potassium superoxide (in the form of pellets) is sufficient to regenerate the air in a chamber in which two subjects are confined for 13 hours. If only a single individual is involved, the regeneration time is more than doubled. A.B.K.

A72-26608 Erythrocyte life-span in mice acclimatized to different degrees of hypoxia. P. H. Abbrecht and J. K. Littell (Michigan, University, Ann Arbor, Mich.). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 443-445. 10 refs. NSF Grant No. GB-5874; Grant No. PHS-AM-10395.

Erythrocyte life-span was estimated with the aid of radioactively labeled diisopropyl phosphorofluoridate in mice maintained at atmospheric pressure and in mice acclimatized to barometric pressures of 0.7 and 0.5 atm. The decreased atmospheric pressures were equivalent to the pressures at 10,000 and 18,000 ft. above sea level. The average measured life-spans were 46.9, 44.0, and 39.2 days at 1, 0.7, and 0.5 atm, respectively, with the difference between the values for 1 atm and 0.5 atm being highly significant. It is concluded that red blood cell life-span is decreased in mice acclimatized to severe hypoxia. (Author)

A72-26609 * Liquid breathing - Prevention of pulmonary arterial-venous shunting during acceleration. D. J. Sass, E. L. Ritman, P. E. Caskey, N. Banchemo, and E. H. Wood (Mayo Clinic and Mayo Foundation, Rochester, Minn.). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 451-455. 10 refs. Research supported by the American Heart Association and U.S. Navy; Contract No. F41609-69-C-0058; Grants No. NGR-24-003-001; No. NIH-HE-3532; No. NIH-FR-7.

Dependent pulmonary atelectasis, arterial-venous shunting, and downward displacement of the heart caused by the gravitational-inertial force environment were prevented in dogs breathing oxygenated liquid fluorocarbon in a whole-body water-immersion respirator. Partial closure of the major airways during part of the expiratory phase of liquid respiration was a significant problem initially but was minimized in subsequent studies. (Author)

A72-26610 Heat of evaporation of sweat - Thermodynamic considerations. C. B. Wenger (Yale University, New Haven, Conn.). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 456-459. 14 refs.

On thermodynamic grounds it is shown that ambient temperature and relative humidity have no effect on the heat of evaporation of sweat. It is further shown that solutes accounting for 92% of the osmotic pressure of sweat do not appreciably displace the heat of evaporation from 0.580 kcal/g, the value for pure water at 30 C and that other solutes are unlikely to do so. Experimental arguments for a higher heat of evaporation are examined, and under extended analysis (including allowances for body heat storage and the increase in convective heat exchange during work) the data are shown to be consistent with a heat of evaporation of 0.580 kcal/g. (Author)

A72-26611 Glottis opening and airway resistance. D. C. Stanescu, J. Pattijn, J. Clement, and K. P. van de Woestijne (Akademisch Ziekenhuis St. Rafael, Louvain, Belgium). *Journal of*

Applied Physiology, vol. 32, Apr. 1972, p. 460-466. 17 refs. Research supported by the Fonds voor Wetenschappelijk Geneeskundig Onderzoek.

In five healthy volunteers, seated in a body plethysmograph, the glottis orifice was observed and photographed through indirect laryngoscopy during panting and continuous slow expirations at different lung volumes. A positive significant correlation was observed between glottis opening, lung volume, and flow rate. The variation of the glottis with volume was larger for continuous expiration, yet, the glottis was wider during panting at all lung volumes. The latter observation explains why, at comparable lung volumes, panting airway resistance is lower than the resistance calculated from the slope of the initial part of isovolume pressure-flow curves. At the functional residual capacity level, the glottis aperture increased with panting volume. However, airway resistance measured in the same conditions demonstrated, on the average, an increase with panting volume or airflow. (Author)

A72-26612 Maximal aerobic power during laddermill climbing, uphill running, and cycling. E. Kamon and K. B. Pandolf (Pittsburgh, University, Pittsburgh, Pa.). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 467-473. 15 refs. Grant No. NIH-EC-00202; Contract No. N00014-67-A-0402-0009.

Twelve female and eleven male healthy subjects were tested for maximal aerobic power while climbing a laddermill inclined 30 deg from the vertical, running up an inclined treadmill, and cycling at 60 rpm. The mean maximal work load on the laddermill was higher than on the cycle ergometer by 6% for the males and by 3.6% for the females. The mean maximal oxygen uptake was progressively higher for climbing, uphill running, and cycling for the females and for uphill running, climbing, and cycling for the males. For most of the subjects, the maximal heart rate was similar for climbing and uphill running but was lower for cycling as compared to that obtained on the other two ergometers. (Author)

A72-26613 * Respiratory weight losses during exercise. J. W. Mitchell, E. R. Nadel, and J. A. J. Stolwijk (Yale University, New Haven, Conn.). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 474-476. 6 refs. Grant No. NIH-ES-00354; Contract No. NAS9-9531.

Evaporative water loss from the respiratory tract was determined over a wide range of exercise. The absolute humidity of the expired air was the same at all levels of exercise and equal to that measured at rest. The rate of respiratory water loss during exercise was found to be 0.019 of the oxygen uptake times (44 minus water vapor pressure). The rate of weight loss during exercise due to CO₂-O₂ exchange was calculated. For exercise at oxygen consumption rates exceeding 1.5 L/min in a dry environment with a water vapor pressure of 10 mm Hg, the total rate of weight loss via the respiratory tract is on the order of 2-5 g/min. (Author)

A72-26614 Effect of hyperoxia on airways resistance in man. K. M. S. Dewar, G. Smith, A. A. Spence, and I. McA. Ledingham (Western Infirmary, Glasgow, Scotland). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 486-490. 25 refs.

Nine normal subjects breathed either 100% oxygen or 10% oxygen-90% nitrogen at an ambient pressure of 2 ata for 5 hr. After breathing oxygen, there was an increase in airways resistance of 30%, an increase in thoracic gas volume of 25%, and a fall in specific airways conductance of 41%; with air equivalent gas, there were no significant changes. There were no changes in vital capacity or forced vital capacity with either air or oxygen. Measurements of cardiac output, alveolar-arterial oxygen tension difference, and blood pressure in three subjects were unaltered during the period of oxygen exposure. (Author)

A72-26615 Utilization of muscle elasticity in exercise. H. Thys, T. Faraggiana, and R. Margaria (Milano, Università, Milan, Italy). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 491-494. 7 refs. Research supported by the Consiglio Nazionale delle Ricerche.

The exercise of deep bending on the knees from the erect position, followed by extension of the legs to return to the upright posture, was performed by man under two different conditions: the extension (positive work) followed immediately the bending (rebound exercise), or alternatively a certain interval elapsed between the flexion and the extension to allow the extensors to relax (no rebound exercise). This exercise was performed on a platform sensitive to vertical acceleration; the O₂ consumption at steady state was measured. The maximal speed measured during the extension was higher, the time of positive work was less, the mean power and the mechanical efficiency were greater in the rebound exercise. These differences are interpreted as evidence that elastic potential energy stored in the muscles stretched during the negative work phase of the exercise is utilized for the performance of positive work. (Author)

A72-26616 Adaptation to hypobarism - Sensitivity of myocardial tissue to carbon dioxide. J. F. Souhrada and R. W. Bullard (Indiana University, Bloomington, Ind.). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 501-505. 24 refs. Contract No. F44620-68-C-0014.

The sensitivity of hearts from rats adapted to chronic hypoxia to increased tension of carbon dioxide was tested. The isolated right ventricle strip (IRV) preparation was placed in 34 C Krebs-Ringer bicarbonate solution and was stimulated to contract isometrically 60 times/min. Experimental hypercapnia was induced by the switching of aerating gas mixture from 95% O₂ + 5% CO₂ to 85% O₂ + 15% CO₂. The IRV from animals adapted to hypobarism 25 days have a significantly greater decrease of isometric contractions to 15% CO₂ in comparison to that of controls. Experiments performed on the animals adapted 40 days showed a greater decrease in isometric contractions to similarly induced hypercapnia than the controls and animals adapted 25 days. Titration of myocardial homogenate showed decreased buffering capacity after 25 days of exposure to chronic hypobarism. (Author)

A72-26617 * Skin and muscle components of forearm blood flow in directly heated resting man. J.-M. R. Detry, G. L. Brengelmann, L. B. Rowell, and C. Wyss (Washington, University, Seattle, Wash.). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 506-511. 23 refs. Grants No. NGR-48-002-082; No. NIH-RR-37.

Changes in forearm muscle blood flow (FMBF) during direct whole-body heating were measured in 17 normal subjects using three different methods. We conclude that FMBF is not increased by direct whole-body heating. Since renal and splanchnic blood flow fall 30% under these conditions, maximal total skin blood flow in 12 previously studied subjects can be estimated from the rise in cardiac output to be 7.6 L/min (3.0-11.1 L/min). (Author)

A72-26618 Hemodynamic correlates of myocardial oxygen consumption during upright exercise. K. Kitamura, C. R. Jorgensen, F. L. Gobel, H. L. Taylor, and Y. Wang (Minnesota, University, Minneapolis, Minn.). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 516-522. 45 refs. Research supported by the Minnesota Heart Association; Grants No. PHS-HE-06314-10; No. PHS-HE-10296-03; No. PHS-HE-05222-18; No. PHS-HE-04997.

The relationships between several readily measured hemodynamic variables and both coronary blood flow and myocardial oxygen consumption were examined during upright bicycle exercise. At the highest level when the total body oxygen consumption

averaged 2.09 liters/min or 56% of maximal, the average myocardial oxygen consumption was 37.5 ml/100 g LV per min. The arterio-venous oxygen difference across the coronary bed widened with increasing levels of exertion. Products of heart rate and aortic blood pressure correlated best with coronary blood flow and myocardial oxygen consumption, but the heart rate alone correlated almost as well. It is concluded that heart rate alone or, better still, heart rate-blood pressure products are satisfactory predictors of coronary blood flow and myocardial oxygen consumption in normal, young subjects over a wide range of upright exercise. (Author)

A72-26619 **Pneumograph recording using a cotton-wick probe.** J. W. Prather, L. Walker, and D. N. Bowes (California, University, La Jolla, Calif.). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 523-525. 9 refs. Grant No. DADA17-67-C-7001.

A saline-loaded cotton-wick probe, connected to a Statham P23db transducer, was used to monitor the respiratory rate in rabbits. The cotton-wick probe was inserted in the subcutaneous tissue over the thoracic cage. Wick response was well correlated with the inspiratory and expiratory pattern as recorded via a linear flowmeter in series with the respiratory pathway. Alterations in respiratory pattern were produced with aminophylline and the thiobarbiturate, Inactin. Inspiratory and expiratory durations, and to some extent respiratory effort, could be reasonably approximated using this method. Different respiratory patterns among animals could also be detected. It is concluded that the method is satisfactory for acute monitoring of respiratory phenomena in laboratory animals. (Author)

A72-26620 **A phase method of calculating respiratory mechanics using a digital computer.** M. Hilberman, R. W. Stacy, and R. M. Peters (California, University, La Jolla, Calif.; Cox Heart Institute, Kettering, Ohio). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 535-541. 24 refs. Grants No. NIH-GM-17236; No. NIH-GM-17284; No. NIH-HE-13172.

A technique has been devised for automated computation of the parameters of respiratory mechanics using digital computers. This technique utilized esophageal balloon pressure and respiratory flow signals, which may be processed on-line or recorded on magnetic tape for off-line processing. The computation procedure assumes that the respiratory mechanical system is a second-order system, and the basic calculations are simple. The unique feature of this method is its use of Fourier series analysis and phasor methods of computation to determine, for the first harmonic, the modulus of impedance, phase angle, compliance, and resistance of the respiratory system. The phase method provides data which show less statistical spread than those from the hand calculation method and uses a set of mathematical tools which allow more complex modeling and analysis to be carried out comparatively easily. (Author)

A72-26621 **On-line measurement of microvascular dimensions by television microscopy.** M. Intaglietta and W. R. Tompkins (California, University, La Jolla, Calif.). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 546-551. 15 refs. Grant No. PHS-HE-12493.

A television microscopic system was developed for the in vivo measurement of diameter of microvessels in the omentum of the cat. The system analyzes the raster lines voltage in two windows in the video picture. These windows are placed over features of interest and the distance between these features is continuously computed and presented in analog form. On-line cross correlation of this signal with systemic pressure allows one to determine diameter variations related to the action of the heart, with resolution of the order of 0.05 micron. Simultaneous measurements of microvascular pressure showed that arteriolar walls behave as if their modulus of elasticity were of the order of one million dynes/sq cm. (Author)

A72-26622 **Comparison of volume and strain-gauge plethysmography during static effort.** A. R. Lind (Indiana University, Bloomington, Ind.) and P. G. Schmid (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 552-554. 13 refs.

Forearm blood flows during isometric exercise were measured by a water-filled volume plethysmograph and by the mercury-in-rubber strain-gauge plethysmograph. Calibrations of the strain-gauge plethysmograph during exercise were no different from calibrations made at rest. The forearm blood flows measured by the two instruments were almost identical during exercise. (Author)

A72-26623 **Microdimensional pressure measurements in electrolytes.** H. Fein (Yale University, New Haven, Conn.). *Journal of Applied Physiology*, vol. 32, Apr. 1972, p. 560-564. 10 refs.

A fluid-filled glass micropipette is used as a microtransducer in electrolyte to measure hydrostatic pressure in limited volume biological compartments. Underlying principles and some exploratory experiments are described which contribute to the design of this apparatus. The resulting instrument is extensively described and performance data are given. (Author)

A72-26626 **Computer-assisted monitoring of ECG's and heart sounds.** C. C. Wilton-Davies (Ministry of Defence, Royal Naval Physiological Laboratory, Alverstoke, Hants., England). *Medical and Biological Engineering*, vol. 10, Mar. 1972, p. 153-162. 11 refs.

Consideration of the heart as a site for the origin of bubbles formed during decompression sickness. If this concept is valid, the first tissue to receive bubble-laden blood would be the heart muscle. If such bubbles are capable of producing physiological effects, these effects might result in changes to the electrocardiographic waveform. In order to explore these possibilities a number of computer-assisted methods of monitoring both ECGs and heart sounds were developed. The emphasis of these methods is on the use of graphical output from a computer to reveal small deviations of both waveforms and derived data from control samples. Derived data include the durations of parts of the ECG waveform and the frequency spectra of heart sounds. F.R.L.

A72-26627 **Computer determination of left ventricular volume using videodensitometry.** B. G. Trenholm, D. A. Winter, D. Mymin, and E. L. Lansdown (Manitoba, University, Winnipeg, Canada). *Medical and Biological Engineering*, vol. 10, Mar. 1972, p. 163-173. 20 refs. Research supported by the Manitoba Heart Foundation.

The time course of left ventricular volume is obtained through computer processing of videoangiographic data. The analysis is based on the theory of X-ray absorption, where the intensity of the single plane image yields the third dimension information. Consequently, a detailed boundary detection of the chamber walls is not required. A TV-computer interface is described which converts, in real time, the desired portion of the TV image. The videodensitometry approach requires uniform opacification, thus the clinical protocol entails upstream injections of dye. This procedure eliminates the undesirable reactions and transients associated with left ventricular injections of dye, and a greater number of heart cycles of data are available for analysis. A limited comparative study of this densitometric technique vs. the area-length method and Arvidsson's ellipsoid model showed considerable correlation. (Author)

A72-26628 **An electrode system with rounded edges for direct ventricular defibrillation.** G. Koning, H. Schneider, R. S. Reneman, and A. J. Hoelen (University Hospital, Utrecht, Netherlands). *Medical and Biological Engineering*, vol. 10, Mar. 1972, p. 201-206. 13 refs.

In this study it was assumed that the current density plays an important role in ventricular defibrillation. The best method for successful defibrillation is then with a homogeneous electrical field between the electrodes, so that the current density is the same in all parts of the ventricles. Electrodes have been compared with and without rounded edges and the same surface area in in vitro experiments, regarding their current density distribution and in vivo experiments, regarding their total current strength, needed for successful defibrillation with a square current pulse. The electrodes with rounded edges needed 75 per cent of the current strength, required by the electrodes without rounded edges, resulting in a dissipated energy of 50-60 per cent. In addition, the local current density at the rims of the electrodes with rounded edges was lower than in the electrodes without rounded edges. It is therefore suggested that the electrodes with rounded edges may be less harmful to the myocardium and that the current density is an essential physical quantity involved in ventricular defibrillation. (Author)

A72-26629 Application of the Gabor-Nelson theory in electrocardiography. P. C. Voukydis (Beth Israel Hospital, Boston, Mass.). *Medical and Biological Engineering*, vol. 10, Mar. 1972, p. 223-229. 9 refs.

The Gabor-Nelson theory provides the background for determining the accuracy of vectocardiographic lead systems; however, determination of the electric vector of the heart by means of this theory is extremely tedious. In the present paper a digital computer has been used to solve the Gabor-Nelson equations. The method was applied to two individuals and it was shown that the vectocardiogram obtained by the commonly used tetrahedral system differs significantly from that obtained by applying the Gabor-Nelson theory. The reasons for such a discrepancy are discussed. (Author)

A72-26630 A study of the absorption and scattering factors of light in whole blood. F. J. Janssen (Philips' Gloeilampenfabrieken, Eindhoven, Netherlands). *Medical and Biological Engineering*, vol. 10, Mar. 1972, p. 231-240. 24 refs.

The oxygen saturation of blood, the cardiac output, and the nature of pathological conditions in the heart and the larger vessels can be determined by a photometrical approach involving optical studies of blood. The absorption and scattering factors are derived together with the relationship between these factors and the hemoglobin concentration. In the one-dimensional case, the transmittance and the reflectance can be calculated with the aid of the Kubelka-Munk equations. The method considered is a special case of a more general approach which makes use of a photon diffusion model. This model can also be applied to three-dimensional problems. G.R.

A72-26631 Design for positive pressure respirators. V. K. Jain and S. K. Guha (H. B. Technological Institute, Kanpur, India). *Medical and Biological Engineering*, vol. 10, Mar. 1972, p. 253-262. 16 refs.

This study deals with the design of a positive pressure respirator using a first order non-linear lung model. The non-linearities considered are non-linear airway resistance, effect of hysteresis and non-constant dead space. The analysis has been carried out using three different waveforms, viz., rectangular, sine and ramp. It is shown that the last two waveforms result in longer inspiratory periods making the actual respirators more reliable in operation. (Author)

A72-26632 Electromyogram and myogram responses under pre-strain conditions in normal humans as an index of fusimotor sensitization of muscle spindles. A. M. Clarke (Macquarie

University, North Ryde, Australia). *Medical and Biological Engineering*, vol. 10, Mar. 1972, p. 291-296. 11 refs.

Comparisons of the EMG and myogram responses in a phasic stretch reflex between normal resting tension (control) and three pre-strain conditions show that (i) there is a positive, linear relationship between these two variables but the correlation coefficient decreases with increase in force of pre-strain, (ii) when the relationship is plotted, the regression lines for control and pre-strain separate but the slopes for the regressions are not dissimilar, (iii) there is a progressive decrease in the variance of responses with increase in force of pre-strain and (iv) there is a high product-moment correlation coefficient between the peak force of the myogram and the area of the myogram. Explanations for these results are discussed in terms of muscle spindle physiology. (Author)

A72-26633 A thermistor pulse transducer - Theoretical and practical aspects. W. Rentsch (Laboratory for Biomedical Electronics, Pirna, East Germany). *Medical and Biological Engineering*, vol. 10, Mar. 1972, p. 301-305. 9 refs.

Description of a pneumatic thermistor transducer which is specifically designed for measuring the so-called steep ejection time (SET) interval, which is the time interval between the start of the upstroke of the volume pulse and the occurrence of the maximum rate of rise. The thermistor transducer consists of an airtight case with a low thermal inertia thermistor bead placed in front of an air jet which is connected by a rubber tube to the measuring cuff. It is shown that the pulse wave incisura can be determined by using a pneumatically reversed thermistor transducer, thus making possible indirect measurement of the ejection time by a new method. A.B.K.

A72-26660 Studies on the central chemosensitive mechanism of respiration. I (Untersuchungen zum zentralen chemosensiblen Mechanismus der Atmung. I). J. Berndt, W. Berger, and K. Mückenhoff (Ruhr-Universität, Bochum, West Germany). *Pflügers Archiv*, vol. 332, no. 2, 1972, p. 127-145. 24 refs. In German.

A mathematical model is proposed for the calculation of the extracellular pH from acid-base parameters of the blood and the cerebrospinal fluid. The model is based on the results of former investigations regarding the diffusion of carbon dioxide and bicarbonate in brain tissue. Cerebral blood flow is considered as a function of the arterial carbon dioxide tension. The model indicates that under the considered conditions the extracellular pH is a function of the distance from the brain surface. It is concluded that structures reacting to variations of the hydrogen ion concentration in the cerebrospinal fluid must be located within a certain distance from the surface. G.R.

A72-26661 Studies on the central chemosensitive mechanism of respiration. II (Untersuchungen zum zentralen chemosensiblen Mechanismus der Atmung. II). J. Berndt, W. Berger, K. Berger, and M. Schmidt (Ruhr-Universität, Bochum, West Germany). *Pflügers Archiv*, vol. 332, no. 2, 1972, p. 146-170. 28 refs. In German.

Experiments were conducted with lightly anesthetized cats whose vagal and carotid nerves had been dissected. The ventral surface of the medulla oblongata was perfused with mock cerebrospinal fluid (CSF) solutions. On the basis of the results of the studies it is concluded that changes in the carbon dioxide pressure of the blood and changes in the bicarbonate concentration and in the carbon dioxide pressure of the CSF affect the respiration by influencing the extracellular hydrogen ion concentration in the medulla. It is assumed that the chemosensitive structures responding to the hydrogen ion concentration are located less than 1 mm below the ventral medullary surface. G.R.

A72-26675 # Age-related angioarchitectonic features of the optic lobe of the human brain (Vozrastnye angioarkhitektonicheskie osobennosti zritel'nogo bugra golovnogo mozga cheloveka). T. G. Kurtishvili (Ministerstvo Zdravookhraneniia Gruzinskoi SSR, Institut Klinicheskoi i Eksperimental'noi Nevrologii, Georgian SSR). *Akademiia Nauk Gruzinskoi SSR, Soobshcheniia*, vol. 65, Jan. 1972, p. 209-212. In Russian.

Results of a study of the vascular-capillary network of the optic lobe of the human brain from infancy to extreme old age. It is found that with aging to age 60 the diameter of vessels and capillaries, as well as the size of capillary loops, increases, while after age 60 the size of the capillary loops tends to decrease. Sinuosity of the vessels and irregularity of the lumen are also observable with age. A.B.K.

A72-26676 Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970. Symposium supported by NATO. Edited by W. P. Colquhoun (Medical Research Council, Cambridge, England). London, English Universities Press, Ltd., 1972. 340 p. In English and French.

Sleep loss and information processing, psychological correlates of physiological circadian periodicity, and sleep stages and performance are among the topics covered in papers concerned with the effects of diurnal rhythm and sleep deprivation on human efficiency. Other topics covered include the influence of work-rest scheduling and sleep loss on sustained performance, nycthemeral rhythms and troop airlifts, and the relation between diurnal variations in psychic and physical performance.

M.V.E.

A72-26677 Diurnal variation in human performance - A review. G. R. J. Hockey (Durham, University, Durham, England) and W. P. Colquhoun (Medical Research Council, Applied Psychology Unit, Cambridge, England). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970. London, English Universities Press, Ltd., 1972, p. 1-23. 51 refs.

Review of published findings on human performance as a function of time of day, including the relation of the circadian rhythm of human performance to physiological rhythms and their alteration as a result of exposure to changes in living routines or to otherwise unusual conditions. Emphasis in the review is on variations in performance efficiency, rather than on physiological processes. Some of the conclusions drawn from the reviewed findings indicate that: (1) there is a marked rhythm in the efficiency of human performance, both in normal and in many unusual environmental conditions; (2) this rhythm has a primary period of 24 hours, and its effects appear not only when tests are made during the normal waking day, but also when they are carried out through the night; and (3) there is a high degree of correspondence between diurnal changes in performance and body temperature. M.V.E.

A72-26678 Sleep deprivation - Eight questions. R. T. Wilkinson (Medical Research Council, Applied Psychology Unit, Cambridge, England). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970. London, English Universities Press, Ltd., 1972, p. 25-30. 21 refs.

In the light of published findings, variations in the effects of sleep deprivation are reviewed as functions of work duration, time of day or night, memory function, information demands of tasks, environmental factors, use of drugs, and age. The effects of partial, or chronic sleep deprivation are also considered. M.V.E.

A72-26679 * Patterns of sleep behaviour. W. B. Webb (Florida, University, Gainesville, Fla.). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the

Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 31-46. 45 refs. Grants No. NIH-M-3881; No. NGR-10-005-057.

Discussion of the electroencephalogram as the critical measurement procedure for sleep research, and survey of major findings that have emerged in the last decade on the presence of sleep within the twenty-four-hour cycle. Specifically, intrasleep processes, frequency of stage changes, sequence of stage events, sleep stage amounts, temporal patterns of sleep, and stability of intrasleep pattern in both man and lower animals are reviewed, along with some circadian aspects of sleep, temporal factors, and number of sleep episodes. It is felt that it is particularly critical to take the presence of sleep into account whenever performance is considered. When it is recognized that responsive performance is extremely limited during sleep, it is easy to visualize the extent to which performance is controlled by sleep itself. M.V.E.

A72-26680 Sleep loss and information processing. L. Buck and C. B. Gibbs (National Research Council, Ottawa, Canada). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970. London, English Universities Press, Ltd., 1972, p. 47-56; Discussion, p. 56, 57. 8 refs.

The hypothesis proposed by Gibbs (1967) that impairment of response-selection time through sleep deprivation varies inversely with signal probability is extended from response selection to response execution, and it is hypothesized that impairment in the time it takes to make a movement varies inversely with target distance. Both these hypotheses are subsumed under the more general hypothesis that sleep deprivation affects the rate of information processing in that a longer time is taken to resolve the uncertainties of which response to initiate, and of where between starting and target positions to place the controlled element. The reaction time data yielded by a described experimental validation procedure are shown to confirm the hypothesis that changes following sleep loss are inversely related to signal probability. M.V.E.

M.V.E.

A72-26681 Psychological correlates of physiological circadian periodicity. G. T. Hauty and F. L. Smith (Delaware, University, Newark, Del.). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970. London, English Universities Press, Ltd., 1972, p. 59-73; Discussion, p. 73, 74. 11 refs. Contract No. N00014-69-C-0236.

Phase shifts of the human circadian system and performance deficits during periods of transition were investigated experimentally for east-west and west-east transitions. In these studies, psychological and physiological functions were assessed at periodic intervals for two or four alternate days throughout the accustomed waking day, to provide a base of reference, whereupon the subjects were transported by jet aircraft across 7-10 time zones to destinations where they remained for 8-12 days, during which they were subjected to the same test schedule, which was repeated for a last time after their return to the origin of the flight. The obtained results indicate, in essence, that phase shifts of the various physiological functions occurred at greatly differing rates and that the psychological functions were only minimally affected and, relative to the time lags of the physiological phase shifts, for an exceedingly short duration only. M.V.E.

M.V.E.

A72-26682 Sleep stages and performance. L. Johnson, P. Naitoh, A. Lubin, and J. Moses (U.S. Navy, Naval Hospital, San Diego, Calif.). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970. London, English Universities

Press, Ltd., 1972, p. 81-99; Discussion, p. 99, 100. 29 refs. Navy-supported research.

Experimental attempt to determine the type of sleep most conducive to effective waking performance, the unique need (if any) each stage of sleep meets, and the recuperative value of each type of sleep. In the described test procedure used, sixteen Navy enlisted men, aged 17 to 21, participated. The results obtained failed to solve the mystery surrounding the stages of sleep and their relation to performance. The only conclusions that appear warranted are the following: (1) the view of sleep stages as unique need states is probably too simple; (2) research should be directed toward finding correlates other than waking psychological and performance variables; and (3) it should be remembered that sleep is just one part of the sleep-waking cycle and that sleep itself contains distinct cycles.

M.V.E.

A72-26683 A study of four days partial sleep deprivation.

P. Hamilton, R. T. Wilkinson, and R. S. Edwards (Medical Research Council, Applied Psychology Unit, Cambridge, England). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 101-112; Discussion, p. 112, 113. 8 refs.

Investigation of the effects of cumulative partial sleep deprivation over a period of four days, and discussion of the implications of the findings both for general theories of human information processing and for hypotheses concerning the effects of sleep deprivation. Under the described experimental procedure vigilance, routine-addition, and running digit span tests were administered to three groups of enlisted men. The obtained results are presented in diagrams, and the significance of the levels of comparisons between each sleep ration on each day and for all four days is reviewed.

M.V.E.

A72-26684 Influence of sleep, lack of sleep and circadian rhythm on short psychometric tests. A. Fort and J. N. Mills (Manchester, Victoria University, Manchester, England). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 115-127.

The effects of sleep, lack of sleep, and circadian rhythm on the performance of subjects were studied. Psychometric tests based on two different methods were used to assess the influence of nychthemeral variation. The results of the tests are presented in diagrams and discussed.

M.V.E.

A72-26685 The influence of sleep-interruption and of sleep-deprivation on circadian rhythms in human performance. J. Aschoff, H. Giedke, E. Poppel, and R. Wever (Max-Planck-Institut für Verhaltensphysiologie, Erling-Andechs, West Germany). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 135-149; Discussion, p. 149, 150. 14 refs.

Several performance tests have been conducted to study the effect of (1) normal living routine with sleep interruptions, (2) continuous darkness, (3) noninterrupted versus interrupted sleep, and (4) sleep deprivation on circadian rhythms in human performance. Results are given graphically and discussed. Free running circadian rhythms have also been studied.

O.H.

A72-26686 Attempt to evaluate the operational effectiveness of military/aeronautical personnel in the course of night duty (Tentative d'évaluation de l'efficacité opérationnelle du personnel de l'aéronautique militaire au cours de veilles nocturnes). R. Angiboust

and M. Gouars (Centre d'Enseignement et de Recherche de Médecine Aéronautique, Paris, France). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 151-170; Discussion, p. 170.

6 refs. In French.

Investigation of the effect of a short period of sleep prior to a spell of duty, and the effects of oxygen breathing on the arousal level of air traffic controllers performing a detection task between 0300 and 0500. It appears that performance impairment is correlated with a lowering of the arousal level as assessed by physiological variables (EEG and heart rate). The impairment is more pronounced when the task is carried out late at night. A 2-hr sleep period taken before a work session held in the second half of the night can raise the levels of both arousal and performance almost to those observed during the daytime. Oxygen breathing has no effect either on performance or on the arousal level.

F.R.L.

A72-26687 The effects of variations in the sleep-wakefulness cycle during a 'time-isolation' experiment on reaction time and spontaneous tempo. G. Oleron, P. Fraisse, N. Zuili (Ecole Pratique des Hautes Etudes, Paris, France), and M. Siffre (Institut Français de Spéléologie, Nice, France). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 171-176. Direction des Recherches et Moyens d'Essais Contracts No. 326/65; No. 540/66.

Variations in the sleep-wakefulness cycle were studied in an experiment with a subject (aged 24) who lived 174 days in a cave at a depth of 70 m, without any time reference, and was free to arrange his own sequence of work, rest, food intake, and leisure. The effects of these variations on reaction time and spontaneous tempo show that the rhythm toward which an individual tends during a prolonged 'time isolation' experiment is a circadian one.

M.V.E.

A72-26688 Loss of sleep and combat efficiency - Effects of the work/rest cycle. E. J. P. Caille, A. M. C. Quideau, J. F. J. Girard, J. C. Grubar, and A. C. Monteil (CERPA, Arsenal Marine, Toulon, France). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 177-193. 29 refs.

Study of the length of sleep deprivation compatible with normal psychomotor reactivity, vigilance, and reliable decision-making capacity, and investigation of the most favorable work/rest rhythm for the occurrence of such a sleep deprivation. The results indicate that a 64 hours to 72 hours sleep loss does not severely impair the fighting capabilities of a small volunteer group of well trained and well motivated enlisted men. Only long-term memory and decision making proved to be very sensitive to such a deprivation. Optimum work/rest cycles are discussed.

M.V.E.

A72-26689 Influence of work-rest scheduling and sleep loss on sustained performance. E. A. Alluisi (Louisville, University, Louisville, Ky.). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 199-214; Discussion, p. 214, 215, 241-245. 23 refs. Grant No. DAHC19-69-C-0009; Contract No. DA-49-193-MD-2567. Project THEMIS.

Study of sustained performance using a synthetic-work approach to provide measurements of multiple-task performances obtained in the work-behavior domain. The job or work situation is created by a synthesis of several time-shared tasks that represent functions which man is called upon to perform in typical jobs. A

multiple-task performance (MTP) battery, the MTP work schedule, and the results of prior MTP research are briefly described, and the current MTP research program is outlined. Some of the benefits obtained, in terms of inferences made possible by comparisons of the results of different studies, are presented. F.R.L.

A72-26690 **The effects of a cumulative sleep deficit, duration of preceding sleep period and body-temperature on multiple choice reaction time.** J. Rutenfranz, J. Aschoff, and H. Mann (Giessen, Universität, Giessen, West Germany). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 217-228; Discussion, p. 228, 229. 5 refs.

Description of an experiment carried out during a three-month sea voyage to investigate the influence both of a cumulative sleep deficit and of the duration of the immediately preceding period of sleep or wakefulness on performance at different times of night. In addition, the simultaneous measurement of reaction time and body temperature carried out in this study provided information about the dependency of reaction time on body temperature. Body temperature, reaction time, potassium excretion, and pulse rate showed clear 24-hr rhythms. Restriction of sleep to about 5 hr/day had no significant effect either on the periodicity or on the daily mean level of reaction time. Reaction time at night is affected by the duration of the preceding period of sleep or wakefulness. Both body temperature and reaction time exhibit circadian rhythms. F.R.L.

A72-26691 **The relation between diurnal variations in psychic and physical performance.** G. Hildebrandt and P. Engel (Marburg, Universität, Marburg an der Lahn, West Germany). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 231-240. 18 refs.

Investigation of an individual's ability to carry out a given task at a given point of time, which is determined by the performance characteristics of various functional levels or systems in the organism. These consist essentially of motivation, precision, economy, and capacity. Various studies are cited which indicate that in the central nervous system the degree of automatic coordination or synchronization of physiological rhythmic functions generally increases greatly during the nocturnal recuperation phase, and can be taken as a common basis for the decrease in psychic performance and the simultaneous increase in physical performance at this time. Thus the 180-deg phase-difference in the diurnal rhythms of the two kinds of performance can be thought of as a consequence of the varying effect of automatic coordinations on the specific performance characteristics of various functional levels in the organism. F.R.L.

A72-26692 **Circadian variations in performance, psychological ratings, catecholamine excretion and urine flow during prolonged sleep deprivation.** J. Froberg, C. G. Karlsson, L. Levi, and L. Lidberg (Kungl. Karolinska Institutet, Stockholm, Sweden). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 247-259; Discussion, p. 260. 13 refs.

Demonstration that circadian rhythms exist in the urinary excretion of catecholamines as well as in urine flow and in self-ratings of fatigue. Experiments are described the purpose of which was to study circadian rhythms in a number of biochemical and psychological variables under conditions controlled with regard to food intake, activity, beverages, tobacco, drugs, and some conventional external clocks. Attention was also given to changes in these variables with the duration of sleep deprivation. Temporal interrelationships between the biochemical and psychological variables were also considered. F.R.L.

A72-26693 **Introversion-extraversion and circadian rhythms.** M. J. F. Blake and D. W. J. Corcoran (Medical Research Council, Applied Psychology Unit, Cambridge, England). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 261-272; Discussion, p. 272. 12 refs.

Individual differences observed in the circadian rhythm are experimentally examined in terms of the biochemical, physiological, and performance changes over the 24-hr period, as well as the ease with which these rhythms can be changed in some subjects compared with the difficulty experienced with others. Emphasis is placed on introversion-extraversion as the external measure discriminating 'morning' and 'evening' types of people. It is suggested that some general difference exists in the arousal mechanism which differentiates introverts and extraverts. It is found that introverts are higher in arousal than extraverts whatever the time of day at which the readings are taken, yet the results obtained suggest that circadian rhythms are certainly involved. O.H.

A72-26694 **Psychological and physiological changes caused by desynchronization following transzonal air travel.** K. E. Klein, H. Bruner, E. Gunther, D. Jovy, J. Mertens, A. Rimpler, and H. M. Wegmann (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 295-305; Discussion, p. 305. 10 refs.

Previous work of Klein et al. (1970) on circadian rhythm of pilots' efficiency and effects of multiple time zone travel has been extended to complete the picture of what is known about human performance degradation caused by transzonal flights. Results indicate that (1) the adjustment of phase is nonlinear, being faster immediately after transition and slower later on, (2) the initial shift occurring on the first postflight day is relatively smaller following eastward flights, and (3) whereas the time required for complete resynchronization is not proportional to the number of time zones crossed, the extent of the daily shift is greater the larger the difference between the phase of the current biological oscillations and that of the local external synchronizers. O.H.

A72-26695 **Preliminary results of the vigilance tests from 'Project Pegasus.'** S. A. Lewis, G. A. Christie, J. R. Daly, J. I. Evans, and M. Moore-Robinson (Edinburgh, University, Edinburgh, Scotland). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg, France, July 12-17, 1970.

London, English Universities Press, Ltd., 1972, p. 307-315; Discussion, p. 315, 316. 7 refs.

Discussion of the vigilance tests results forming an integral part of Project Pegasus, an interdisciplinary study of the biochemical, physiological, and behavioral aspects of the time zone 'syndrome.' A team of 14 subjects were administered vigilance tests when assembled in London on November 4th, after being flown to San Francisco on November 10th, and following the return flight to London on November 21st, 1969. The results indicate that some of the subjects were relatively unaffected by the flight while others were considerably affected. The very large individual differences were the most striking feature of all the results. M.V.E.

A72-26696 **Nychthemeral rhythms and air trooping - Some preliminary results from 'Exercise Medex.'** J. Adam, T. Brown, P. Colquhoun, P. Hamilton, J. Orsborn, I. Thomas, and D. Worsley (Royal Army Medical College, London; Royal Victoria Hospital, Netley, Hants.; Medical Research Council, Applied Psychology Unit, Cambridge, England). In: Aspects of human efficiency: Diurnal rhythm and loss of sleep; Proceedings of the Symposium, Strasbourg,

France, July 12-17, 1970. London, English Universities Press, Ltd., 1972, p. 317-326. 7 refs.

Investigation of the effects of circadian rhythm disturbances on the fighting efficiency of military personnel crossing several time zones while flown to distant trouble spots. The general picture emerging from the preliminary results obtained suggests that phase adjustment of both physiological and performance rhythms occurs very rapidly following time-zone transition from UK to Malaysia.

M.V.E.

A72-26701 Effect of physical training on the mechanical and metabolic response of the rat heart to hypoxia. J. Scheuer and S. W. Stezoski (Pittsburgh, University, Pittsburgh, Pa.). *Circulation Research*, vol. 30, Apr. 1972, p. 418-429. 28 refs. Research supported by the Max Baer Heart Fund and American Heart Association; Grant No. NIH-HE-09727.

A study of the effects of physical conditioning on cardiac function and metabolism during hypoxia, carried out in rats conditioned by swimming, revealed that hearts of these rats had enhanced pumping capacity when subjected to hypoxia compared with hearts of sedentary rats. Oxygen delivery and energy formation during hypoxia are not improved in hearts of conditioned animals.

O.H.

A72-26702 Pulmonary alveolar blood flow. Y. C. Fung (California, University, La Jolla, Calif.) and S. S. Sobin (Los Angeles County Heart Association; Southern California, University, Los Angeles, Calif.). *Circulation Research*, vol. 30, Apr. 1972, p. 470-490. 36 refs. NSF Grants No. GK-10553; No. GK-27647; Grants No. NIH-HL-11152; No. NIH-HL-12494.

Explicit results concerning blood flow, alveolar blood volume, regional differences, and transit time distribution are derived from the sheet-flow theory and compared with experimental evidence available in the literature. A general consistency is indicated. The theory exhibits in a simple form the effects on flow of the arterial, alveolar, and venous pressures, the alveolar area, the mean path length between arterioles and venules, and the tension in the alveolar membrane, both elastic and surface tension; thus the theory provides a quantitative understanding of a large number of factors. (Author)

A72-26770 An experimental study of the projection of the amygdala to the accessory olfactory bulb and its relationship to the concept of a dual olfactory system. G. Raisman (Oxford University, Oxford, England). *Experimental Brain Research*, vol. 14, no. 4, 1972, p. 395-408. 43 refs. Research supported by the Medical Research Council and Foundations Fund for Research in Psychiatry.

An experimental study has been conducted in rats to confirm the observation that the centrifugal fibers of the stria terminalis may project back to the accessory olfactory bulb, and to determine their precise mode of termination. It has been found that a separate subdivision exists of the olfactory system whose connections are quite different from the principal part. The main olfactory bulb has olfactory afferents from the receptors of the general olfactory mucosa, while the accessory bulb has afferents from receptors in the vomeronasal organ. The main bulb projects to the olfactory tubercle and pyriform cortex, while the accessory bulb projects to the amygdala. In turn, these areas are further related with the medial forebrain bundle in the case of the pyriform cortex and olfactory tubercle, and with the medial preoptic area and medial hypothalamus in the case of the amygdala.

O.H.

A72-26771 Latencies and correlation in single units and visual evoked potentials in the cat striate cortex following monocular and binocular stimulations. B. Minke and E. Auerbach (Hadassah University Hospital, Jerusalem, Israel). *Experimental Brain Research*,

vol. 14, no. 4, 1972, p. 409-422. 18 refs. PHS-supported research. PHS Project 06-810-2.

The responses to light stimuli were studied experimentally in cats at three levels of derivation. Poststimulus-time histograms of single unit responses of simple and complex cells in the striate cortex were recorded extracellularly and compared both with the averaged visual evoked potential (VEP) and the averaged surface VEP. A comparison of the latencies in the responses to ipsi- and contralateral and to binocular stimulations was made, and the changes in the latencies were studied as functions of the stimulus strength at the three levels of derivation. Furthermore, the phase relationship between the unit discharge and the slow waves was examined by correlating the different components of the latter with the spike activity. Finally, the possibility of the occurrence of an algebraic summation of VEPs produced by ipsi- and contralateral stimulations was studied.

O.H.

A72-26772 Extrageniculostriate vision in the monkey. III - Circle vs triangle and 'red vs green' discrimination. P. Schilder, P. Pasik, and T. Pasik (New York, City University, New York, N.Y.). *Experimental Brain Research*, vol. 14, no. 4, 1972, p. 436-448. 20 refs. Grants No. PHS-MH-02261; No. PHS-K3-EY-16,865.

Investigation of the problem of whether, following exclusion of the geniculostriate system, monkeys can exhibit various forms of visually guided behavior in the absence of luminous flux cues. The results of the original tests and controls confirmed and extended previous findings showing (1) that monkeys without striate cortex can discriminate luminous flux-equated figures, (2) that prior training on luminous flux differences is not a prerequisite, and (3) that they can master a circle vs triangle, and red vs green type of visual discriminations.

O.H.

A72-26773 Left ventricular pressure-dimension relationships in the conscious dog. L. D. Horwitz (USAF, School of Aerospace Medicine, Brooks AFB, Tex.) and V. S. Bishop (Texas, University, San Antonio, Tex.). *Cardiovascular Research*, vol. 6, Mar. 1972, p. 163-171. 20 refs. Grant No. PHS-HE-12415-01.

The dynamic function of the left ventricle was described in terms of internal diameter, pressure, and flow in conscious sedated dogs at rest and during isoproterenol and metaraminol infusions. The diastolic pressure-diameter curve was sigmoidal in shape, negative in pressure in early diastole, and affected by viscous, and probably inertial, forces.

(Author)

A72-26774 Radiological assessment of arterial branching coefficients. J. S. M. Beales and R. E. Steiner (Hammersmith Hospital; London, Royal Postgraduate Medical School, London, England). *Cardiovascular Research*, vol. 6, Mar. 1972, p. 181-186. 9 refs.

Measurements made on a series of normal aortograms show that at the bifurcation of the normal human aorta there is a mean decrease in the size of the vascular bed by a factor of 0.77. This decrease is also seen in patients with hypertension. Measurements made at a number of other arterial divisions show only a small increase in the size of the vascular bed (1.15-1.25). These findings conflict with previous necropsy reports and have important implications in the study of arterial blood flow.

(Author)

A72-26775 Fluid mechanics of a model mitral valve and left ventricle. B. J. Bellhouse (Oxford University, Oxford, England). *Cardiovascular Research*, vol. 6, Mar. 1972, p. 199-210. 14 refs. Research supported by the Medical Research Council.

A model of the left ventricle was built incorporating a mitral and an aortic valve. The bicuspid mitral valve was seen to achieve

most of its closure during diastole. This was shown to be due to a ring-vortex occupying the left ventricle together with flow deceleration through the mitral ring during the latter part of diastole. The vortex was asymmetrical in the model, because of the shape of the ventricle, and this caused the anterior cusp to close earlier in diastole than the posterior cusp. Enlargement of the ventricle eliminated the vortex and resulted in later closure of the mitral valve. The effect of atrial systole on valve closure was studied experimentally and theoretically. (Author)

A72-26778 **Clinical application of the Doppler ultrasonic flowmeter.** A. Benchimol and K. B. Desser (Good Samaritan Hospital, Phoenix, Ariz.). *American Journal of Cardiology*, vol. 29, Apr. 1972, p. 540-545. 16 refs. Research supported by the Nichol's Memorial Fund.

Instantaneous and continuous measurement of phasic blood flow velocity was obtained with the Doppler ultrasonic flowmeter system in over 700 patients. Using transcutaneous and implanted probes, flow velocity was recorded from arteries in normal subjects and patients with aortic valvular and subvalvular disease, arrhythmias, myocardial infarction and congestive heart failure. Catheter probe recordings were obtained from the superior vena cava, right atrium, right ventricle, aorta, carotid arteries and coronary arteries in patients with a variety of clinical disorders. Ventricular diastolic and atrial systolic flow in atrial septal defect, compensatory diastolic flow acceleration in tricuspid insufficiency, peak flow velocity variations dependent on previous cycle length in arrhythmias, small atrial contribution to ventricular systolic flow, diagnostic recognition of aortic valvular disease, and other flow velocity relations are stressed. (Author)

A72-26787 **Serum cortisol, plasma free fatty acids, and urinary catecholamines as indicators of complications in acute myocardial infarction.** R. Prakash, W. W. Parmely, M. Horvat, and H. J. C. Swan (Cedars of Lebanon Hospital, Los Angeles, Calif.). *Circulation*, vol. 45, Apr. 1972, p. 736-745. 32 refs. NIH-supported research; Grant No. PHS-S01-RR-05468.

On the basis of the results of the investigations conducted it is suggested that the level of cortisol, free fatty acids, and catecholamines reflects the overall stress imposed on an individual by acute myocardial infarction. In those patients with complications, all but one had elevations in at least two of the three parameters. In a few patients such elevations preceded the development of complications by 24 hours. The measurements provide additional information which is not available from standard hemodynamic measurements or prognostic indices such as the Peel score. G.R.

A72-26891 # **Weightlessness (Niewazkosc).** Z. Jethon. *Technika Lotnicza i Astronautyczna*, vol. 27, Mar. 1972, p. 1-4. In Polish.

Known effects of weightlessness on the human organism are reviewed, and promising methods of counteracting the adverse consequences are surveyed. Attention is given to energy expenditures in performing motor functions, muscular changes, disturbances of the central nervous system, densitometric changes in bones, cardiovascular effects, dehydration, consumption of food, and disturbance of biological rhythms. The use of spacecraft rotation to create artificial gravity is discussed, along with benefits which can be expected from on-board physical exercises. T.M.

A72-26975 **The value of the computer as a screening tool for routine electrocardiograms.** A. S. Verdesca (Western Electric Co., New York, N.Y.). (*Industrial Medical Association, Annual Meeting, 56th, Atlanta, Ga., Apr. 19-22, 1971.*) *Journal of Occupational Medicine*, vol. 14, Apr. 1972, p. 293-297.

Results of a study based on a random sample comparison of electrocardiographic readings between one particular computerized program vs readings by physicians. Basically, the computer prints out one of the four over-all classifications of diagnoses: normal, atypical, borderline, and abnormal. A computer program is described the efficiency and accuracy of which may make possible a 30% savings in the cost of outside cardiogram reading. F.R.L.

A72-26987 # **Standards for some hemodynamic criteria in airmen (O normakh nekotorykh gemodinamicheskikh pokazatelei u letchikov).** L. A. Fel'dman, L. S. Anikin, and S. I. Nagornyi. *Voenna-Meditsinskii Zhurnal*, Jan. 1972, p. 51, 52. In Russian.

Discussion of age-dependent variations in heart beat rates, arterial pressure and body temperature as criteria of physical fitness of flying personnel. Empirical formulas, based on a large volume of statistical data, are proposed for rating the physical fitness of aircraft crew members of various age groups for airborne duties. V.Z.

A72-26988 # **Changes in individual physiological indexes of parachutists (Izmenenie otdel'nykh fiziologicheskikh pokazatelei u parashiuistov).** P. I. Gvozdev. *Voenna-Meditsinskii Zhurnal*, Jan. 1972, p. 58, 59. In Russian.

Plasma recalcification time, blood prothrombin, heparin time and number, fibrinolytic activity, arterial pressure and heart beat were measured before and after a jump in a group of 300 sky divers, 19 to 40 years old, some of whom sustained physical stresses before jumps. The heparin number and time went up before, during and after a jump in all ages groups, as did also the recalcification time and to a lesser degree the fibrinolytic activity. V.Z.

A72-26998 **Training airline flight crews.** G. C. Beutler (United Air Lines, Inc., Flight Training Center, Denver, Colo.). *IEEE Transactions on Education*, vol. E-15, May 1972, p. 129-133.

Aspects of improved flight crew training having a noticeable impact on its cost and quality are discussed. Emphasis is placed on safety and on the application of flight simulators. Training programs are outlined which make it possible to cut the training period from up to 56 days to under 30 days. O.H.

A72-27042 * **Contamination threats to critical surfaces from handling and storage practices.** H. C. Poehlmann, R. R. Manning, and R. W. Jackman (Ball Brothers Research Corp., Boulder, Colo.). (*International Vacuum Congress, 5th, Boston, Mass., Oct. 11-15, 1971.*) *Journal of Vacuum Science and Technology*, vol. 9, Jan.-Feb. 1972, p. 457-461. NASA-supported research.

Review of the procedures and results of a program designed to remove the threat of sources of molecular and particulate contamination of critical optical, electrical, and mechanical elements in spacecraft. The results of recent contamination-probing thermal-vacuum tests indicate that some of the materials and practices commonly used to protect critical surfaces from molecular or particulate contamination can themselves represent significant threats. These contamination sources include clean-room and clean-tent materials, gloves, tissues, and covering or packaging materials. Mass and infrared spectral analyses of these materials and the environments and instruments exposed to them show that the contaminants are mostly plasticizers, slip or antistatic agents, and binders used in the manufacture of these products. Products of particular threat include vinyl gloves, boots, clean-tent walls, and some polyethylene sheets and bags. Techniques for reducing these threats are discussed. M.V.E.

A72-27074 **Visual processing capacity and attentional control.** R. M. Shiffrin and G. T. Gardner (Rockefeller University,

New York, N.Y.). *Journal of Experimental Psychology*, vol. 93, Apr. 1972, p. 72-82. 17 refs. Grants No. PHS-GM-1789; No. PHS-MH-12707-05.

Three experiments tested whether visual processing operates under attentional control, and with temporal-spatial capacity limitations. The Ss identified which of two key letters was present in briefly presented four-letter displays. The simultaneous condition presented the letters concurrently for t msec, preceded and followed by masking fields. The sequential condition presented the letters successively, each preceded and followed by a masking field, each for t msec. In the sequential condition, Ss were given the onset order of the four letters. Models postulating attentional control and limited capacity would predict an advantage for the sequential condition since in this case processing capacity need not be simultaneously shared among four letters. The results demonstrated simultaneous and sequential conditions to be equal. It was concluded that the initial stages of visual processing, up to at least the level of letter recognition, take place without capacity limitation and without attentional control. (Author)

A72-27075 *Interhemispheric effects on choice reaction times to one-, two-, and three-letter displays.* C. Umiltà, N. Frost, and R. Hyman (Oregon, University, Eugene, Ore.). *Journal of Experimental Psychology*, vol. 93, Apr. 1972, p. 198-204. 16 refs. Contract No. F44620-67-0099.

Sixteen normal right-handed subjects saw letters presented either to the right or left of a central fixation mark. The subjects pressed a key when stimuli designated as positive appeared, and did not respond to all other. Both right- and left-hand responses were used. Analysis of correct responses revealed a slight left hemifield superiority with one letter, and a significantly faster response to right hemifield presentations for two- and three-letter displays. In another experiment, the subjects responded to single letters differing simultaneously in visual and phonemic discrimination. Analysis of reaction times indicates faster phonemic discrimination of vowel and stop consonant sounds for left and right hemifields, respectively. The results are discussed in terms of hemispheric specialization and interhemispheric transmission of visual information. V.P.

A72-27160 * *Theoretical foundations for a quantitative approach to paleogenetics.* I, II. R. Holmquist (California, University, Berkeley, Calif.). *Journal of Molecular Evolution*, vol. 1, no. 2, 1972, p. 115-149. 41 refs. Grant No. NGR-05-003-020.

It is shown that by neglecting the phenomena of multiple hits, back mutation, and chance coincidence errors larger than 100% can be introduced in the calculated value of the average number of nucleotide base differences to be expected between two homologous polynucleotides. Mathematical formulas are derived to correct quantitatively for these effects. It is pointed out that the effects change materially the quantitative aspects of phylogenetics, such as the length of the legs of the trees. A number of problems are solved without approximation. G.R.

A72-27161 * *Separate physiological roles for two isozymes of pyridine nucleotide-linked glycerol-3-phosphate dehydrogenase in chicken.* H. B. White, III and N. O. Kaplan (Brandeis University, Waltham, Mass.). *Journal of Molecular Evolution*, vol. 1, no. 2, 1972, p. 158-172. 36 refs. Research supported by the American Cancer Society; Grants No. NSG-374; No. NIH-CA-03611.

The isozymes considered are designated 'liver type' and 'muscle type' based on the tissue of highest concentration. Electrophoretic analysis shows that the liver type is found in small amounts or is undetectable in all tissues studied except liver. The muscle type is found in skeletal muscles and kidney. Presumptive hybrid enzymes occur at low levels in chicken liver and kidney. The tissue distribution of glyceron-3-P dehydrogenase in several birds capable of sustained flight is different than in chicken. G.R.

A72-27238 # *Triglyceridemia and relative weight (Triglycéridémie et poids relatif).* M. Vastesaegeer, J. Doumit, W. Page, F. Vanderveiken, P. Block, K. Vuylsteek, W. Eylenbosch, L. Lefebvre, H. Peeters, and V. Blaton. *Acta Cardiologica*, vol. 27, no. 1, 1972, p. 33-48. 41 refs. In French.

Study of 3142 male subjects aged 20 to 65 who were subjected to questions concerning coronary angina, infarction, and intermittent claudication, and to an anthropometric and clinical investigation with an ECG and an exploration of the metabolism of glucids and lipids (including fasting triglyceridemia). An increase of triglycerides with age till the fifth decade was observed. In the group of volunteers aged 40 to 59 years the mean triglyceridemia of the subjects with probable or possible ischemic cardiopathy was significantly higher than in the normal subjects of the same age. There is a close relationship between triglyceridemia and relative weight: low values of relative weight correspond to a low mean triglyceridemia. F.R.L.

A72-27271 # *Problems of functional diagnostics of the heart and circulation system (Probleme der Funktionsdiagnostik des Herz-Kreislaufsystems).* J. Wirth, D. Warnke, and G. Fiedler (Medizinischer Dienst der Verkehrswesen, Direktion Zivile Luftfahrt, Berlin, East Germany). *Technisch-ökonomische Informationen der zivilen Luftfahrt*, vol. 8, no. 2, 1972, p. 86-88. In German.

Further improvements in the diagnostic methods and the widespread application of these methods are important because it is possible that conditions of heart disease in a person can exist unnoticed by the person himself for a long time. The prospects for a successful treatment are better if the disease is recognized at an early stage. The diagnostic methods employed include the use of an EKG, the measurement of the blood pressure, an X-ray examination of the heart, a phonocardiographical approach, and an examination of the pulmonary functions. G.R.

A72-27288 # *Ultrasensitive magnetic field measurements in the presence of high ambient noise levels - Application to magneto-cardiography.* A. Rosen, G. T. Inouye, A. L. Morse (TRW Systems Group, Redondo Beach, Calif.), and D. L. Judge (Southern California, University, Los Angeles, Calif.). *Journal of Applied Physics*, vol. 43, Apr. 1972, p. 1908-1914. 21 refs. Grant No. NIH-69-2243.

A two-junction superconducting Josephson tunneling magnetometer has been developed for the measurement of magnetic field strengths of the order of one nanogauss in an unshielded environment. The application of the device to the measurement of the heart's magnetic signature, the magnetocardiogram, and the problems associated with the measurement techniques are discussed. It is demonstrated that the fine details of the heart's magnetic signature (the magnetocardiogram) can be resolved in real time in an unshielded environment. (Author)

A72-27293 *Application of the combined action of vacuum and cold for the defence and preservation of living organisms (Application de l'action conjurée du vide et du froid à la défense et à la conservation des organismes vivants).* D. Simatos (Laboratoire de Biologie Physico-Chimique IBANA, Dijon, France). *Le Vide*, vol. 26, Nov.-Dec. 1971, p. 227-231. 21 refs. In French.

Living systems can be kept in a state of suspended activity by depriving them of oxygen and water. Only in some specific cases is the direct elimination of these two factors by vacuum feasible. The combined use of refrigeration and vacuum in the technique of lyophilization makes it possible to maintain many biological systems and some living systems in a stable dry state. Due to the various effects of cooling and drying on biological systems, the operation of freezing and dehydration must be effected following optimum requirements. Among the most important parameters are the freezing rate, sample temperature during sublimation and secondary drying, residual moisture, absence of oxygen in the storage atmosphere, and use of appropriate protective agents. F.R.L.

A72-27298 Effect of hormonal state on cell number and functional maturation of the brain. R. Balazs and M. Cotterrell (Medical Research Council, Neuropsychiatry Unit, Carshalton, Surrey, England). *Nature*, vol. 236, Apr. 14, 1972, p. 348-350. 19 refs.

Investigation of the effects of treatment with thyroid and adrenocortical hormones on cell number and functional development of the brain. The results obtained indicate the possibility that in man, as in experimental animals, factors affecting neurogenesis in the infant brain may cause later impairment in brain function, and that adverse influences during the early postnatal period can affect the functional development of the brain by influencing the differentiation of the nerve cells. M.V.E.

A72-27299 Gain control in the retina and retinal dynamics. R. Shapley, C. Enroth-Cugell, A. B. Bonds, and A. Kirby (Northwestern University, Evanston, Ill.). *Nature*, vol. 236, Apr. 14, 1972, p. 352, 353. 7 refs. Research supported by the Fight for Sight, Inc., Helen Hay Whitney Foundation, and PHS.

Investigation of the process underlying the rapid light adaptation in the cat retina that attenuates the signals reaching retinal ganglion cells from photoreceptors. The retinal response study was conducted upon anesthetized adult cats by means of a described technique for determining the automatic gain control in the cat retina. The results obtained indicate that response dynamics depend on gain setting, not on background retinal illumination. M.V.E.

A72-27304 # Ultrastructure of the capillaries of the spinal cord upon hypothermy. K. N. Ichev (Vissh Meditsinski Institut, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady*, vol. 25, no. 1, 1972, p. 129-131. 6 refs.

Spinal cord ultrastructure was studied microscopically in 15 albino rats subjected to cooling by keeping in water for 1 hr with an oral temperature of 32 to 33 C. Glutaraldehyde perfusion was performed for 15 min after the period, with the rats remaining in a state of hypothermy. The sinking of the endothelial cells to lower levels in most capillaries was the most significant effect of hypothermy. V.Z.

A72-27310 # Recognition of figures during voluntary saccadic eye movements. N. A. Iakimov (B'lgarska Akademiia na Naukite, Institut po Fiziologija, Sofia, Bulgaria). *Bolgarskaia Akademiia Nauk, Doklady*, vol. 25, no. 2, 1972, p. 275-278. 10 refs.

Experiments are described which indicate that the visual system is capable of recognizing images during a voluntary saccade of the eyes. Smearing of the image over the retina does not prevent recognition either in the case of a fixed stimulus and saccadic eye motion or in the case of a moving stimulus and motionless eyes. Recognition is enhanced, however, when smearing is avoided by synchronizing the motion of the stimulus and the motion of the line of sight. The detrimental effect of eye motion on recognition is attributed to a change in the visible luminance of stimuli due to suppression of vision during a saccade. However, a change in the recognition mechanism itself cannot be ruled out. V.P.

A72-27415 The significance of hydrospace medicine for manned interplanetary space flights (Die Bedeutung der Tauchmedizin für die bemannte interplanetare Raumfahrt). A. F. Low (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany). *DFVLR-Nachrichten*, Apr. 1972, p. 239-245. In German.

The branch of medicine concerned with medical problems in diving operations investigates questions of the effect of pressure changes on the human body. Such questions have great importance

for aerospace applications and for manned explorations of the surface of other planets. Venus, Jupiter, and possibly Saturn have atmospheres with higher pressures than Earth. Medical problems presented by manned landings on planets with such atmospheres are discussed, giving attention to the required pressure in the space suit, aspects of the selection of the gas mixture for breathing, questions of compression and decompression, and types of breathing devices. The use of isotonic oxygen-enriched solutions for breathing is considered, together with the employment of semipermeable membranes which permit only the passage of oxygen. G.R.

A72-27417 The technology of respiration and pulse rate measurements involving pilots (Zur Technik der Atem- und Pulsfrequenzmessung bei Piloten). H. Hohlweck. *DFVLR-Nachrichten*, Apr. 1972, p. 251-253. In German.

A thermistor device which is introduced into the nose serves as the respiration sensor. The difference in the temperatures of the inhaled air and the skin is responsible for the emission of electric signals corresponding to the respiration process. The method for measuring the pulse frequency makes use of brightness variations in the nose which are electrically indicated with the aid of a phototransistor. G.R.

A72-27418 Changes in auditory flutter fusion frequency during prolonged visual deprivation. C. H. Pangman and J. P. Zubek (Manitoba, University, Winnipeg, Manitoba, Canada). *Perception and Psychophysics*, vol. 11, Feb. 1972, p. 172-174. 9 refs. Defence Research Board of Canada Grant No. 9425-08; National Research Council of Canada Grant No. APA-290.

Determination of the auditory flutter fusion frequency of 18 subjects at intervals of 0, 1/2, 1, 2, 3, 5, and 7 days of visual deprivation (darkness). Relative to control subjects, a progressive improvement in performance as a function of duration was observed, a functional relationship which was best represented by a fourth-order polynomial. These results were similar to those obtained in an earlier experiment in which a tactual fusion task was employed, a measure analogous to auditory flutter fusion. (Author)

A72-27442 * # Astronauts' menu problem. W. G. Lesso (Texas, University, Austin, Tex.) and E. Kenyon (NASA, Manned Spacecraft Center, Houston, Tex.). *Operations Research Society of America, National Meeting, 41st, New Orleans, La., Apr. 26-28, 1972, Paper*. 19 p.

Consideration of the problems involved in choosing appropriate menus for astronauts carrying out SKYLAB missions lasting up to eight weeks. The problem of planning balanced menus on the basis of prepackaged food items within limitations on the intake of calories, protein, and certain elements is noted, as well as a number of other restrictions of both physical and arbitrary nature. The tailoring of a set of menus for each astronaut on the basis of subjective rankings of each food by the astronaut in terms of a 'measure of pleasure' is described, and a computer solution to this problem by means of a mixed integer programming code is presented. A.B.K.

A72-27470 Cardiac electro-mechanical time intervals as indices of hypoxic circulatory stress in man. N. B. Kowalsky and J. R. Anthony (Ohio State University, Columbus, Ohio). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 361-367. 21 refs.

Noninvasive means of assessing the change in cardiovascular function upon exposure to acute hypoxia were undertaken in this experiment. Simultaneous recordings of the electrocardiogram, phonocardiogram, carotid pulse tracing, and apex cardiogram were taken at a rapid speed on a multichannel light recorder. An estimation of the total electromechanical systolic interval, the

preejection period including the electromechanical lag and the isovolumetric contraction time, the left ventricular ejection time, the isovolumetric relaxation time, and the period of rapid filling were measured atraumatically and are presented. Twenty-six normal healthy male subjects were acutely exposed to altitudes of 18,000 feet in a hypobaric chamber and there was found to be a significant shortening of the preejection period and the isovolumetric contraction time and a lengthening of the left ventricular ejection time when these intervals were adjusted for heart rate. No significant changes were found in the total electromechanical systolic interval, the electromechanical time lag, the carotid transmission time, the isovolumetric relaxation time, and the period of rapid filling.

(Author)

A72-27471 # Evaluation of the lap belt, Air Force shoulder harness-lap belt and air bag plus lap belt restraints during impact with anthropomorphic dummies. J. F. Sprouffske, T. D. Clarke, C. D. Gragg, E. M. Trout, and W. H. Muzzy (USAF, Aerospace Medical Research Laboratory, Holloman AFB, N. Mex.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 368-371. 11 refs.

Abrupt linear decelerations (-Gx) were conducted using anthropomorphic dummies in order to investigate the impact protection afforded by three different restraints: the automotive lap belt, the Air Force shoulder harness-lap belt, and the air bag plus lap belt. The study emphasizes the comparison of peak forces transmitted to the lap belt and seat pan at 9 g by dummies using each of the three restraint systems. The results indicated that in comparison with the lap belt only and Air Force shoulder harness-lap belt systems, the air bag plus lap belt restraint significantly reduced the impulses and peak belt forces transmitted to the pelvis. However, the efficacy of the air bag plus lap belt restraint using dummies as a test subject should be reviewed with caution since the anthropomorphic dummy is not the ultimate biodynamic surrogate of man.

(Author)

A72-27472 Factor analysis of undergraduate and post-graduate flight training grades. R. M. Bale, M. J. Smith, and R. K. Ambler (U.S. Naval Aerospace Medical Center, Pensacola, Fla.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 372-375.

The typical jet pilot requires almost two years training to attain the required proficiency of a fleet-qualified aviator. The purpose of this study was to identify by a factor-analytic approach independent skills taught throughout the two-year training period. Training grades were assembled for 112 naval aviators who had completed replacement air group (RAG) training in the A-7 aircraft during 1967 and 1968. These data included flight and ground grades received in the basic, advanced, and RAG phases of training. In each phase eleven separate grades, for a total of 33, were included in the factor analysis. Nine factors were identified: three in basic, two in advanced, and four in the RAG, with only small overlap across training phases. Three types of skills were evident: academic (1 factor), instrument (2 factors), and flying (6 factors). Of particular interest within the six flying skill factors was the separation of the day and night carrier-qualification skills. The composition of each factor and the implications relative to training phases are discussed.

(Author)

A72-27473 * Comparison of calcium and phosphorus excretion with bone density changes during restraint in immature *Macaca nemestrina* primates. R. A. Hoffman, W. N. Hood (NASA, Ames Research Center, Moffett Field, Calif.), and P. B. Mack (Texas Woman's University, Denton, Tex.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 376-383. 41 refs. Contract No. NAS2-2711.

Calcium and phosphorus balance data on *Macaca nemestrina* monkeys during immobilization are presented and correlated with X-ray bone densitometry findings. A positive mineral balance was maintained during the immobilized period. A reduced bone density

was observed in most skeletal sites examined with increased density observed in epiphyseal regions. Migration of mineral from one site to another is suggested as a possible explanation for the findings.

(Author)

A72-27474 * Electroencephalographic and behavioral effects of nocturnally occurring jet aircraft sounds. T. E. LeVere, R. T. Bartus, and F. D. Hart (North Carolina State University, Raleigh, N.C.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 384-389. 11 refs. Grant No. NGL-34-002-095.

The present research presents data relative to the objective evaluation of the effects of a specific complex auditory stimulus presented during sleep. The auditory stimulus was a jet aircraft flyover of approximately 20-sec duration and a peak intensity level of approximately 80 dB (A). Our specific interests were in terms of how this stimulus would interact with the frequency pattern of the sleeping EEG and whether there would be any carry-over effects of the nocturnally presented stimuli to the waking state. The results indicated that the physiological effects (changes in electroencephalographic activity) produced by the jet aircraft stimuli outlasted the physical presence of the auditory stimuli by a considerable degree. Further, it was possible to note both behavioral and electroencephalographic changes during waking performances subsequent to nights disturbed by the jet aircraft flyovers which were not apparent during performances subsequent to undisturbed nights.

(Author)

A72-27475 Computer analysis of eye movement patterns during visual search. M. Troy, S. C. Chen, and J. A. Stern (Washington University, St. Louis, Mo.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 390-394. 14 refs. Contract No. DA-49-193-MD-2715.

Eye movements were recorded from 13 novice and 13 skilled helicopter pilots during a cross-country flight. This analysis is restricted to an evaluation of the pattern of eye movements as a function of skill and time on task. No differences were found as a function of skill. The incidence of nonpatterned search activity was found to decrease as a function of time on task. The results are discussed in terms of a decrease in alertness to 'unexpected' environmental stimuli. The development of a reliable computer-based procedure (utilized in the present study) for analyzing eye movements is also discussed.

(Author)

A72-27476 Walk on floor eyes closed /WOFEC/ - A new addition to an ataxia test battery. A. R. Fregly, A. Graybiel, and M. J. Smith (U.S. Naval Aerospace Medical Center, Pensacola, Fla.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 395-399. 28 refs.

Tandem walking - an often-used qualitative clinical ataxia test - was quantified simply by adopting the method of counting the number of heel-to-toe steps (1 to 10) a person can take without sidestepping with eyes closed and arms folded against chest. Standardization was based on testing 287 normal men and 100 normal women. Validation was based on testing 22 individuals having labyrinthine defects of varying severity and origin. Use of this new test in combination with a related ataxia test (Sharpened Romberg) having equally high validity (r pt. bis = .837) as an indicator of vestibular ataxia is recommended for rapid, economical screening purposes in medical clinics and biomedical research laboratories. Data analysis permitted an innovative definition of ataxia. A unique finding of special interest having both practical and theoretical implications suggested that abnormal function of the semicircular canals alone or of the otolith organs alone may be sufficient to demonstrate vestibular ataxia with an ataxia test battery that includes WOFEC.

(Author)

A72-27477 * Effects of bedrest and centrifugation of humans on serum thyroid function tests. C. S. Leach (NASA, Manned Spacecraft Center, Houston, Tex.), P. C. Johnson (Baylor

University; Methodist Hospital, Houston, Tex.), and T. B. Driscoll (NASA, Manned Spacecraft Center; Baylor University, Houston, Tex.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 400-402. 8 refs. Contract No. NAS9-11201; Grant No. PHS-HE-05435-11 P/17.

Changes in plasma volume and protein concentration have been reported when normal subjects are bedrested or centrifuged. Since thyroid hormones are transported by specific plasma proteins, each of these procedures could be expected to change plasma levels of these hormones. In this study centrifugation of normal healthy human subjects produced an increased concentration of total protein and albumin. When these same subjects were bedrested for six days, no change in total protein, albumin or thyroxine binding globulin were found although there was an eight per cent decrease in plasma volume. Centrifugation and, to a lesser extent, bedrest produced changes in serum T-4 levels and the T-3 test results. The direction of these changes (decreased % T-3 values and increased T-4 levels) indicate that these two situations produce an increased plasma concentration of thyroxine binding sites. (Author)

A72-27478 * EEG monitoring of a free-swimming diver at a working depth of 15 meters. J. R. Zweizig, W. R. Adey, J. Hanley, P. M. Hahn, A. A. Pilmanis, R. R. Given, and A. T. K. Cockett (California, University; Southern California University, Los Angeles, Calif.; Rochester, University, New York, N.Y.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 403-407. 7 refs. Grant No. NGL-05-007-195; Contracts No. F44620-70-C-0017; No. N00014-67-A-0398-0008.

Feasibility has been shown for underwater transmission of physiological signals, using frequency modulation of carriers transmitted by return-current-density methods, as part of a personal biotelemetry system. In the prototype system, a standard IRIG subcarrier frequency (2300 Hz) was used. Power requirements, antenna design, and signal attenuation are compatible with free-ranging diving activity at distances up to 15 meters from the receiver. Extrapolation from this study and further developments are expected to substantially increase the range. Advantages of this system include subcarrier compatibility with standard IRIG demodulators using channels 1 through 10, the absence of highly specialized antenna requirements, and reasonable attenuation characteristics for transmission through the turbidity of typical seawater. Moreover, the system would not appear to be depth limited, and to be compatible with use of high-powered transponders of the same type for long-distance transmission, with or without further encoding. (Author)

A72-27479 Jumping on the moon - Power output at different gravity values. G. A. Cavagna, A. Zamboni, T. Faraggiana, and R. Margaria (Milano, Università; CRN, Centro di Studio per la Fisiologia del Lavoro Muscolare, Milan, Italy). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 408-414.

The mechanical features of a vertical jump off both feet were investigated at different values of simulated gravity, g , by recording during the push: (1) the force exerted by the feet on the ground, (2) the upward velocity of the center of gravity of the body, (3) the potential, (4) the kinetic energy change of the body, and (5) the work performed during the jump. The speed at the takeoff is 2.6 m/sec at 1 g and it increases with decreasing g ; at 1/6 g , as on the moon's surface, it amounts to 3.7 m/sec corresponding to a jump of about 4 m. The higher speed at the takeoff at low gravity is attained by accelerating the body upward throughout a greater distance; this is obtained through a greater flexion on the knees preceding the push. Inversely, at gravity values higher than on earth the extent of the movement is reduced. The gain of power due to stretching of the contracted muscles, which takes place immediately before the push during the flexion on the knees, is maximum at 1 g and it decreases both at high and low g values. (Author)

A72-27480 Effects of a multi-hour immersion on trained and untrained subjects. II - Blood protein and electrolyte concentrations. D. Boening, H.-V. Ulmer, U. Meier, and J. Stegemann

(Deutsche Sporthochschule, Cologne, West Germany). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 415-418. 15 refs. Translation. Research supported by the Nordrhein-Westfalen Landesamt für Forschung.

Serial measurements on blood protein and electrolyte content were carried out during 4- to 8-hour immersion of trained and untrained human subjects. After an initial drop the hematocrit value and the hemoglobin concentration showed a general increase, which could be accounted for by water displacement. There was no significant change in total protein and albumin content in plasma. The sodium concentration fluctuated and the potassium concentration increased temporarily. Inorganic phosphate concentration, probably because of a change in metabolism, increased steadily. In the erythrocytes the potassium concentration fluctuated and the chloride concentration decreased. No important differences could be ascertained between trained and untrained subjects. (Author)

A72-27481 Ventilation response to hypoxia and acute mountain sickness. A. B. King and S. M. Robinson (U.S. Army, Biochemistry and Pharmacology Laboratory, Natick, Mass.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 419-421. 11 refs.

Previous studies in man have established an inverse relationship between the ventilation response to hypoxia and acute mountain sickness. We have confirmed this finding and also observed that the sensitivity of peripheral chemoreceptors to hypoxia determined the intensity of this response. Twenty-four male volunteers were studied in a hypobaric chamber at a simulated altitude of 14,000 ft (447 mm Hg). Minute ventilation was determined prior to ascent and after 2 and 6 hours at altitude; isocapnic-hypoxia sensitivity was determined at sea level. Minute ventilation of the 5 most ill subjects changed little from baseline during the first 6 hours at altitude, while minute ventilation of the 5 least ill subjects increased by 3.3 L/min/sq m. The mean isocapnic-hypoxic sensitivity of the ill group was 1.5 L/min/sq m and differed significantly from the well group (3.2 L/min/sq m). (Author)

A72-27482 * # Cardiac beta-adrenergic receptors and coronary hemodynamics in the conscious dog during hypoxic hypoxia. H. H. Erickson and H. L. Stone (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 422-428. 24 refs. NASA-supported research.

The mechanisms by which acute hypoxia (10% and 5% oxygen) mediates changes in coronary blood flow and cardiac function were investigated in the conscious dog. When the dogs breathed hypoxic gas mixtures through a tracheostomy, both arterial and coronary sinus oxygen tensions were significantly decreased. With 5% oxygen, there were significant increases in heart rate (25%), maximum left ventricular dP/dt (39%), left circumflex coronary artery blood flow (163%), and left ventricular oxygen consumption (52%), which were attenuated by beta-adrenergic blockage with propranolol. When electrical pacing was used to keep the ventricular rate constant during hypoxia, there was no significant difference in coronary blood flow before and after beta blockade. Beta-adrenergic receptor activity in the myocardium participates in the integrated response to hypoxia although it may not cause active vasodilation of the coronary vessels. (Author)

A72-27483 Oxygen-modified collagen and its possible pathological significance. L. E. Puleo and H. H. Sobel (Colorado State University, Fort Collins, Colo.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 429-431. 16 refs. Contract No. N00014-67-A-0299-0012.

Acid soluble collagen isolated from the skin of mice was exposed to 150 psi of oxygen at 37 C for four weeks in pH 8.0 buffer. The product was considerably modified from its native state, becoming insoluble in dilute acetic acid, exhibiting reduced ability to

form gels in hot water and reduced digestibility by bacterial collagenase. The action of the latter on oxygen-modified collagen results in a soluble fraction which exhibits marked fluorescence at 425 nm after activation at 350 nm. Approximately 10% of a brown collagenase-insoluble product results. The collagenase-soluble fraction yields a fluorescent peptide which contains most or all of the tyrosine in this fraction. Oxygen-modified collagen might be formed in vivo during exposure to high oxygen tension and results in certain pathological changes, such as aseptic necrosis of bone which is observed in diving personnel. (Author)

A72-27484 **Electrophysiological changes in humans during perceptual isolation.** E. A. Serafetinides, J. T. Shurley, R. Brooks, and W. P. Gideon (Oklahoma, University, Norman; U.S. Veterans Administration Hospital, Oklahoma City, Okla.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 432-434. 8 refs. Research supported by the U.S. Veterans Administration and NIH.

EEG, EMG, EOG, ECG, and electrodermal measures were obtained from 16 normal female subjects during a 4-hour period of perceptual isolation. The results showed significant decrease of EEG voltage but also significant increase of EEG frequency and vertical eye movements. Electrodermal responses were also found to be significantly increased. The findings are discussed in terms of 'paradoxical arousal' and diverse autonomic reactivity resulting from reduction of perceptual input. (Author)

A72-27485 **Aural responsivity of a pilot following endolymphatic shunt surgery.** J. R. Dille, D. J. Schroeder, W. E. Collins (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.), and R. J. Hill (Oklahoma, University, Norman; FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 435-438. 11 refs.

Although some vestibular testing of pilots and astronauts has been described, specific testing of pilots following labyrinthine surgery has not been reported. The purpose of this case study is to present data obtained from a pilot who developed Meniere's disease, underwent surgical correction and was then exposed (1) to a battery of vestibular and auditory tests, and (2) to a standard altitude decompression. The battery of tests administered to this pilot indicated general aural responsivity. His ataxia test results were generally good, the decompression caused him no difficulty, both labyrinths were functional to caloric and rotational stimulation, and the audiometric results showed normal receptivity in the left ear and probable improvement (and certainly no deficit from preoperative tests) of hearing in the right ear. Although this pilot did not present a near normal picture with regard to some vestibular responses (very weak spontaneous nystagmus; directional imbalance to caloric irrigations), those responses were not unlike the pattern obtained from many individuals in normal populations, including those of test pilots. (Author)

A72-27486 **Biological effects of simulated high altitude climate in pressurized commercial planes on passengers and flying personnel.** S. W. Tromp (Biometeorological Research Centre, Leiden, Netherlands). *Aerospace Medicine*, vol. 43, Apr. 1972, p. 446-449. 13 refs.

It is pointed out that in most commercial planes the simulated altitude in the cabins surpasses the 1,500 m altitude boundary, particularly in the USSR, Latin America, India and Pakistan. Considering the physiological and clinical effects of high altitude above 1,500 m, similar effects must be expected in passengers and flying personnel during commercial flights. After a stay of several hours an improved lung ventilation and vital capacity of the lung can be expected, increased peripheral bloodflow, increased sensitivity of the autonomic nervous system, stimulation of the hormonal production of the adrenal gland and of the blood producing mechanisms,

improvement of the overall thermoregulation efficiency, increased sensitivity to drugs and toxic substances, explosive developments of latent infectious diseases, etc. In general it can be stated that apart from biological rhythm disturbances, emotional stresses, irregular working hours, etc. a commercial flight with a simulated altitude in the cabin of 1,600 m is very healthy both for passengers and flying personnel. (Author)

A72-27487 **Hyperactive cardio-inhibitory reflex manifested by a near-syncope episode - A case report.** G. M. Stone. *Aerospace Medicine*, vol. 43, Apr. 1972, p. 450, 451.

The possibility of sudden incapacitation due to loss of consciousness is always of great concern to the flight surgeon. Of all the causes of syncope it would appear that a hyperactive cardio-inhibitory vagal reflex is quite rare in military aviation. The following case report illustrates this entity in a highly experienced naval aviator and the subsequent disposition. (Author)

A72-27516 **Pamper or ignore.** R. C. Roth and J. M. Melvin (USAF, Hospital Edwards, Edwards AFB, Calif.). *Society of Experimental Test Pilots, Technical Review*, vol. 11, no. 1, 1972, p. 31-34.

Discussion of life support equipment as one of the many areas that must complement the aircraft and crew to help them fulfill their basic objective. The most fertile ground for pampering or ignoring crew members is in the pressure suit operations area. It is recognized that life support equipment can never be designed so that standard off-the-shelf items will be satisfactory to 100% of the flying population. The help of test pilots in developing improved equipment is solicited. F.R.L.

A72-27529 * **Primordial organic chemistry and the origin of life.** C. Ponnampertuma (NASA, Ames Research Center, Exobiology Div., Moffett Field; Stanford University, Stanford, Calif.). *Quarterly Reviews of Biophysics*, vol. 4, no. 2-3, 1971, p. 77-106. 63 refs.

Aspects of Darwinian evolution are discussed together with spontaneous generation, the inorganic chemical evolution, the primitive atmosphere, and interstellar matter. The significance of the change of the earth's reducing atmosphere to an atmosphere with oxidizing characteristics is considered. Experiments regarding the abiogenic synthesis of nucleic acids and proteins are reported. It was found that micromolecules can be formed in simulation experiments. The condensation reaction taking place in the presence of water was studied together with the condensation reaction taking place in the relative absence of water or under hypohydrous conditions. Jupiter simulation studies were conducted, and lunar and meteorite material was analyzed. G.R.

A72-27531 * **Ultrastructural changes in rat lung during long-term exposure to oxygen.** G. A. Harrison (NASA, Ames Research Center, Moffett Field, Calif.). *Experimental Medicine and Surgery*, vol. 29, 1971, p. 96-107. 32 refs.

The pathogenesis of oxygen toxicity in the lung of rats was studied by electron microscopy. The following long-term effects were established: (1) a progressive destruction of the blood-air barrier beginning with the endothelial cell layer; (2) a profuse edema in the interstitial spaces in the pleural space in the alveoli and in the cytoplasm and organelles; (3) a continuing increase in the quantity and complexity of the alveolar exudate; (4) gradual hemolysis of red blood cells; and (5) eventual subsiding of the interstitial edema in surviving rats with a concomitant development of emphysema. O.H.

A72-27577 # **Data processing in biological sensors (Informationsverarbeitung in biologischen Messfählern).** R. A. Chaplain, B.

Michaelis, and R. Coenen (Magdeburg, Technische Hochschule, Magdeburg, East Germany). (*Fachkolloquium Informationstechnik, 4th, Technische Universität Dresden, Dresden, East Germany, Jan. 14, 15, 1971.*) *Zeitschrift für elektrische Informations- und Energietechnik*, vol. 1, no. 2, 1971, p. 77-81. 6 refs. In German.

Study of the data flow and the data processing in an isolated strain receptor of the sweet-water crab. In comparison with all other receptors, this system is unmeshed and has the additional advantage of good realizability of well-defined input signals. This mechano-receptor consists of three structurally well-defined subsystems connected in series - the receptor muscle, the transducer, and the encoder. For various reasons, it is concluded that the encoding process in this receptor constitutes an integral pulse frequency modulation. The occurrence of such a modulation suggests the presence of a threshold element with subsequent resetting in the initial state. This behavior best corresponds to the interaction between a negative resistance with a dynatron characteristic and the external network of the receptor. A.B.K.

A72-27578 # Engineering modeling of data encoding in biological sensors (Zur technischen Modellierung der Informationscodierung in biologischen Messführlern). R. A. Chaplain, B. Michaelis, and G. Mohs (Magdeburg, Technische Hochschule, Magdeburg, East Germany). (*Fachkolloquium Informationstechnik, 4th, Technische Universität Dresden, Dresden, East Germany, Jan. 14, 15, 1971.*) *Zeitschrift für elektrische Informations- und Energietechnik*, vol. 1, no. 2, 1971, p. 82-85. In German.

Results of electronic modeling of the pulse generation in a receptor membrane. A description is given of a circuit realized by the authors which is based on the principle of voltage-frequency conversion. The proposed circuit is based on the use of a negative resistance with a dynatron characteristic (in this particular case - a tunnel diode). A calculation is performed to show how linearity of the voltage-frequency conversion characteristic is achieved. A.B.K.

A72-27615 Recommendations for drawing up provisional safety rules for working with lasers. V. R. Pronin, E. P. Vysokosov, M. T. Nesterenko, and Iu. I. Lazarev. (*Kvantovaya Elektronika/Moscow*, vol. 1, no. 2, 1971, p. 87-91.) *Soviet Journal of Quantum Electronics*, vol. 1, Sept.-Oct. 1971, p. 180-183. 25 refs. Translation.

Safety rules are recommended for working with lasers. These recommendations are based on the analysis of current Soviet and foreign data on the biological effects of laser radiation and on the dangerous and safe levels of this radiation, which are worked out making allowance for the optical and physiological properties of the eye. A discussion is given of the requirements which should be satisfied by industrial buildings in which quantum-electronic devices are operated. (Author)

A72-27624 The search for life on Mars - Where we stand today. N. H. Horowitz (California Institute of Technology, Pasadena, Calif.). *Bulletin of the Atomic Scientists*, vol. 27, Nov. 1971, p. 13-17.

The prospects for life on Mars are reviewed in the light of new ground-based and probe observations of atmospheric pressure and composition, surface temperature, polar cap composition, UV radiation, and dominant surface features. A survey of research in the dry valleys of Antarctica leads to the conclusion that terrestrial microorganisms carried to Mars could not contaminate the planet. Possible past environments on Mars are discussed, and it is noted that previously developed life forms may have adapted to present conditions. Immediate tasks in the search for life on Mars involve the identification and location of sites which are most promising for future landing missions. T.M.

A72-27626 * Apollo 12 lunar material - Effects on plant pigments. J. D. Weete (Lunar Science Institute, Houston, Tex.) and C. H. Walkinshaw (U.S. Forest Service, Washington, D.C.; NASA, Lunar Receiving Laboratory, Houston, Tex.). *Canadian Journal of Botany*, vol. 50, no. 1, 1972, p. 101-104. 10 refs. Contract No. NSR-09-051-001.

Tissue cultures of tobacco grown for 12 weeks in contact with lunar material returned by Apollo 12 contained 21 to 35% more total pigment than control tissues. This difference is due primarily to increased chlorophyll a concentrations per gram fresh weight of tissue in experimental cultures. No differences were noted in the fresh or dry weight of the experimental and control cultures. (Author)

A72-27646 # Synaptic organization of neuronal background activity in the visual cortex (Sinapticheskaia organizatsiia fonovoi aktivnosti neironov zritel'noi kory). R. R. Velikaia (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, Feb. 1972, p. 150-157. 22 refs. In Russian.

In unanesthetized rabbits, experiments with stimulation and depression of the lateral geniculate body and mesencephalic reticular formation showed that the background activity of cortical neurons was mainly determined by specific and nonspecific afferentation. Impulses from the lateral geniculate body seemed to induce the background activity of cortical neurons while the mesencephalic reticular formation modulated this activity. (Author)

A72-27647 # Effect of the cerebral cortex on the progress of cardio-cardiac reflexes (Vliianie kory bol'shikh polusharii na protekanie kardio-kardial'nykh reflektsov). G. E. Samonina, T. B. Aleksandrova, N. Khiltunen, and M. G. Udel'nov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, Feb. 1972, p. 215-223. 26 refs. In Russian.

Cats and rats were used in 66 experiments in which square pulses were delivered into the sensorimotor cortex in a study of the cortical influence in cardiac and cardiovascular reflexes. The results suggest that the cortex has a controlling effect on the intermediate nervous centers directly controlling the cardiac activity. This effect is expressed in the weakening and strengthening of cardiac reflex responses to stimuli. Hypotheses are proposed to explain the findings. V.Z.

A72-27648 # Effect of preadaptation to hypoxia on the myocardium noradrenalin content in rats with experimental vitium cordis (Vliianie predvaritel'noi adaptatsii k gipoksii na sodержanie noradrenalina v miokarde pri eksperimental'nom poroke serdtsa u krysa). M. G. Pshennikova, B. N. Manukhin, and F. Z. Meerson (Akademiia Meditsinskikh Nauk SSSR; Akademiia Nauk SSSR, Institut Biologii Razvitiia, Moscow, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, Feb. 1972, p. 249-254. 32 refs. In Russian.

Pressure chamber experiments on 53 rats subjected to intermittent low pressure exposures over a period of 2.5 months are discussed. Artificial vitium cordis was produced in the rats by abdominal aorta narrowing with an inserted spring. The low pressure exposures were from 2 to 6.5 km over sea level on 55 days for five 5-hr days in a week. The adaptation to low pressure reduced markedly the sinking of the noradrenalin content in the myocardium of the rats, which is usually caused by vitium cordis. V.Z.

A72-27649 # Use of a nonspecialized tape recorder for arterial pressure recording in a form convenient for subsequent digital processing (Registratsiia arterial'nogo davleniia na nespetsiali-

zirovannyi magnitofon v forme, udobnoi dlia posleduiushchei tsifrovoy obrabotki). V. P. Lebedev and A. P. Golubev (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR*, vol. 58, Feb. 1972, p. 285, 286. In Russian.

Description of an arterial-pressure magnetic tape recording technique with automatic conversion of recordings into digital data. A block diagram of the assembly is given. The characteristic features of the assembly are a common tape recorder, an electrocardiograph, a polarization relay, vibrators, a digital voltmeter, and a printing device. V.Z.

A72-27651 # Responses of auditory-cortex neurons to electrical stimulation of the medial geniculate body (Reaktsii neuronov slukhovoi kory na elektricheskoe razdrazhenie vnutrennego kolenchatogo tela). F. N. Serkov and E. Sh. Ianovskii (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Neirofiziologiia*, vol. 4, Jan.-Feb. 1972, p. 23-31. 15 refs. In Russian.

The activity of 98 auditory-cortex neurons in cats was examined in response to electrical stimulation of the medial geniculate body (MGB). Responses of 11% of the neurons consisted only of excitatory postsynaptic potentials (EPSP), 66% of the neurons responded with primary inhibitory postsynaptic potentials (IPSP), and 23% of the neurons exhibited EPSP-IPSP and EPSP-peak-IPSP responses. Latent periods varied from 1 to 4 msec for EPSP responses, from 2.2 to 6.5 msec for IPSP responses, and from 1.5 to 12.5 msec for peak potentials. A mechanism is proposed by which auditory-cortex neurons are inhibited when an afferent volley is applied to the auditory cortex. T.M.

A72-27652 # The effect of transection of cortico-subcortical connections upon the spontaneous activity of the lateral geniculate body and visual cortex neurons (Vliianie pereryva korkovopodkorkovykh svyazei na fonovuiu aktivnost' neuronov naruzhnykh kolenchatykh tel i zritel'noi kory). V. L. Silakov and E. G. Zarkeshev (Akademiia Meditsinskikh Nauk SSSR, Leningrad, USSR). *Neirofiziologiia*, vol. 4, Jan.-Feb. 1972, p. 47-53. 24 refs. In Russian.

Cortico-subcortical connections were transected in one hemisphere in acute experiments on cats. Main characteristics of spontaneous impulses on the lateral geniculate body (LGB) and visual cortex were studied. The types of spontaneous activity were found to be similar to those of intact structures, but the number of cells with spontaneous activity in the structures of the operated brain area decreased considerably. In the visual field of the isolated cortex, a redistribution in the percentage ratio of neurons, possessing spontaneous activity, took place in different layers; more frequently such cells were found in layers IV-V, whereas in the normal cortex active cells are present more frequently in layers III-IV. The average impulse frequency in all types of cells of the isolated cortex was reduced. In the LGB on the operated side, a decrease in the number of cells with a high discharge frequency was observed. (Author)

A72-27653 # Study of time relations between human motor unit discharges during prolonged muscle contraction (Analiz vremennykh sootnoshenii razriadov dvigatel'nykh edinits cheloveka pri dlitel'nom sokrashchenii myshtsy). E. N. Artem'eva (Akademiia Nauk SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR). *Neirofiziologiia*, vol. 4, Jan.-Feb. 1972, p. 68-74. 18 refs. In Russian.

The study was performed to find out the connection in time between motoneuron discharges and to examine the character of this connection using several statistical methods. Trains of action potentials of human m. rectus fem. and m. biceps br. under long isometric contraction were recorded and analyzed. The intervals between adjacent action potentials of two motor units (cross-intervals) as well as mean interspike intervals of each motor unit were measured, and the standard deviations of the latter were calculated.

It was found that for some pairs of motor units there are more coinciding impulses than may be expected as a result of random coincidence. Synchronous impulses may follow one after another, interrupting independent activity. For a given train of motor unit discharges, the mean duration of interspike intervals preceding synchronous impulses is shorter than that of the other interspike intervals. (Author)

A72-27657 # Detection of nucleic acid bases in photochemically synthesized self sustaining coacervates. S. Ranganayaki, V. Raina, and K. Bahadur (Allahabad University, Allahabad, India). *British Interplanetary Society, Journal*, vol. 25, May 1972, p. 279-285. 11 refs.

Study of particles formed by exposing a mixture of ammonium molybdate, diammonium hydrogen phosphate, mineral solution, and formaldehyde to sunlight for 8 hr/day for 4 days. Chromatographic analysis after hydrolysis indicates the presence of adenine, cytosine, uracil, thymine, adenosine, and guanosine. F.R.L.

A72-27680 # Spatial characteristics of metacontrast. R. Growney and N. Weisstein (Loyola University, Chicago, Ill.). *Optical Society of America, Journal*, vol. 62, May 1972, p. 690-696. 27 refs. Grant No. PHS-EY-00143-03.

Determination of the spatial extent of lateral interaction for nonoverlapping equal-energy stimuli in a metacontrast design with targets and masks of constant separation but varying width. The weighting functions derived from these data are wholly negative. Unlike previous estimates of spatial extent in metacontrast, based on experiments in which the separation between target and mask was varied, our weighting functions subtend only about 10 min of visual angle, for both monoptic and dichoptic observations. However, the weighting functions resemble those derived from a wide variety of other psychophysical procedures such as sensitization. The differences of estimates of weighting functions are interpreted in terms of two spatial-lateral-interaction systems. One of these systems may depend critically on the proximity of stimuli; the independence of the spatial extent of the system from target size suggests the involvement of an edge mechanism. (Author)

A72-27726 The effects of added elastic loads on the respiratory response to CO₂ in man. S. Freedman, K. J. Dalton, D. Holland, and J. M. S. Patton (London, Royal Postgraduate Medical School; Middlesex Hospital Medical School, London, England). *Respiration Physiology*, vol. 14, Apr. 1972, p. 237-250. 25 refs. Research supported by the National Fund for Research into Crippling Diseases.

We have examined the effects of added elastic loads (of 14 and 23 cm water/liter) on the carbon dioxide response curve in six normal subjects. In one subject with the bigger load the slope of the ventilation versus carbon dioxide pressure curves were similarly unaffected. In all subjects the slope of the ventilation/tidal volume curve was increased by loading. These changes in pattern of breathing enable ventilation to be sustained at control levels without any increase in inspiratory muscle power and with minimal increases in inspiratory muscle force and subjective discomfort. (Author)

A72-27727 The effect of graded hypoxia with and without exercise on ventilatory acclimatization. C. G. Morrill and R. H. Kellogg (California, University, San Francisco, Calif.). *Respiration Physiology*, vol. 14, Apr. 1972, p. 287-295. 16 refs. Grants No. NIH-GM-09262; No. NIH-HR-13841.

To study the role of exercise in ventilatory acclimatization, the hypothesis that exercise increases or speeds it was tested. For this

purpose, steady-state hyperoxic carbon dioxide-response curves were measured on chronically tracheostomized goats before and after four-hour exposures to graded levels of hypoxia. The results fail to support the hypothesis that exercise affects ventilatory acclimatization to hypoxia, but they do suggest that the magnitude of acclimatization that occurs in four hours is greater when the arterial oxygen tension is lower. O.H.

A72-27728 Chemoreflex ventilatory response to CO₂ in man at low and high altitudes. R. Lefrancois, H. Gautier, P. Pasquas, A. M. Cevaer, M. F. Hellot, and J. Leroy (Rouen, Université, Rouen, France). *Respiration Physiology*, vol. 14, Apr. 1972, p. 296-306. 21 refs.

On man, a peripheral chemoreflex ventilatory response curve was obtained by measuring ventilatory reactions to the transient inhalation of a carbon dioxide-rich mixture. Experiments have been performed, (1) on lowlanders in normoxia, in acute hypoxia and during acclimatization at an altitude of 3660 m and (2) on native highlanders. In lowlanders, acute and chronic hypoxia is characterized by an increase in the slope of the pulmonary ventilation versus arterial carbon dioxide tension curve. Acclimatization is marked by a shift of this curve to a lower arterial carbon dioxide tension and a higher ventilation. This shift is achieved within two days. Highland natives at high or low altitude have a very low peripheral chemoreflex carbon dioxide drive. (Author)

A72-27732 Haemodynamic effects of angiographic contrast material in man - A beat-by-beat analysis. J. S. Karliner, R. J. Bouchard, and J. H. Gault (California, University, San Diego, Calif.). *British Heart Journal*, vol. 34, Apr. 1972, p. 347-355. 28 refs. PHS-supported research.

Assessment of the hemodynamic effect of contrast medium during the first 10 beats after left atrial injection in five subjects without left ventricular disease, and in eight patients with left ventricular myocardial disease, and after aortic root injection in eight patients with aortic insufficiency. Since myocardial performance was little affected in the first few beats after injection of contrast material and not at all in patients with reduced left ventricular function, it is concluded that angiographic methods of assessing left ventricular function allow valid comparisons of one patient with another, provided a contraction before the fifth opacified beat is analyzed. F.R.L.

A72-27733 Clinical significance of minor ST/T depression in resting electrocardiogram. D. Short (Aberdeen Royal Infirmary, Aberdeen, Scotland). *British Heart Journal*, vol. 34, Apr. 1972, p. 377-382. 11 refs.

Analysis of 225 patients who showed minor ST/T depression, which indicated that at least 92% of them had heart disease. It appears that slight ST/T depression in a resting cardiogram recorded under standard conditions is abnormal. It may be due to a number of factors, but the commonest in clinical practice are coronary heart disease and left ventricular hypertrophy. F.R.L.

A72-27734 Simplified estimation of aortic valve area. R. J. Bache, C. R. Jorgensen, and Y. Wang (Minnesota, University, Hospitals, Minneapolis, Minn.). *British Heart Journal*, vol. 34, Apr. 1972, p. 408-411. 8 refs. Research supported by the Minnesota Heart Association and PHS.

Simple linear measurements of the systolic pressure gradient across the stenosed aortic valve were sought to substitute for the mean systolic gradient in the calculation of aortic valve area, in order

to eliminate the need for the time-consuming process of hand planimetry. Two measurements were found to be equally satisfactory, namely the peak systolic gradient and the maximum systolic gradient. Formulae for their use in this calculation have been evolved and are presented. (Author)

A72-27820 Analysis of aircraft accidents in a F-104 squadron of the navy (Analyse der Flugunfälle in einem F-104-Geschwader der Marine). W. Landsberg. *Wehrmedizinische Monatsschrift*, vol. 16, Apr. 1972, p. 97-105. In German.

The period from 1958 to 1970 is covered in the analysis. It was found that 49.8% of the accidents were caused by the human factor, while technical factors were responsible for 34.7%. Only 4% of all accidents were due to the environment. No specific cause could be determined for the remaining accidents. The temporal distribution of the accidents was also considered together with factors of the physical condition of the pilot before the accident. G.R.

A72-27821 Automatic ECG recording and evaluation by digital computer (Automatische EKG-Aufnahme und Auswertung durch Digitalrechner). K. Schmahl (Bundeswehr-Krankenhaus, Detmold, West Germany). *Wehrmedizinische Monatsschrift*, vol. 16, Apr. 1972, p. 106-111. 33 refs. In German.

Description of the present possibilities and technical requirements for ECG analysis by means of electronic data processing equipment. After an outline of the methods used for acquisition, transmission, measurement, and evaluation, the advantages both for routine diagnosis and for prophylactic mass examinations in military mustering and cardiology are emphasized. The question as to whether the conventional-classic or corrected orthogonal ECG leads are better suited for automatic ECG evaluation is still disputed and needs further clarification and discussion. In addition to the economic aspects (rationalization of doctor's working capacity, uniform evaluation according to unchanging criteria, simplified documentation and retrieval of the result of the evaluation), the automatic ECG evaluation system can be expected to provide, with the benefit of the knowledge and experience of a team of experts, an internationally standardized interpretation of findings which can be reproduced for sequential observations and the preparation of expert opinions. The limits of result analysis are set by the system-dependent information content of the ECG, which, particularly in the case of young persons, can lead to the registration of 'false-positive' findings due to autonomic or sometimes medicinal effects or technical disturbances. This means that the final classification of the findings, in synopsis with other clinical findings, must be left to the judgement of the doctor. (Author)

A72-27822 Systemic classification of chronic polyarthritis (Systematik der chronischen Polyarthritis). H. G. Fassbender (Bundeswehr, Institut für allgemeine und experimentelle Pathologie und Institut für Wehrmedizin und Hygiene, Bonn, West Germany). *Wehrmedizinische Monatsschrift*, vol. 16, Apr. 1972, p. 112-115. In German.

Description of the development of chronic polyarthritis - a disease of the middle germ layer which can develop in two stages. In the first stage, the process occurs at the borders of the mesodermal cleft; in the second stage, in which the rheumatic factor is necessary, the process is complicated by the fact that mesodermal tissue structures of various kinds, including heart muscle and vascular walls, become necrotic. The clinical picture of chronic polyarthritis is then imprinted with the visceral processes. (Author)

A72-27825 Studies on the central chemosensitive mechanism of respiration. III, IV (Untersuchungen zum zentralen chemosensiblen Mechanismus der Atmung. III, IV). J. Berndt, W.

Berger, K. Berger, and M. Schmidt (Ruhr-Universität, Bochum, West Germany). *Pflügers Archiv*, vol. 332, no. 3, 1972, p. 171-197. 22 refs. In German.

The respiratory response to changes in the medullary extracellular pH was studied both in lightly anesthetized cats before and after cervical vagotomy, and in normally anesthetized and decerebrate cats. Results indicate that the hydrogen ion concentration in the cerebrospinal fluid (CSF) does not influence respiration at pH values of CSF below 6.5, and that an increase of ventilation as a response to increasing extracellular hydrogen ion concentration is only obtained in an extracellular pH range of about 0.2 pH units. Vagotomy influences the response to tidal volume and the respiratory frequency to changes in extracellular pH. The arterial CO₂ tension response curves of tidal volume obtained during perfusion of the ventral medullary surface with mock CSF show a smaller slope than the control curves recorded without perfusion. During perfusion, ventilation does not reach the maximal values observed under control conditions. The extracellular pH response of tidal volume is not diminished during anesthesia. O.H.

A72-27826 * Guinea pig ductus arteriosus. II - Irreversible closure after birth. F. S. Fay (Harvard University, Boston, Mass.) and P. H. Cooke (Harvard University, Cambridge, Mass.). *American Journal of Physiology*, vol. 222, Apr. 1972, p. 841-849. 29 refs. Research supported by the American Heart Association; Grants No. PHS-5-T07-GM-00707-07; No. NGR-22-007-059.

To investigate the mechanism underlying irreversibility of ductal closure after birth, studies were undertaken to determine the exact time course for the onset of irreversible closure of the guinea pig ductus arteriosus. Parallel studies of the reactivity of ductal smooth muscle to oxygen and studies of the postpartum cellular changes within the vessel were also carried out. O.H.

A72-27827 Sensitivity to low temperature in hibernating rodents. C. P. Lyman (Harvard University, Boston, Mass.) and R. C. O'Brien (Harvard University, Cambridge, Mass.). *American Journal of Physiology*, vol. 222, Apr. 1972, p. 864-869. 19 refs. Grant No. PHS-GM-16714; Contract No. F44620-70-C-0044.

Experiments were carried out in which the brains of deeply hibernating rodents were maintained at the steady temperature of hibernation while the peripheral temperature was chilled. Conversely, the brain was chilled while the rest of the body was kept at the steady temperature. Results indicate that *Citellus tridecemlineatus* and *Citellus lateralis* in hibernation do not regulate their temperature in the euthermic sense, for peripheral temperature receptors are not involved. However, decline in brain temperature is sensed with considerable accuracy, and response to this may protect the hibernator from lethal cold, either by causing arousal from hibernation, or by a series of incipient arousals which serve to hold body temperature above the danger point. *Glis glis* and *Mesocricetus auratus brandti* respond at a higher temperature than do the *citellids*. O.H.

A72-27828 * Renal clearance studies of effect of left atrial distension in the dog. M. J. Kinney and V. A. DiScala (Public Health Service Hospital, Staten Island, N.Y.). *American Journal of Physiology*, vol. 222, Apr. 1972, p. 1000-1003. 27 refs. NASA-supported research; Grant No. PHS-P-70-41-66. NASA Order T-91344.

Investigation of the water diuresis of left atrial distension in 16 dogs on the basis of clearance studies employing hydration, chronic and acute salt loading, deoxycorticosterone (DOCA) in excess, and distal tubular nephron blockade with diuretics. The diuresis was found in hydrated and salt-loaded dogs and was independent of DOCA and presumed renin depletion. It was not found in five dogs after distal tubular blockade. No significant reproducible saluresis was ever documented. The water diuresis was always stopped by

exogenous vasopressin (seven dogs). Antidiuretic hormone inhibition with distal tubular nephron water permeability changes appears to be the sole mechanism of the diuresis of left atrial distension in the dog. (Author)

A72-27829 Adrenocortical function in hypothalamic deafferented rats maintained at high altitude. C. Lau and P. S. Timiras (California, University, Berkeley, Calif.). *American Journal of Physiology*, vol. 222, Apr. 1972, p. 1040-1042. 25 refs. Grants No. PHS-HD-101; No. PHS-NS-08989.

Results of a study designed to determine whether intact neural tracts to the hypothalamus are necessary for proper adrenocortical stimulation during long-term exposure (1 week) to high altitude (12,470 ft). It was observed that (1) in agreement with other investigators, deafferented rats presented high resting corticosterone concentrations; (2) intact animals, exposed to 12,470 ft for 1 week, demonstrated an immediate and transient activation of the adrenals followed by a delayed stimulation after three days; and (3) deafferented rats exposed to the same experimental conditions showed no immediate increase in plasma and adrenal corticosterone levels, but rather a decline from their high resting levels to values comparable to those observed in intact rats. It was concluded that the adrenocortical response to prolonged hypoxia involves a rapid neural stimulatory component followed by a delayed humoral activation. (Author)

A72-27841 # The oxygen supply to the retina. II. A. Alm and A. Bill (Uppsala, Universitet, Uppsala, Sweden). *Acta Physiologica Scandinavica*, vol. 84, Mar. 1972, p. 306-319. 34 refs. Research supported by the Regnell's Fund; Swedish Medical Research Council Grant No. B71-14X-147-07; Grant No. PHS-EY-00475.

Use of 15- and 35-micron microspheres labelled with Sr85 and Yb169 to determine the rate of blood flow through various intraocular tissues, optic nerve, brain, kidney cortex, and small intestine in cats at normal and increased arterial CO₂ partial pressure. One eye had its spontaneous intraocular pressure, the other eye had its pressure stabilized at a higher level. At normal arterial CO₂ partial pressure a reduction in perfusion pressure resulted in decreased vascular resistance in the iris, the ciliary body, and the retina, but not in the choroid. In the retina the eye with reduced perfusion pressure had a significantly higher blood flow than the control eye. Increased arterial CO₂ partial pressure resulted in increased blood flow in all ocular tissues and all extraocular tissues studied except the kidney cortex. Reductions in perfusion pressure at high arterial CO₂ partial pressure resulted in further decreases in vascular resistance in two eyes of seven only. The results suggest that about 21% of the O₂ consumed by the retina is delivered by the retinal blood vessels, the rest by the choroid. Both myogenic and metabolic mechanisms seem to contribute to the adjustment of retinal vascular resistance after a change in perfusion pressure. (Author)

A72-27842 # The influence of the crowding phenomenon on the oxygen consumption of blood cells as determined by the Cartesian diver technique. I. Talstad (Bergen, Universitetet, Bergen; Rikshospitalet, Oslo, Norway). *Acta Physiologica Scandinavica*, vol. 84, Mar. 1972, p. 332-337. 12 refs. Research supported by the Norwegian Research Council of Science and Humanities.

Study of the tendency of decrease in oxygen (O₂)-consumption per cell with increase in cell concentration during measurements (crowding phenomenon) with the Cartesian diver technique. The theoretical linear relationship between O₂-consumption and the number of cells was found for polymorphonuclear leukocytes (PMN), lymphocytes, and platelets with the standard divers, the capillary type of divers giving the same results as standard divers. However, a marked crowding phenomenon occurred at high numbers

of PMN, lymphocytes, or platelets per diver. An explanation for the crowding phenomenon is probably deficient O₂-equilibration during measurements and not a peculiar phenomenon of PMN or lymphocytes, as has so far been suggested. (Author)

A72-27843 # The voluntary regulation of breathing in man. R. M. Bergstrom, P. K. Halttunen, and A. V. Viljanen (Helsinki, University, Helsinki, Finland). *Acta Physiologica Scandinavica*, vol. 84, Mar. 1972, p. 428, 429. 7 refs.

The voluntary control of both inspiration and expiration has been studied in healthy male subjects using the psychophysical method of category production. The results were compared with those obtained with force of handgrip, which was recorded with a dynamometer. It has been found that expiration and force of handgrip give a similar psychophysical function which is not the case in inspiration. This indicates that inspiration is controlled in a way different from that in expiratory and hand muscles. O.H.

A72-27925 # A qualitative investigation of the dynamics of neuron networks (Kachestvennoe issledovanie dinamiki neuronnykh setei). B. G. Sushkov. In: Studies in the theory of adaptive systems. (A72-27921 12-08) Moscow, Vychislitel'nyi Tsent AN SSSR, 1971, p. 223-266. 8 refs. In Russian.

Differential equations expressing the membrane potential and the neuron threshold are presented. The existence of a solution to these equations and the uniqueness of the solution are demonstrated for different conditions. The behavior of neuron networks consisting of a large number of interacting neurons is illustrated through several examples. These networks are considered in terms of the linear differential equations that describe the change in membrane potential. D.F.L.

A72-27926 # Pathophysiological principles of air and space pharmacology (Patofiziologicheskie osnovy aviatsionnoi i kosmicheskoi farmakologii). P. V. Vasil'ev, V. E. Belai, G. D. Glod, and A. N. Razumeev. Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 17), 1971. 357 p. 1103 refs. In Russian.

A detailed analysis is made of the problems involved in increasing the resistance of the human organism to extremal actions of air and space flights with the aid of pharmacological agents. The possibilities and prospects of using pharmacological agents to reduce nervous and emotional stress, to reduce fatigue effects, and to increase the efficiency of pilots and astronauts under the special conditions of their activity are considered. Data are presented concerning the special features of the pharmacological action of medicinal agents during and after exposure to various flight factors. Pathophysiological justifications of the use of medicinal agents in air and space medicine are also presented. A.B.K.

A72-27953 # Use of moiré fringes for testing visual acuity of the retina. W. Lotmar (Swiss Office of Weights and Measures, Berne, Switzerland). *Applied Optics*, vol. 11, May 1972, p. 1266-1268. 9 refs. Grant No. NIH-EY-00232.

Arrangements for testing retinal visual acuity one by zero order moiré fringes from two diffraction gratings and the other by first order moiré fringes, are described, and their respective visual-acuity testing capabilities are discussed. Two square-wave amplitude gratings, consisting of thin film opaque chromium stripes on a glass base, form the zero-order moiré fringes, while the first-order ones are formed by two photographic gratings obtained by direct exposure to a two-beam interference field. M.V.E.

A72-27961 Blood-pressure transducer. S. K. Kahng (Oklahoma, University, Norman, Okla.). (*Institute of Electrical and*

Electronics Engineers, Transducer Conference, 3rd, Washington, D.C., Oct. 6, 1971.) *IEEE Transactions on Industrial Electronics and Control Instrumentation*, vol. IECI-19, May 1972, p. 54-56.

A piezoelectric blood-pressure transducer has been developed for indirect blood-pressure measurements on a wrist for the clinical environment. Use of a piezoelectric ceramic beam with a relatively high impedance amplifier provides a position-insensitive pressure measurement, which is very much desirable for a long-term measurement. Design and construction techniques are briefly discussed, and performance of the transducer is presented. In addition to the transducer, a warning system for an extreme pressure is presented. (Author)

A72-27963 Human exposure to nonionizing radiant energy - Potential hazards and safety standards. S. M. Michaelson (Rochester, University, Rochester, N.Y.). *IEEE, Proceedings*, vol. 60, Apr. 1972, p. 389-421. 295 refs. AEC-supported research.

Review of the pathophysiology of exposure to ultraviolet, infrared, coherent electromagnetic (laser), microwave, and radio-frequency radiation. Certain biomedical aspects of exposure to these various types of radiation are considered, noting the organs most susceptible to damage by these radiations and the human tolerance threshold for these different radiations. Protection guides that have been established for the different types of radiation are summarized, noting the difficulties that sometimes arise in formulating these guidelines. A.B.K.

A72-28095 Orthopedic applications of biocarbon implants. V. Mooney (Rancho Los Amigos Hospital, Downey, Calif.). In: Materials review for '72; Proceedings of the National Symposium and Exhibition, Los Angeles, Calif., April 11-13, 1972.

Azusa, Calif., Society of Aerospace Material and Process Engineers, 1972, p. IV-B-THREE-1 to IV-B-THREE-7.

Pure carbon materials which have been an outgrowth of aerospace technology present themselves as an excellent biomaterial. Because of the lack of biologic reactivity, these materials have been utilized for infection-free, transcaneous passage and on a preliminary basis for skeletal fixation of prosthetic devices. Appropriate structural design and material availability are the significant problems to be worked out before greater application in clinical practice is available. (Author)

A72-28121 # Modeling the effects of pilot performance on weapon delivery accuracy. C. T. Leondes (California, University, Los Angeles, Calif.) and R. R. Rankine, Jr. (USAF, Institute of Technology, Wright-Patterson AFB, Ohio). *Journal of Aircraft*, vol. 9, Apr. 1972, p. 286-293. 12 refs.

A model of the pilot-aircraft system which can relate the pilot tracking performance attainable with specific aircraft dynamics to the over-all accuracy of tactical weapon delivery is required in order to realistically determine essential flight control system dynamic performance characteristics. The approach taken is to derive a linear expression for projectile impact error in terms of errors in the task variables which are directly under the pilot's control. A statistical model of the propagation of these pilot-induced errors into impact error is then developed by considering each of the pilot inputs to be random variable. An analytical model of the human pilot is used to estimate the tracking error from the flight control system and aircraft dynamics and the turbulence environment. The model is further refined as a result of piloted simulation studies to include important cross-coupling effects. The resulting model represents a method for relating impact accuracy to design of the manual flight control system and provides a technique for comparative evaluation of display, computation, and control aids to the tactical pilot. (Author)

A72-28206 Effect of solar activity on the earth's atmosphere and biosphere (Vliianie solnechnoi aktivnosti na atmosferu i biosferu zemli). Edited by M. N. Gnevyshev (Glavnaia Astronomicheskaiia Observatoriia, Pulkovo, USSR) and A. I. Ol' (Glavnoe Upravlenie Gidrometeorologicheskoi Sluzhby SSSR, Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, Leningrad, USSR). Moscow, Izdatel'stvo Nauka, 1971. 260 p. In Russian.

The effects of solar radiation on climate, vegetation, animals, and man are studied. Emphasis is on the troposphere as an environmental medium having the greatest effect on various forms of life. New details are given on the reactions of human physiological functions to solar activity whose effects are transmitted to the biosphere through the magnetosphere.

V.Z.

A72-28210 # Biological activity of a perturbed geomagnetic field (O biologicheskoi aktivnosti vozmushchennogo geomagnitnogo polia). N. I. Muzalevskaia (Glavnaia Astronomicheskaiia Observatoriia, Pulkovo, USSR). In: Effect of solar activity on the earth's atmosphere and biosphere. Moscow, Izdatel'stvo Nauka, 1971, p. 119-126. 17 refs. In Russian.

Local energy levels and magnetic fluxes of the geomagnetic field are calculated for various types and phases of geomagnetic storms, showing that these variables usually exceed the sensitivity threshold of the human organism when appropriate units are used for measurements in individual sense organs. The feasibility of an effect of geomagnetic storms on humans is believed to be thereby proved in principle, with certain changes in the biological plasma being a likely manifestation of the effects.

V.Z.

A72-28211 # Possible solar activity factors influencing processes in the biosphere (O vozmozhnykh faktorakh solnechnoi aktivnosti, vliiaushchikh na protsessy v biosfere). B. M. Vladimirkii. In: Effect of solar activity on the earth's atmosphere and biosphere. Moscow, Izdatel'stvo Nauka, 1971, p. 126-141. 90 refs. In Russian.

An extensive review of papers concerning the relation between biological processes and solar activity indicates that such a relation becomes apparent only when a biological, or a nonbiological physicochemical system, is in an unsteady state. Various types of biologically active solar radiations are considered in terms of their direct action on biological objects. Particular attention is given to the various biological effects of electromagnetic waves of various frequencies, showing that these effects on the human organism are maximum at frequencies from several tens to several hundreds of Hz or less than several Hz.

V.Z.

A72-28212 # Solar activity and chemical tests (Solnechnaia aktivnost' i khimicheskie testy). G. Piccardi (Firenze, Università, Florence, Italy). In: Effect of solar activity on the earth's atmosphere and biosphere. Moscow, Izdatel'stvo Nauka, 1971, p. 141-147. 13 refs. In Russian.

BiCl₃ hydrolysis tests, conducted systematically since 1951 at Florence, showed that solar activity was one of the factors having impact on the behavior of this highly sensitive heterogeneous nonequilibrium system. The effects of solar activity on the progress of the hydrolysis was apparent both in statistical results and after each individual solar flare.

V.Z.

A72-28213 # A possible molecular mechanism of the effects of solar activity on processes in the biosphere (O vozmozhnom molekuliarnom mekhanizme vliianiia solnechnoi aktivnosti na protsessy v biosfere). L. D. Kislovskii (Akademiia Nauk SSSR, Institut Kristallografii, Moscow, USSR). In: Effect of solar activity

on the earth's atmosphere and biosphere.

Moscow, Izdatel'stvo Nauka, 1971, p. 147-164. 65 refs. In Russian.

Formation, condition and stabilization of metastable structures in water are discussed as a basis for the construction of molecular activation mechanisms induced by solar radiation in water and hydrous molecular systems. The topics include the properties of 'activated water' and activation methods, a molecular mechanism of biological solar activity effects, biological effects of electromagnetic fields, and the effects of instantaneous changes in free calcium ion concentration on biological systems. Biological processes are traced to membrane processes associated with instantaneous drops of active calcium ion concentration in the intercellular plasma during the formation of hexaqua complexes under the action of LF radiation bursts.

V.Z.

A72-28214 # Experimental study of the effect of extremely-low-frequency electromagnetic fields on warm-blooded animals and microorganisms (Eksperimental'noe issledovanie vliianiia elektromagnitnykh polei sverkhnizkoi chastoty na teplokrovnykh zhivotnykh i mikroorganizmy). B. M. Vladimirkii, A. M. Volynskii, S. A. Vinogradov, Z. I. Brodovskaia, N. A. Temur'iants, Iu. N. Achkasova, V. D. Rozenberg, and Zh. D. Chelkova (Krymskaia Astrofizicheskaia Observatoriia, Partizanskoye; Krymskii Gosudarstvennyi Meditsinskii Institut, Sinferopol, Ukrainian SSR). In: Effect of solar activity on the earth's atmosphere and biosphere. Moscow, Izdatel'stvo Nauka, 1971, p. 224-233. 13 refs. In Russian.

Rabbits, adult dogs, pups and some bacteria strains were kept in 0.1 to 8-Hz magnetic fields comparable to a natural magnetic storm field in power. A comparison with control animals showed appreciable changes in the encephalograms, EKGs and blood characteristics of exposed animals. The changes were in accord with those observed in humans during geomagnetic storms.

V.Z.

A72-28215 # Functional state of the central nervous system in dogs reanimated by means of artificial blood circulation after long periods of clinical death by drowning in salt water (Funktsional'nii stan tsentral'noi nervovoi sistemi sobak pri ozhivlenii metodom shtuchnogo krovoobigu pislia trivalikh strokiv klinichnoi smerti vid utoplennia v solonii vodi). A. I. Zaplatkina (Akademiia Nauk Ukrain'skoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 17, Jan.-Feb. 1972, p. 44-49. 11 refs. In Ukrainian.

The electrical activity of the brain in dogs was monitored during the first 13 hr and for longer periods (daily, weekly, and monthly) after reanimation from prolonged (15 to 26 min) clinical death by drowning in salt water (1%-NaCl solution). Reanimation was conducted by artificial circulation of the blood. The continuous electrical brain activity in surviving dogs was formed on a background of restored external respiration and cardiac activity by the end of the first hour after reanimation. Within a day or two, the electrocorticogram of these animals did not differ from normal. Animals with a later restoration of brain activity (more than an hour after reanimation) perished.

T.M.

A72-28216 # Effect of physical stress on hemodynamics in dogs with acute arterial hypertension (Pro vpliv fizichnogo navantazhennia na gemodinamiku u sobak z gostroiu arterial'noiu gipertenzieiu). M. I. Gurevich (Akademiia Nauk Ukrain'skoi RSR, Institut Fiziologii, Kiev, Ukrainian SSR) and T. Mansurov (Andizhans'kii Pedagogichnii Institut, Andizhan, Uzbek SSR). *Fiziologichnii Zhurnal*, vol. 17, Jan.-Feb. 1972, p. 50-56. 24 refs. In Ukrainian.

Physical exercise in dogs with acute arterial hypertension (induced by angiotensin II) resulted in decreased total vascular resistance (TVR) and increased average arterial tension (AAT), cardiac cycle rate (CCR), minute volume (MV), stroke volume (SV), and heart work. The rise in MV, CCR, and heart pumping function in

hypertensive animals is more pronounced than in normal animals. The rise in the minute volume during exercise occurs as a consequence of both an increased stroke volume and an accelerated CCR. However, the degree to which each of the latter two factors affects the minute volume differs in normal and hypertensive animals. SV plays a larger role in normal animals, while CCR plays the more extensive role in increasing the minute volume of hypertensive animals. T.M.

A72-28217 # Influence of ascorbic acid on the coagulogram of dogs with acute hypoxia (Vpiv askorbinovoi kisloti na koagulogramu sobak pri gostrii gipoksii). V. V. Bakans'ka (Grodens'kii Medichnyi Institut, Grodno, Belorussian SSR). *Fiziologichnii Zhurnal*, vol. 17, Jan.-Feb. 1972, p. 106-108. 24 refs. In Ukrainian.

The influence of ascorbic acid on the coagulation and anticoagulation systems of the blood was studied in experiments on dogs with acute hypoxia evoked by 3-hr exposure to an equivalent altitude of 6000 m. Peroral daily ingestion of 20 mg/kg of ascorbic acid for ten days does not affect blood-coagulation and plasma-recalcification times, but reduces the activity of proconvertin and lowers plasma tolerance to heparin both under normal conditions and during hypoxia. A daily intravenous dose of 20 mg/kg for five days reduces blood-coagulation and plasma-recalcification times, increases the fibrinogen content, increases plasma tolerance to heparin, and reduces the activity of proconvertin. These changes are more pronounced under acute hypoxia. T.M.

A72-28218 # Certain problems involving procedures and objective evaluation of rheoencephalogram /REG/ parameters (Deiaki pitannia metodiki i ob'ektivnoi otsinki parametriv reoentsefalogrami /REG/). F. F. Getman, G. I. Kul'baba, and A. A. Novikov (Odes'kii Medichnii Institut, Odessa, Ukrainian SSR). *Fiziologichnii Zhurnal*, vol. 17, Jan.-Feb. 1972, p. 125-127. 7 refs. In Ukrainian.

Automatic differentiation was carried out independently of the rheograph system to provide objective evaluation of the main REG parameter (duration of the anacrotic phase of the rheogram) for disturbed blood circulation in the brain. The design of the two-channel rheographic system coupled to the electroencephalograph permits remote monitoring in an open field of electrical noise without the need for screening. Records are qualitatively almost independent of the electrode material and size, and this feature shows promise in using the system for studies of other vessel areas. T.M.

A72-28251 Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972. 287 p. Members, \$7.00; nonmembers, \$10.00.

Topics discussed include aircrew oxygen systems, the vestibular function, cardiovascular studies, the effects of weightlessness, the effects of vibration and impact, aviation otolaryngology and ophthalmology, the psychological and psychopathological aspects of flight safety, bioinstrumentation techniques and systems, the effects of drugs, the effects of acceleration, hyperbaric biochemistry, studies of thermoregulation, studies of visual perception, studies of hypoxia, cardiopulmonary studies, the Skylab flight medical experiments program, the effects of toxicology, the effects of radiation, decompression effects, and a status report of the Apollo flights viewed from the biological standpoint. A.B.K.

A72-28252 # A proposed new test for improved aptitude screening of applicants for air traffic control training. B. B. Cobb and J. J. Mathews (FAA, Civil Aeromedical Institute, Oklahoma City,

Okl.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 1, 2.

Development and experimental validation of a novel aptitude test for the selection of air traffic control specialist trainees. The test requires the subject to rapidly interpret letters, symbols, and degrees in order to determine: directional headings, the exact opposites of headings, and opposites of headings under conditions of aural distraction. M.V.E.

A72-28253 # Contaminant detector for aviator's breathing oxygen. R. L. Miller, C. E. Robinson, and K. G. Ikels (USAF, School of Aerospace Medicine, Brooks AFB, Texas). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 6, 7.

Discussion of the analytical requirements and development of an aviator's breathing oxygen analyzer and contaminant detector. Two approaches currently under development are described. One approach is based on gas chromatography and the other on the use of a commercially developed portable infrared analyzer. M.V.E.

A72-28255 # Arterial blood gas tensions using phased dilution oxygen delivery technics. W. J. Sears, R. W. Krutz, S. E. Poppell, and R. W. Bancroft (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 10, 11.

A sequential phased-dilution oxygen delivery system, that first delivers a volume of oxygen at the beginning of each inspiration and then follows it up by air, is studied in an experiment with five anesthetized dogs, as part of an effort to develop the most effective and economical method of oxygen delivery to an aviator. It is found that this system produces a higher arterial oxygen tension and is more economical than a system which delivers the same volumes of oxygen and air thoroughly mixed. M.V.E.

A72-28256 # The brief vestibular disorientation test as an assessment tool for non-pilot aviation personnel. R. K. Ambler and F. E. Guedry, Jr. (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 14, 15.

Extension of the brief vestibular disorientation test (BVDT) technique for use in assessing potential naval flight officers (NFO) or nonpilot airborne technical specialists. The rater BVDT procedure was used on 116 entering NFO students with emphasis on a performance task. The results show the performance task approach to be a productive one. M.V.E.

A72-28257 * # The relationship between motion sickness experience and vestibular tests in pilots and nonpilots. B. Clark (San Jose State College, San Jose, Calif.) and J. D. Stewart (NASA, Ames Research Center, Moffett Field, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 16, 17. 9 refs. Grant No. NGL-05-046-002.

The contribution of the vestibular system to motion sickness experience is studied by means of an attempt to determine the relationship between five subjective tests of vestibular function and reports of motion sickness experiences by pilots and nonpilots. The experimental procedure is described and the obtained results are discussed. M.V.E.

A72-28258 # The influence of vision on susceptibility to acute motion sickness studied under quantifiable stimulus-response conditions. W. J. Oosterveld, A. Graybiel, and D. B. Cramer (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints.

Washington, D.C., Aerospace Medical Association, 1972, p. 18, 19. 6 refs.

Experimental study of the influence of vision on the elicitation of motion sickness in a slow rotation room. The experimenter had thorough control over the stressful accelerations, and collaboration between subject and observers, in grading levels of motion sickness severity, was facilitated. Of 24 subjects tested, 19 were more susceptible to motion sickness with their eyes open, 3 were more susceptible with their eyes covered, and in 2 the susceptibility was the same under each condition. M.V.E.

A72-28259 * # Correlation between five measures of vestibular function for airline pilots. J. D. Stewart (NASA, Ames Research Center, Moffett Field, Calif.) and B. Clark (San Jose State College, San Jose, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints.

Washington, D.C., Aerospace Medical Association, 1972, p. 20, 21. 11 refs.

Experimental study of the relationships among five subjective measures of semicircular canal function for 18 airline pilots, using the Ames man-carrying rotation device. Thresholds, aftereffects, and power functions found are compared and interpreted. M.V.E.

A72-28260 # Pilot tracking performance during successive in-flight simulated instrument approaches. P. G. Rasmussen and A. H. Hasbrook (FAA, Stress Physiology Laboratory, Oklahoma City, Okla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints.

Washington, D.C., Aerospace Medical Association, 1972, p. 23, 24.

Evaluation of the practical limits of tracking accuracy based on the glide slope and localizer tracking behavior of a group of instrument rated pilots practicing an extended series of successive approaches. The results were examined to determine if the accrued practice resulting from successive approaches led to more consistent performance. No significant differences were found. M.V.E.

A72-28261 # Effect of a general aviation simulator on the stress of flight training. C. E. Melton, Jr., S. M. Hoffmann, J. R. Kelln, and J. T. Saldivar, Jr. (FAA, Stress Physiology Laboratory, Oklahoma City, Okla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints.

Washington, D.C., Aerospace Medical Association, 1972, p. 25, 26.

Experimental study of the effect of flight simulators on the stress of learning to fly. The results show that substitution of simulator training for 11 of 32 flights led to flight performance essentially equal in quality to that of students trained exclusively in an airplane. Training in a simulator, however, involved less stress than training in actual flight. M.V.E.

A72-28262 # A new approach to criterion development in the replacement air group/RAG/. W. L. Waag, R. H. Shannon, and J. C. Ferguson (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints.

Washington, D.C., Aerospace Medical Association, 1972, p. 27, 28.

Experimental study designed to lead to a selection of a small set of scored maneuver items that would make it possible to discriminate among the 'above average,' 'average,' and 'below average' students as defined by their overall replacement-air-group (RAG) grade. The results obtained are presented in terms of zero-order correlations between item scores and RAG grades. M.V.E.

A72-28263 # The relationship between anxiety and success in the naval flight program. S. F. Bucky (U.S. Naval Aerospace Medical Center, Aerospace Medical Institute, Pensacola, Fla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints.

Washington, D.C., Aerospace Medical Association, 1972, p. 29, 30.

Anxiety in naval aviation students and its relation to their success or failure were investigated on 316 aviation officer candidates. The results obtained indicate that there is a relationship between anxiety and the completion of the flight training program. Those students who were more anxious during the first week of training were more likely to drop out of the program than the less anxious students. Yet, a minimal amount of anxiety seems necessary for a successful completion of the training program. M.V.E.

A72-28264 # Measures of cardiovascular risk. J. H. Chadwick (Stanford Research Institute, Menlo Park, Calif.) and E. Podolak (FAA, Office of Aviation Medicine, Oklahoma City, Okla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints.

Washington, D.C., Aerospace Medical Association, 1972, p. 31, 32.

The application of a general method for defining algorithms of optimum content and form to a study of more than 300 cardiovascular-risk variables in 456 subjects is reviewed. The study group included a large number of pilots and other types of air transport personnel. The underlying concepts, some of the techniques used, and the results obtained are discussed. M.V.E.

A72-28265 # The use of simple indicators for detecting potential coronary heart disease susceptibility in the air traffic control population. M. T. Lategola (FAA, Stress Physiology Laboratory, Oklahoma City, Okla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints.

Washington, D.C., Aerospace Medical Association, 1972, p. 33, 34.

Discussion of an economical approach to the problem of meeting the need for medical vigilance in the detection of silent forms of coronary heart disease (CHD) and in controlling the thereto related hazards of sudden unpredictable airman incapacitation, as an alternative to a comprehensive annual examination of 487,000 airmen at a cost of nearly 48.7 million dollars per year. The proposed approach is based on the assumption that, in accordance with the findings of the Framingham heart study, a logical initial focus for comprehensive cardiological examination should be the oldest/most obese individuals in whom the Framingham parameters are most indicative of the highest relative CHD susceptibility. An analysis of pertinent data from 23,826 male ATC personnel is briefly described and discussed for illustration of the proposed approach. M.V.E.

A72-28266 # Red cell mass plasma volume changes found in selected Apollo missions. P. C. Johnson (Methodist Hospital, Houston, Tex.) and T. B. Driscoll (Baylor University, Houston, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints.

Washington, D.C., Aerospace Medical Association, 1972, p. 36, 37.

Review of red cell mass determinations on Gemini and Apollo

mission crews, using Cr-51 red cells and performed 15 days before mission, within two hours after splashdown, and 7 and 14 days after mission. Greater red cell mass decreases were found in the Apollo missions which used the lunar module than in those which did not. Inhibition of erythropoiesis is suggested as the probable cause of the red cell mass decrease. M.V.E.

A72-28267 # Metabolic and hormonal effects of prolonged hypo-dynamics. H. Saiki, M. Nakaya, and H. Mizunuma (Tokyo Jikei-kai University, Tokyo, Japan). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 38, 39. 5 refs.

The metabolic and hormonal effects of water immersion (head out) lasting 1 to 6 days are reported, with special attention to diurnal and nocturnal differences in circadian rhythms and adaptations to the unusual environment. The results of the study suggest the development of a hormonal response adaptation in the 4th to 5th day of the water immersion period. M.V.E.

A72-28268 # Biothermal response of the rhesus monkey to mechanical vibration. A. B. Broderson (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 41, 42.

Prolonged mechanical vibration is shown to increase core temperature in the rhesus monkey by about 0.5 C. Dissipation by friction is suggested as the probable mechanism of this 'heating' response. Sternal-skin temperature decreases and rapid changes at vibration onset and cessation indicate the possibility of neurally mediated peripheral clamping. Similar vibration-induced core temperature responses in man may be apparent during stress, fatigue, or prolonged exercise and should be considered in evaluations of a pilot's performance during flight missions involving prolonged exposure to buffeting. M.V.E.

A72-28269 # Effect of angular oscillation in yaw on vision. A. J. Benson (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 43, 44.

Experimental demonstration of the importance and limitations of vestibular reflexes in preserving visual acuity during angular oscillations of the head. These reflexes are shown to stabilize the angular position of the eye relative to an object which does not move with the observer. Thus, the vestibularly driven eye movements preserve primarily the aviator's acuity for targets outside the aircraft, rather than for instruments within the aircraft. However, in situations where structural vibration induces movement of the aviator's head relative to the cockpit instruments, vestibulo-ocular compensation for the angular component of motion will certainly aid vision. M.V.E.

A72-28270 # Mechanical impedance of supine humans under sustained acceleration. L. Vogt, H. Krause, H. Hohlweck, and E. May (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany; USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB; Dayton, University, Dayton, Ohio). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 45, 46. 5 refs. Research

supported by the Bundesministerium für Bildung und Wissenschaft.

Experimental study of the dynamic properties of the supine human body under a combined stress of steady-state vibration and sustained acceleration. A three-degree-of-freedom model for the supine human body, based on the results and findings of the study, is proposed. M.V.E.

A72-28271 * # A model for predicting aortic dynamic response to -G sub z impact acceleration. S. H. Advani, T. J. Tarnay, E. F. Byars (West Virginia University, Morgantown, W. Va.), and J. S. Love (Clemson University, Clemson, S.C.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 47, 48. Grants No. NIH-5-R01-HE-11345; No. NGL-49-001-001.

A steady state dynamic response model for the radial motion of the aorta is developed from in vivo pressure-displacement and nerve stimulation experiments on canines. The model represented by a modified Van der Pol wave motion oscillator closely predicts steady state and perturbed response results. The applicability of the steady state canine aortic model to tailward acting impact forces is studied by means of the perturbed phase plane of the oscillator. The backflow through the aortic arch resulting from a specified acceleration-time profile is computed and an analysis for predicting the forced motion aortic response is presented. G.R.

A72-28272 # Biomedical responses of humans to 110 through 175 knot /IAS/ aerial tow. D. H. Reid, J. T. Matsuo, and D. G. Ellertson (U.S. Navy, Naval Aerospace Recovery Facility, El Centro, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 49, 50. Research supported by the Bureau of Medicine and Surgery, U. S. Air Force, and U. S. Navy.

Seventeen aerial tows utilizing three volunteer naval test parachutists were conducted between April 1971 and January 1972. The data obtained indicate that the parachutist subjects can withstand being towed behind aircraft at 150 knots in the face-to-airstream attitude for a mean duration of 17 minutes while maintaining aerodynamic stability. In the back-to-airstream attitude, mean duration of tow was 8 minutes at 150 knots with the subjects finding it difficult to prevent potentially dangerous autorotation about the longitudinal axis. G.R.

A72-28273 # The man-machine interface - A study of injuries incurred during ejection from U.S. Navy aircraft. E. V. Rice and E. H. Ninow (U.S. Navy, Naval Safety Center, Norfolk, Va.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 51, 52.

A review of U.S. Navy operational ejections revealed that 32% of the ejection survivors sustained injury during egress, 11% sustained injury in the air, and 11% were injured on impact with the terrain. Although 120 of the 501 nonfatal ejectees sustained egress injuries, only 25% of this number were classified as major. The distribution of major egress injuries shows 27 vertebral fractures. It appears that the basic cause of most egress injuries is poor body position. G.R.

A72-28274 # Aeromedical considerations in the management of paranasal sinus barotrauma. J. P. Smith and D. E. Furry (U.S. Naval Aerospace Medical Center, Aerospace Medical Institute, Pensacola, Fla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 55, 56.

The incidence of sinus barotrauma in personnel undergoing altitude training during a 10-year period in the U.S. Navy was 1.16%. At the Naval Aerospace Medical Institute the incidence of sinus barotrauma during a subsequent 3-year period was 1.24%. During a 6-month period a clinical study of 29 patients experiencing sinus barotrauma during altitude training was conducted. Radiographic evidence of significant pathology was demonstrated in 83.3% of these patients. G.R.

A72-28275 # Aeromedical significance of frontal sinus hematomas. R. S. Green and B. W. Weissman (USAF, Medical Center, Lackland AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 57, 58.

The clinical correlation of a recent series of 13 cases of frontal sinus hematomas is discussed. The patients were 12 aviators and one scuba diver. The medical treatment of the disease is discussed. All 12 flyers were returned to flying status after a successful altitude chamber ride. However, four had further sinus problems after returning to the cockpit and were medically eliminated. It is pointed out that frontal sinusitis and frontal sinus hematomas in aviators continue to be a cause of lost flying time and should be of medical concern among flight surgeons and otolaryngology consultants. G.R.

A72-28276 # A feasibility study of the use of ear protectors in aircraft. V. C. Bragg and R. Danford, Jr. (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 59, 60.

Two methods for obtaining pressure equalization with a standard USAF insert device, the V-51R plug, are discussed. The first involved perforation of the plug's septum and insertion of a small polyethylene tube to assure that the channel would remain open. The second procedure consisted of making one or multiple slits through the septum, providing a valve which, it was hoped, would open during changes in altitude and remain closed at all other times. G.R.

A72-28277 * # C14-radiorespirometry system for astronaut medical monitoring. D. D. Feller, E. D. Neville, K. S. Talarico, A. O. Cole, and J. A. DeGrazia (NASA, Ames Research Center, Environmental Biology Div., Moffett Field; Stanford University, Stanford, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 62, 63.

A C14-CO2 radiorespirometry-computer system for monitoring human metabolism during space missions is described. Data collection using this apparatus is an effective 'real time' system allowing rapid, low-cost data processing which is ideal for telemetering signals from spacecraft to earth. O.H.

A72-28278 # An ear oximeter for use on the human centrifuge. W. R. Peters and E. D. Michaelson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 66, 67.

Description of an ear oximeter designed primarily for estimation of blood oxygen saturation of human subjects during increased g-loads. It is a two-wavelength transmittance apparatus which uses a fiber optic bundle to carry the transmitted light from the lightweight earpiece to a photodetector in the instrumentation module. O.H.

A72-28280 # Microbiology in zero gravity - Design considerations and zero gravity experiments. H. D. Freudenthal, P. Cooper, and G. Greenstein (Fairchild Industries, Inc., Fairchild Republic Div., Farmingdale, N.Y.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 73, 74.

Discussion of the design considerations underlying a modular microbiology laboratory which makes it possible to perform specific microbiological procedures consistent with the constraints imposed by the nature of a manned space vehicle. Some zero gravity experiments carried out to investigate the unknown behavior of microbial culture systems are also briefly described. O.H.

A72-28281 # Dynamic electrocardiography and computer analysis. W. H. Walter, III, E. D. Grassman, E. J. Engelken, and M. C. Lancaster (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 75, 76.

It is shown that supraventricular and ventricular premature contractions can easily be overlooked during manual scanning of continuous 6-8 hour tape-recorder electrocardiograms. In an effort to accurately detect, count, and classify atypical ventricular depolarization complexes, an analog computer program has been developed which will not only count each ventricular complex, but will activate a high-speed oscillograph when a premature beat occurs. O.H.

A72-28282 # Quantitative stress vectorcardiography. F. G. Yanowitz, J. E. Douglas, H. N. Kiser, D. E. Stowe, and M. C. Lancaster (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 77, 78.

An attempt has been made to develop a more quantitative analysis of the ECG response to the treadmill exercise test. The purpose was to establish criteria for the diagnosis of an abnormal test at an earlier stage of coronary heart disease than is now possible with current techniques. The vectorcardiographic approach has been taken to facilitate analysis of the repolarization forces in three-dimensional space. Some early results are illustrated. O.H.

A72-28283 # Decompression sickness in USAF operational flying, 1968-1971. S. T. Lewis (USAF, Inspection and Safety Center, Norton AFB, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 80, 81.

During the last four years, 13 cases of gas decompression sickness were recorded in USAF operational flying. In seven of these cases, simple bends only occurred, whereas the six remaining cases involved central nervous system symptoms. A study was conducted to examine the causes of this sickness, the severity of reactions, and the treatment required. O.H.

A72-28284 # Pilot incapacitation - An expression of convergent factors. P. Bartek and J. G. Gaume (Douglas Aircraft Co., Long Beach, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 82, 83, 5 refs.

A mathematical expression has been developed for pilot incapacitation. The expression is applied to actual incapacitation

data obtained from high-stress/short duration encounters with environmental problems. The results are summarized tabularly, and point out the relationship of the relative physiological limit and physiological load imposed by an incapacitating stress for a given time. O.H.

A72-28285 * # Splanchnic blood flow and plus or minus Gx acceleration. H. L. Stone (Texas, University, Galveston, Tex.), H. Erickson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.), and H. Sandler (NASA, Ames Research Center, Moffett Field, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 85, 86.

Experimental data show that there is a neurogenic response to acceleration stress in the front to back direction and that this response is intensified during higher accelerative forces. The afferent limb of this response is unknown but possibilities are suggested. The integrated response at high acceleration levels might serve to conserve oxygen during the stress time. The effector limb is the constriction of less critical vascular beds to preserve blood flow to the heart and brain. The concomitant increase in vagal activity causes a slowing down of the heart. D.F.L.

A72-28286 # Pulmonary capillary blood flow of human subjects in different body positions. G. Meineri (Italian Air Force, Aerospace Medical Center, Rome, Italy). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 87, 88.

Nine healthy male subjects (age 22-45) were submitted to capillary blood flow determination in three successive body positions: supine, head up (plus 60 deg), and head down (minus 60 deg). A gravitational stress of .86 g along the Z axis and .5 g along the X axis was imposed by the 60-deg angulation. Results show that variations in the gravitational field during these experiments have an effect on both capillary blood flow and stroke volume. This method of testing ascertains the fact that, in general, changes of capillary blood flow per minute are due to changes in stroke volume, since heart rate undergoes changes in the opposite direction. D.F.L.

A72-28287 # Blood oxygenation in man during high, sustained +Gz. E. D. Michaelson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 89, 90. 7 refs.

Male human subjects were centrifuged in the sitting position at 1, 3, 5, and 7 g levels of positive acceleration in the z axis. Acceleration onset was 1 g per second, and the plateau was maintained for 45 sec. Tidal CO₂ tension, arterial saturation, tidal volume respiratory rate, and heart rate were measured, and results are given in tabulated form. D.F.L.

A72-28288 # Involuntary head movements, and helmet motions during centrifuge runs of up to 6 Gz. K. H. E. Kroemer and K. W. Kennedy (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 91, 92.

Open-loop centrifuge runs reaching +6 g in the z axis were performed with 13 subjects wearing two different types of helmets: the foam-padded standard HGU-2A/P, and the Gentex 129-2 with adjustable web suspension. Helmets were loaded both symmetrically

and asymmetrically with weights up to 40 ounces. Voluntary head motions were eliminated through the use of a visual target. Helmet and head positions were recorded photographically at each g level. Results for both helmet and head displacements are given, and show that head rotations are essentially the same for asymmetrical loadings as for symmetrical loadings. D.F.L.

A72-28289 # The effects of intermittent noise on human serial decoding performance and physiological response. D. W. Conrad and R. G. Pearson (North Carolina State University, Raleigh, N.C.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 95, 96.

Sixteen university students, pretested for visual and aural acuity, were subjected to three types of noise stimuli: periodic, continuous, and aperiodic white noise. The noise stimuli were imposed intermittently in order to investigate a predicted differential decremental effect of intermittent noise over continuous noise. The performance test used was an externally paced, rapid serial decoding task. The physiological variables recorded were finger photoplethysmographic blood volume pulse amplitude, pulse rate, and forearm electromyogram. The study demonstrated that a subjective measure of noise annoyance sensitivity could be used to predict autonomic responses under exposure to intense auditory stimulation. D.F.L.

A72-28290 # Influence of workload patterns during the letdown, approach and landing of a Boeing 707 on nervous activity of the pilot. A. N. Nicholson, R. G. Borland, L. E. Hill, and W. J. Krzanowski (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 97, 98.

Studies were carried out to explore the possibility that the ultimate neurological change associated with approach and landing can be modified by changes in preceding workload. Results of the studies suggest that the rr interval at touchdown can be increased by changes in preceding workload. Reduced workload preceding the final part of the approach is not effective unless it is extended well into the approach. In the case of low workload let downs, shared and coupled approaches to 500 feet seemed to have similar effects on rr interval at touchdown. Shared approaches also increase the rr interval of more difficult landings, whereas coupled approaches are not applicable to the same situation. D.F.L.

A72-28291 # The impact of modern equipment design on the functions and responsibilities of the Naval Flight Officer. J. B. Shelnut, R. H. Shannon, and W. F. Clisham, Jr. (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, Fla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 99, 100.

This paper offers opinions and conclusions regarding the expansion of the Naval Flight Officer's (NFO) functions as a result of modern equipment design. The increase in weapons capabilities and range, through an increase in sensor capabilities, has enlarged the tactical profile, thereby increasing the duties of the NFO. In addition, more information is available for use in an increasing number of options. D.F.L.

A72-28292 # The USAFSAM cardiovascular disease follow-up study - 1972 progress report. D. A. Clark, M. F. Allen, and F. H. Wilson, Jr. (USAF, School of Aerospace Medicine, Brooks AFB,

Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints.

Washington, D.C., Aerospace Medical Association, 1972, p. 105, 106.

The purpose of the study is to obtain information on the relationship of various lipid components of the blood to the occurrence of atherosclerotic heart disease. Graphs show the mean cholesterol and phospholipid levels and the mean serum lipoprotein levels in subjects for the years 1952-1970. Although results are not conclusive, they provide a solid data base which may be used to adequately characterize significant cardiovascular developments among the subjects as these events occur during the coming years.

D.F.L.

A72-28293 # Primary prevention of atherosclerotic cardiovascular disease among the SABENA flying personnel. P. Anet, H. Brouns, A. Delescluse, J. Malcolm, and K. G. Van den Abbeele (SABENA, S.A., Brussels, Belgium). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 107, 108.

From 1969 to 1970, 32 individuals of the SABENA flying personnel were treated with clofibrate, and 29 others were considered as a control group. All persons had been under medical surveillance for at least ten years. Definite reductions in cholesterol and beta lipoprotein levels were noted after clofibrate treatment, and it is stressed that patients should be treated indefinitely with the drug.

D.F.L.

A72-28294 # Cardiac rhythm disturbances in flying personnel. A. Dietz and H. W. Kirchhoff (Bundesministerium der Verteidigung, Luftwaffe, Flugmedizinisches Institut, Fürstfeldbruck, West Germany). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 109, 110.

Individuals with no sign of severe cardiac damage showed cardiac rhythm disturbances when subjected to a flight fitness examination. ECGs showed the frequency of the arrhythmias, as well as the type and range of variation among the examinees. Certain criteria stemming from clinical experience and used to assess rhythm disturbances are questioned.

D.F.L.

A72-28295 * # +Gz tolerance after 14 days bed rest and the effects of rehydration. J. E. Greenleaf, W. van Beaumont, E. M. Bernauer, R. F. Haines, H. Sandler, H. L. Young, and J. W. Yusken (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 112, 113. 10 refs.

Measurement of the reduction in centrifugation tolerance after two weeks of bedrest with moderate daily exercise, with an attempt to determine if rehydration improves +Gz tolerance. There were significant reductions in +Gz tolerance during bedrest periods at three acceleration levels. Rehydration resulted in a significant increase in tolerance at 2.1G but it did not restore tolerance to control levels. Rehydration did not affect tolerance at 3.2G and 3.8G.

F.R.L.

A72-28296 * # Comparative changes in plasma protein concentration, hematocrit and plasma volume during exercise, bedrest and + Gz acceleration. W. van Beaumont (St. Louis University, St. Louis, Mo.) and J. E. Greenleaf (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.). In: Aerospace Medical

Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 114, 115.

Discussion of experiments which indicate that under conditions of a constant red cell volume the proportional changes in hematocrit and plasma volume during exercise are never equal. On the basis of direct measurements and calculated changes of plasma volume it is concluded that during maximal exercise there is a small loss of protein from the plasma. It is clear that changes in content of blood constituents can only be evaluated correctly after determination of changes in plasma volume.

F.R.L.

A72-28297 * # Effect of bedrest and positive radial acceleration upon peripheral visual response time. R. F. Haines (NASA, Ames Research Center, Moffett Field, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 116, 117. 7 refs.

Attempt to determine if peripheral visual response time (RT) could be used as a reliable advanced predictor of +G sub z-related blackout or grayout. The relatively high luminance of the peripheral stimuli used in the experiments may account for the finding that peripheral RT was not sensitive to impending blackout or grayout. The relatively consistent mean RTs within subjects across test days in bed is probably due to the relatively constant response characteristics of the retina and to the high repeatability of the stimuli.

F.R.L.

A72-28298 # Effects of hyperoxic breathing gases on blood cell formation. B. Richardson, S. R. Jaskunas, and E. J. Stork (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 122, 123.

Assessment of the effect of oxygen on red blood cell (RBC) production following blood loss. Rats were bled of 10 to 20% of their blood volume and exposed to either air or pure oxygen. Results indicate that hyperoxia suppresses the production and repopulation of RBCs following blood loss, and suppresses the production of the erythropoietin hormone. It appears that the primary mechanism by which hyperoxia suppresses erythropoiesis and the consequent decline in RBC mass is due primarily to the suppression of the hormone production, rather than to any direct effect of oxygen on bone marrow stem cells.

F.R.L.

A72-28299 # Growth responses of Paramecium caudatum to hypo- and hyperbaric environments - Induction of cellular tolerance to hyperbaric oxygen pressures. S. S. Wilks (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 124, 125.

Attempt to observe and measure some of the physiological and biochemical responses of a protozoan ciliate to hypo- and hyperbaric stresses, and to elucidate some of the mechanisms involved in protoplasmic inactivation by high oxygen pressure (HOP). A primary factor in determining the tolerance of organisms to HOP appears to be the composition and architecture of the plasma membrane. The membrane potential (electrical) may be the primary factor governing the flux equilibrium between the cell and its environment.

F.R.L.

A72-28300 # Seizures, H₂O₂ formation, and lipid peroxides in brain during exposure to oxygen under high pressure. S. A. Jerrett (Missouri, University, Columbia, Mo.). In: Aerospace Medical As-

sociation, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 127, 128.

Attempt to determine if hydrogen peroxide occurs in brain during exposure to oxygen under high pressure (OHP) and if it has any relation to lipid peroxidation and seizures, and to study any morphologic alterations that acute exposure to OHP causes in brain. Results of tests on mice indicate that brain damage during OHP may be due to the direct peroxidation of cell membrane lipid by oxygen leading to rupture of double bonds to form free peroxide radicals. Light microscopy revealed no lesions in the brains of mice with multiple hyperoxic seizures. F.R.L.

A72-28301 * # Effect of bedrest on thermoregulation. B. A. Williams and R. D. Reese (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 140, 141.

Attempt to determine what changes occur in the thermoregulatory control system during the simulated weightlessness of prolonged bed rest, as determined by measurement of the onset of sweating in response to an imposed heat load. The threshold for sweating occurred at a lower mean skin temperature and the normal vasodilation response appears to be impaired slightly. It is possible that the result of bed rest is to decrease the circulatory capability of the body (autonomic dysfunction) and the effect on the thermoregulatory system, therefore, is to decrease vasomotor heat loss capability. F.R.L.

A72-28302 # Effect of environmental temperature on motion sickness sweating. J. A. McClure (Toronto, University; St. Michael's Hospital, Toronto, Canada) and A. R. Fregly (U.S. Navy, Naval Medical Research Laboratory, Pensacola, Fla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 144, 145.

Experimental demonstration that a temperature can be selected that will result in a sweat/NI (nausea indication) ratio of less than one. At such a temperature sweating will always occur prior to NI, and the sweat response thus becomes an early indicator of motion sickness and a predictor of NI and other more discomforting symptomatology. F.R.L.

A72-28303 # Physiological effects of backscatter of high intensity light pulses on the human pilot. A. R. Zeiner, G. A. Brecher (Oklahoma, University, Norman, Okla.), and S. J. Gerathwohl (FAA, Washington, D.C.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 148, 149.

Attempt to determine the effects of brief high intensity light pulses from an anticollision light flashing at 1.27 Hz on a variety of physiological measures in a normal nonpileptic population. Since the subjects in the first experiment were not pilots, the experiment was repeated using instrument-rated pilots as subjects as well as an age-matched control group of nonpilots. The actual backscatter conditions were simulated more closely by using backscatter from manmade fog as a stimulus. Results indicate that physiological changes which are resistant to habituation take place under intense brief pulses of backscatter light. F.R.L.

A72-28304 # An investigation of the relationship between nystagmus eye movements and the oculogyral illusion. M. D. Yessenow (New York, State University, Genesco, N.Y.). In: Aero-

space Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints.

Washington, D.C., Aerospace Medical Association, 1972, p. 150, 151. Investigation of the hypothesis which states that if nystagmus is the cause of the oculogyral illusion (OGyl), then the velocity of the perceived movement should be directly related to the velocity of the eye movement present while the subject views the stimulus. The subjects were trained to make quantitative estimates of the velocity of stimuli moving across their visual fields. They then received vestibular stimulation after which they made velocity estimates of the OGyl. These estimates were compared with the velocity of the nystagmus recorded while the subject viewed the target. Results indicate that the hypothesis which states that the OGyl is caused by vestibularly induced nystagmus is not supported. F.R.L.

A72-28305 # Proprioceptive and otolith variables in the perceived elevation of visual targets. M. M. Cohen (U.S. Naval Material Command, Air Development Center, Warminster, Pa.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 152, 153. 8 refs.

Attempt to separate the effects of neck proprioception and otolith organ activity in the perceived elevation of a visual target. The NADC human centrifuge was used to generate various gravitational-inertial forces (GIFs). The experiments were performed on subjects with previous experience in the centrifuge. Particularly important aspects of the data are that the target appears lower when the head is tilted forward than when it is erect, and that the rate at which the apparent elevation of the target changes as a function of G sub z is reduced as the head is tilted forward on the trunk. These effects may be attributed partly to altered activity of the otolith organs and partly to altered activity of proprioceptors in the neck. F.R.L.

A72-28306 * # Circadian rhythms of visual accommodation responses and physiological correlations. M. R. Murphy, R. J. Randle, and B. A. Williams (NASA, Ames Research Center, Moffett Field, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 154, 155. 7 refs.

Use of a recently developed servocontrolled infrared optometer to continuously record the state of monocular focus while subjects viewed a visual target for which the stimulus to focus was systematically varied. Calculated parameters from recorded data - e.g., speeds of accommodation to approaching and receding targets, magnitude of accommodation to step changes in target distance, and amplitude and phase lag of response to sinusoidally varying stimuli were submitted to periodicity analyses. Ear canal temperature (ECT) and heart rate (HR) rhythms were also recorded for physiological correlation with accommodation rhythms. HR demonstrated a 24-hr rhythm, but ECT data did not. F.R.L.

A72-28307 # Self-estimates of distractibility as related to lapses of attention during perceptual-motor performance. R. I. Thackray, K. N. Jones, and R. M. Touchstone (FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 156, 157.

Investigation of whether subjects who differed in self-rated susceptibility to distraction also differed in their ability to sustain performance on a task (serial reaction) which, although requiring continuous perceptual-motor discrimination, rapidly becomes repetitive and monotonous. The study also examines changes in certain psychophysiological measures during the performance session

which are believed to reflect shifts in attention or arousal. Results indicate that individuals who rate themselves high in susceptibility to distraction show evidence of a progressive decline in the ability to sustain attention under monotonous task conditions, while individuals who rate themselves low in distractibility are able to sustain relatively constant performance levels. F.R.L.

A72-28308 # Human exposure to Halon 1301 /CB₂F₃/ during simulated aircraft cabin fires. D. G. Smith and D. J. Harris (U.S. Naval Air Test Center, Patuxent River, Md.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 160, 161. Navy-sponsored research.

Study of the effects on human beings of Halon 1301, a fire suppression agent to be used in occupied cabin areas. Flight tests were conducted at cabin pressure altitudes from sea level to 20,000 ft. Human exposure to the agent for 3 min at reduced atmospheric pressures in concentrations up to 7% Halon 1301 in air may be accomplished with no adverse biomedical effects. The distribution system and quantity of agent must be carefully tailored for each type of installation. F.R.L.

A72-28310 # Effect of hypoxia on aircraft pilot performance. R. E. Gold and L. L. Kutak (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 164, 165.

Use of sensitive methods of measuring system error, utilizing qualified pilots in both real aircraft and aircraft simulators to determine the effects of hypoxia in the critical 12,000 to 15,000 ft region. Two consecutive experiments were run, the first using air and a gas mixture of 13% oxygen with the remainder nitrogen, and the second using air and a gas mixture of 11.4% oxygen and the remainder nitrogen. It is considered that the results indicate the need for supplemental oxygen at or above 12,000 ft for any crew member involved in a complex or dangerous task. F.R.L.

A72-28311 # Tolerance of physically fit young men to exercise and graded levels of inspired PCO₂ up to 40 mm Hg. R. D. Sinclair, J. M. Clark, and J. B. Lenox (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 166, 167.

Results of an exercise-CO₂ combined stress study designed to extend previous observations by determining the physiologic and subjective responses of a larger group of subjects to wider ranges of experimental variables. Major attention is given to general aspects. It is indicated that well conditioned young men approach physiologic and subjective tolerance limits during very heavy exercise with an inspired P sub CO₂ level of 40 mm Hg. F.R.L.

A72-28312 # The EEG and controlled hyperventilation. G. H. Byford, A. E. Hay (RAF, Institute of Aviation Medicine, Farnborough, Hants., England), and P. J. O'Connor (Central Medical Establishment, London, England). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 168, 169.

Definition of hyperventilation, with its severity continuously controlled as explained by Stoddart (1965). The electroencephalogram (EEG) is analyzed during an analog technique described by Byford (1965). The time course of activity in the several EEG frequency bands is displayed on an xy plotting table. F.R.L.

A72-28313 * # Autonomic control of cardiac function and myocardial oxygen consumption during hypoxic hypoxia. H. H. Erickson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.) and H. L. Stone (Texas, University, Galveston, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 170, 171. NASA-supported research. NASA Order A-94544.

Investigation in 19 conscious dogs of the importance of the sympathetic nervous system in the coronary and cardiac response to altitude (hypoxic) hypoxia. Beta-adrenergic blockade was used to minimize the cardiac effect associated with sympathetic receptors. It is shown that the autonomic nervous system, and particularly the sympathetic nervous system, is responsible for the increase in ventricular function and myocardial oxygen consumption that occurs during hypoxia. Minimizing this response through appropriate conditioning and training may improve the operating efficiency of the heart and reduce the hazard of hypoxia and other environmental stresses, such as acceleration, which are encountered in advanced aircraft systems. F.R.L.

A72-28314 # Cardiorespiratory response to breathing dense gas at exercise with imposed mechanical airway resistance. R. R. Uhl, P. L. Hendricks, J. Merz, D. B. Arkin, and G. L. Miller (California, University; U.S. Navy, San Diego, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 174, 175.

Development of a protocol simulating the ventilation requirement, which increases with resistance, density, and work. The simulation is effected by breathing 80% sulfur fluoride and 20% oxygen at ambient pressure through resistive apparatus while performing work. The mixture is 4.3 times as dense as air, and as dense as helium-oxygen diving mixtures at 1000 ft. Respiratory failure occurs during such conditions, with hypercarbia, hypoxemia, acidosis, and extremely labored breathing. It was found that extremely well trained athletes could tolerate the combined effects of 500 kgM/min work while breathing the mixture with moderate mechanical airway resistance. F.R.L.

A72-28315 # Aircraft accidents/incidents among aircrewmembers flying with medical waiver. R. B. Rayman (USAF, Inspection and Safety Center, Norton AFB, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 186, 187.

Review of all USAF aircraft accidents/incidents during the 1962 through 1970 period in which the pilot or navigator was flying with a medical waiver granted with reasonable assurance that flying safety has not been compromised. Of 447 aircrewmembers with medical waivers involved in accidents/incidents, only 33 (or about 7%) were thought to have a waived medical condition which was a contributory factor. F.R.L.

A72-28316 # USAF aeromedical consult service experience in causes for grounding over the past fifteen years. M. C. Lancaster (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 188, 189.

Review of the medical records of aircrew patients for the even-numbered fiscal years 1956 through 1970 to study factors related to medical grounding. These factors have changed markedly over the past 15 years. Increasing age of the flying population is the major causative factor. Improved diagnostic techniques and increased information about normals and early disease have also had a significant influence upon both the types of problems evaluated and their disposition. Data are presented which point out the importance of direct experience with a specific population. F.R.L.

A72-28317 * # Physiological response in pilot/back-seat man during aerial combat maneuvers in F-4E aircraft. S. D. Leverett, Jr. (USAF, School of Aerospace Medicine, Brooks AFB, Tex.), H. M. Davis, Jr. (USAF, Aerospace Medical Div., Brooks AFB, Tex.), and W. R. Winter (NASA, Flight Research Center, Edwards, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 192, 193.

Comparison of objective/subjective physiological data between the pilot and the back-seat man during training within the G maneuvering envelope. It appears that the psychological requirements for the pilot to be mentally alert and physiologically adapted to a continually changing environment places additional responsibility on him to the extent the physiological signs monitored are indicative of a high stress condition and are increased by a significant amount over the back-seat man who is, in most instances, riding passively. F.R.L.

A72-28318 # Protective effects of the Valsalva and M-1 maneuvers during +G sub z acceleration. S. J. Shubrooks, Jr. and S. D. Leverett, Jr. (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 194, 195.

Comparison of the M-1 maneuver (forcefully exhaling against the partially closed glottis accompanied by generalized muscle tensing) with the Valsalva maneuver (forcefully exhaling against the completely closed glottis) as a means of establishing maximally effective G-protective systems. The study clearly indicates that the Valsalva maneuver is effective in increasing +G sub z tolerance, either in conjunction with an anti-G suit or without the suit if combined with muscle tensing to make this maneuver comparable to the M-1. F.R.L.

A72-28319 # +G sub z protection afforded by a modified partial pressure suit. M. J. Parkhurst, S. D. Leverett, Jr., and R. R. Burton (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 196, 197.

Demonstration that the partial pressure suit modified as an anti-G device is an effective mechanical means for increasing human tolerance when subjected to relatively high positive G forces. The application of pressure by the capstan method was found to be comfortable during all runs. Abdominal compression by the abdominal bladder plays an important role in controlling the degree of protection. There appears to be a greater control of pressures into the capstans and abdominal bladder while using 2 anti-G valves as compared to the 1 anti-G valve used in a single-bladder system of the regular CSU-12/P suit. F.R.L.

A72-28320 # Analysis of five selected factors in pursuit tracking performance of men during acceleration. K. A. Smiles, D. B. Rogers, F. M. Holden, and C. R. Replogle (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 199, 200.

Evaluation of a two-dimensional pursuit tracking task performed in the gondola of a human centrifuge by five healthy young male subjects. The experimental design allowed for separation of five main factors on tracking performance: (1) variations between subjects, (2) day-by-day training effects, (3) fatigue effects within one day's runs, (4) Gz load, and (5) performance preceding G, during G, and post G. The most significant differences in performance were between subjects. F.R.L.

A72-28321 # Neuroendocrine effects of microwave radiation. W. C. Milroy (Rochester, University, Rochester, N.Y.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 213, 214.

Evaluation and correlation of thyroid and thyrotropic activity in microwave exposed rats in an attempt to determine the mechanism by which thyroid function is altered. Based on preliminary data, it would appear that no specific effect of microwave radiation on the hypophysio-thyroid axis can be demonstrated. Those effects which have been demonstrated can be adequately explained on the basis of heating. This is consistent with the thermal theory of microwave bioeffects rather than the direct neuroendocrine stimulation theory. F.R.L.

A72-28322 # Effects of exposure at 80,000 feet at different decompression rates. J. P. Cooke, R. W. Bancroft, R. L. Holden, and H. H. Erickson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 223, 224. 6 refs.

Investigation on both anesthetized and conscious dogs of selected cardiovascular, biochemical, and pathologic measurements made during exposure at 80,000 ft following decompression from 10,000 ft at four different rates. Decompression to 80,000 ft within 1 sec resulted in an immediate reduction in femoral arterial bloodflow with the flowrate dropping from 108 cc/min to less than 28 cc/min within 10 sec, with complete stoppage in flow in less than 37 sec. In contrast, during 10, 30, and 60 sec decompressions, bloodflow continues for a much longer time, ceasing from 36 to 85 sec after the beginning of the decompression. A more severe degree of hypoxia is experienced after slow decompressions than after decompressions completed within 1 sec. F.R.L.

A72-28323 # Sleepy pilot evaluation - A simple, inexpensive method to measure alertness. G. L. M. Gibson (USAF, Office of the Command Surgeon, Wright-Patterson AFB, Ohio). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 226, 227. USAF-supported research.

Test of the accuracy of a simple and unsophisticated method to screen large numbers of people for detection of 'low arousal' individuals. The apparatus (the Metascope) is an infrared personnel viewing device. Pupillary waves and lid closure are easily discernible. Each subject was required to gaze steadily at a dim pin-point of light for 15 min of otherwise total darkness. It is suggested that candidates for flight training be given this type of test. Another potential use for this instrument would be for objective evaluation of fatigue level in aircrew members prior to departure on, and return from, long or stressful missions. F.R.L.

A72-28324 # Utilization of anthropometric data in resolving pilot/aircraft incompatibility. W. F. Moroney and N. E. Lane (U.S. Naval Aerospace Medical Center, Aerospace Medical Institute, Pensacola, Fla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 232, 233. 8 refs.

Development of a system which would identify those individuals whose anthropometric features would preclude safe operation of and/or safe egress from a particular aircraft. The two basic requirements for such a system are development of an accurate and accessible anthropometric data bank, and development and implementation of a workable cockpit exclusion code. F.R.L.

A72-28325 # A study of female pilot control force capabilities for general aviation aircraft. B. B. Karim, R. F. Chandler, C. C. Snow, and A. H. Hasbrook (Oklahoma, University, Norman; FAA, Civil Aeromedical Institute, Oklahoma City, Okla.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 234, 235.

Results of a program of strength tests to investigate the strength capabilities of women pilots, making use of a ground-based cockpit mock-up with fixed controls. Licensed female pilots ranging in age from 18 to 35 were tested for both maximal strength and strength endurance. It was found that a pilot strength control problem exists and that further research is necessary in order to establish data upon which a revision of the FARs specifying maximum allowable control forces could be based. F. R. L.

A72-28326 # Field evaluation of light signals for use in navigation and visual collision avoidance. J. A. Sirkis and S. J. Gerathewohl (FAA, Office of Aviation Medicine, Washington, D.C.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 238, 239.

For a variety of light signals at sea during nighttime, tests have been conducted dealing with: detection range; peripheral detection; detection range and color recognition; brightness matching; and subjective responses to distant and near distant flashes. The design of the tests is summarized, the experiments are described, and the conclusions reached by the interpretation of the data are presented. O.H.

A72-28327 # Methods of auditory display for aircraft collision avoidance systems. R. G. Hector (USAF, Flight Test Center, Edwards AFB, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 240, 241.

To facilitate visual detection, a head-up, omnidirectional, two-dimensional auditory display is proposed which transforms the elevation information of the intruding aircraft into either the peak tones at the proper pressure ratios, or into high-pass noise shaped into the proper spectrum. It is shown that this display appears to be feasible and that it possesses many advantages that should be considered in developing a cost effective system. O.H.

A72-28328 * # Advance techniques for monitoring human tolerance to +Gz accelerations. R. Pelligra, H. Sandler, S. Rositano, K. Skrettingland (NASA, Ames Research Center, Moffett Field, Calif.), and R. Mancini (Santa Clara, University, Santa Clara, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 245, 246.

Standard techniques for monitoring the acceleration-stressed human subject have been augmented by measuring (1) temporal, brachial and/or radial arterial blood flow, and (2) indirect systolic and diastolic blood pressure at 60-sec intervals. Results show that the response of blood pressure to positive accelerations is complex and dependent on an interplay of hydrostatic forces, diminishing venous return, redistribution of blood, and other poorly defined compensatory reflexes. O.H.

A72-28329 # The development of the miniature swine as a human analog for positive acceleration research - Acceleration tolerance. R. R. Burton (USAF, School of Aerospace Medicine,

Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 247, 248. 5 refs.

An animal species (miniature swine) has been established as a human analog for investigating physiologic responses to high positive acceleration. A comparison has been made of acceleration tolerances between man and this animal species. Comparative eye-heart-seat measurements, and mean values for acceleration tolerances of man and the miniature swine are tabulated. O.H.

A72-28330 # Displacements of a helmet-attached reticle under G-forces. K. W. Kennedy and K. H. E. Kroemer (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 249, 250.

Study undertaken to gain quantitative information on the effect that selected positive acceleration forces have in producing displacements of a helmet-attached reticle located in front of the subject's left eye at 1g. The recorded movements do not indicate any obvious systematic relationships to helmet type, total load, or load distribution. After return to the 1g condition, the reticle generally was not relocated to its original position, but a displacement of 3 to 5 mm remained below the pupil. O.H.

A72-28331 # Keratoconus in USAF flying personnel. W. E. Barry and T. J. Tredici (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 260, 261.

Review of the recent six-year experience of the USAF School of Aerospace Medicine with keratoconus - i.e., a condition characterized by a noninflammatory conic or cone-like protrusion of the cornea - in its rated aircrew personnel. The criteria used for keratoconus diagnosis in eleven patients are given, and the successful rehabilitation of nine of these patients is described. O.H.

A72-28332 # An evaluation of the Landolt ring radioactive plaque night vision tester. J. L. Mims, III and T. J. Tredici (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 264, 265.

The accuracy of the Landolt ring radioactive plaque night vision tester was examined by conducting extensive special tests on night-blind patients, including electroretinography and dark adaptation on the standard Goldmann-Weekers apparatus. The Goldmann-Weekers adaptation values were compared to the maximum passing distances on the Landolt ring test. The results are plotted and analyzed. O.H.

A72-28333 # Some effects of radiant heating of the head on body temperature measurement at the ear. P. Marcus (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 268, 269.

Results of an experimental investigation indicate that radiant heating of the scalp and upper part of the face specifically raises ear temperature, and could be a source of error in body temperature measurement at the ear. The effect appears to be due to warm venous blood draining from these tissues. The effect may be prevented if the subject wears a flying helmet. O.H.

A72-28334

A72-28334 # Combined skin temperature and direct heat flow measurement in a thermally stressful environment. G. L. Hody (Southern California, University, Los Angeles, Calif.) and J. J. Kacirk (California, University, La Jolla, Calif.). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 270, 271.

An instrument system was built for direct measurement of important thermal variables including skin heat flow. During experiments at 5 meters depth and 13.4 C water temperature, the system performed reliably in the course of open ocean dives. The data were used to compute a protective index for the wet-suit, the metabolic rate, and the rate of decrease of body heat content. O.H.

A72-28335 # Free 17-hydroxycorticosteroid levels in parotid fluid as indicators of physiologic strain in hyperthermic stress. M. T. Ulrich and A. T. Kissen (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: Aerospace Medical Association, Annual Scientific Meeting, 43rd, Bal Harbour, Fla., May 8-11, 1972, Preprints. Washington, D.C., Aerospace Medical Association, 1972, p. 272, 273.

The analysis of 17-hydroxycorticosteroids (17-OHCS) in parotid fluid was used for painless and continuous monitoring of subjects exposed to environmental heat stress. The main objective was to establish the validity of relating 17-OHCS output to various loads of hyperthermia. Results show that heart rate and body temperatures are more sensitive barometers of heat stress than parotid fluid 17-OHCS. O.H.

the organism are reviewed. Data are basically taken from animal experiments with mice and dogs. Author

STAR ENTRIES

N72-20039*# Techtran Corp., Glen Burnie, Md.
PROBLEMS OF SPACE BIOLOGY. VOLUME 9: OUTLINE OF SPACE RADIOBIOLOGY
 P. P. Saksonov, V. V. Antipov, and B. I. Davydov Washington NASA Feb. 1972 616 p refs Transl. into ENGLISH of the book "Problemy Kosmicheskoy Biologii, tom 9. Ocherki Kosmicheskoy Radiobiologii" Moscow, Nauka Press, 1968 p 1-603
 (Contract NASw-1695)
 (NASA-TT-F-604) Avail: NTIS HC \$9.00/MF \$0.95 CSCL 06R

The effects of space radiation on a broad spectrum of biological entities is dealt with. Generalized data concerning the combined effect of radiation with other factors of flight, obtained in model experiments and under the conditions of space flight, are given.

N72-20040*# Techtran Corp., Glen Burnie, Md.
THE RADIATION SITUATION IN SPACE
In its Probl. of Space Biol., vol. 9 Feb. 1972 p 1-34 ref.

Avail: NTIS HC \$9.00/MF \$0.95 CSCL 06R

A comprehensive analysis of ionizing radiation sources in space is presented. Data obtained by both U.S.S.R. and U.S. satellites are used as a basis for conclusions regarding the role, importance, and place of radiation hazards in manned space flight. The radiation sources dealt with are divided into two groups: The first group includes natural sources of ionizing radiation in space; primary cosmic rays, charged particles of the near-earth radiation belts, and corpuscular radiation generated by solar flares. The second group includes artificial sources of radiation; radiation belts caused by nuclear explosions at high altitudes, and the use of nuclear power plants in spacecraft.

D.L.G.

N72-20041*# Techtran Corp., Glen Burnie, Md.
EVALUATION OF THE BIOLOGICAL EFFECT OF RADIATION AS APPLIED TO THE PROBLEMS OF SPACE RADIOBIOLOGY
In its Probl. of Space Biol., vol. 9 Feb. 1972 p 35-138;

Avail: NTIS HC \$9.00/MF \$0.95 CSCL 06R

Early somatic effects and later somatic illnesses (for longer flights) are of primary importance to space radiobiology. Radiation sickness symptoms are described with particular emphasis on hematological and neurologic effects. Animal experiments and human experience are included. Author

N72-20042*# Techtran Corp., Glen Burnie, Md.
EFFECT OF FLIGHT FACTORS ON RADIOBIOLOGICAL EFFECTS
In its Probl. of Space Biol., vol. 9 Feb. 1972 p 139-209

Avail: NTIS HC \$9.00/MF \$0.95 CSCL 06R

The effects of such flight factors as temperature, gas medium, acceleration, vibration, weightlessness, physical loads and microwave irradiation on the action of ionizing radiation on

N72-20043*# Techtran Corp., Glen Burnie, Md.
CHARACTERISTICS OF THE BIOLOGICAL EFFECT OF COSMIC RADIATION
In its Probl. of Space Biol., vol. 9 Feb. 1972 p 210-252

Avail: NTIS HC \$9.00/MF \$0.95 CSCL 06R

The relative biological effectiveness of various types of particle and wave radiation is noted. Experiments on mice, rats and dogs are reviewed. Author

N72-20044*# Techtran Corp., Glen Burnie, Md.
SPACE PHARMACOLOGY
In its Probl. of Space Biol., vol. 9 Feb. 1972 p 253-417 refs

Avail: NTIS HC \$9.00/MF \$0.95 CSCL 06E

The problems and techniques of space pharmacology are described. Three problems are specifically discussed: (1) chemical protection from radiation damage, (2) reactivity of organisms to medical agents and the aftereffects of certain spaceflight factors, and (3) the principles of selection of drugs intended for the crews of spacecraft. Author

N72-20045*# Techtran Corp., Glen Burnie, Md.
CRITERIA FOR DETERMINING THE PERMISSIBLE DOSES OF IRRADIATION FOR ASTRONAUTS
In its Probl. of Space Biol., vol. 9 Feb. 1972 p 418-470 ref

Avail: NTIS HC \$9.00/MF \$0.95 CSCL 06R

Certain problems in determining the permissible doses of ionizing radiation for astronauts are assessed. Reactions of the human organism to radiation are tabulated and discussed. Author

N72-20046*# Techtran Corp., Glen Burnie, Md.
STUDY OF THE BIOLOGICAL EFFECT OF COSMIC RADIATION IN FLIGHT EXPERIMENTS
In its Probl. of Space Biol., vol. 9 Feb. 1972 p 471-547

Avail: NTIS HC \$9.00/MF \$0.95 CSCL 06R

Studies on the biological effect of radiation carried out under flight conditions are described. Equipment and results are tabulated from flight experiments made over the last 40 years. Author

N72-20047*# Techtran Corp., Glen Burnie, Md.
PROTECTION OF VOSTOK AND VOSKHOD COSMONAUTS FROM THE RADIATION HAZARDS
In its Probl. of Space Biol., vol. 9 Feb. 1972 p 548-603 refs

Avail: NTIS HC \$9.00/MF \$0.95 CSCL 06R

The protective systems used in the Vostok and Voskhod spacecraft are described. They provided: physical shielding, dosimetry, biological dosimetry, medical hygienic measures, and radiation level forecasting. Author

N72-20048*# National Aeronautics and Space Administration, Washington, D.C.
THE EXPERIMENTS OF BIOSATELLITE 2
 Joseph F. Saunders, ed. 1971 358 p refs Original contains color illustrations
 (NASA-SP-204; LC-78-609943) Avail: NTIS; SOD \$3.50 CSCL 06C

Experiments are described with invertebrates, plants, and cellular systems which were included on the flight of Biosatellite

2. The results of flight and ground control experiments are discussed.

N72-20050*# Oak Ridge National Lab., Tenn.
MUTATIONAL AND PHYSIOLOGIC RESPONSES OF HABROBRACON IN BIOSATELLITE 2

R. C. vonBorstel, R. H. Smith, Anna R. Whiting, and D. S. Grosch (North Carolina State Univ.) *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 17-39 refs Sponsored in part by AEC

(Grant NGR-34-002-023)
 (Expt-P-1079) Avail: NTIS; SOD \$3.50 CSCL 06C

Results of three experiments involving the parasitic wasp, *Habrobracon*, are reported, one in orbital flight, and two in tests on the earth after the flight. Five packages, each containing four modules to hold the wasps, were used for the experiments. The modules were secured on each package to face the radiation source. Most *Habrobracon* were exposed to five different exposures of radiation during the flight. The various strains of *Habrobracon* selected for the experiment are discussed in relation to their properties. Genetic analyses of male and female *Habrobracon* are presented. Genetic recombination, mating behavior in males, and physiological and late effects were observed. Experiments were also conducted on the X841 strain of yeast and the San Francisco strain of *Artemia salina*. Bioassays were made of *Saccharomyces* for intragenic and intergenic recombination. Effects of vibration and weightlessness are also discussed. K.P.D.

N72-20051*# Bowling Green State Univ., Ohio.
GENETIC IMPLICATIONS OF SPACEFLIGHT

Irwin I. Oster *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 41-54 refs

(Expt-P-1160) Avail: NTIS; SOD \$3.50 CSCL 06C

Results of experiments using highly specialized strains of the fruit fly, *Drosophila melanogaster*, are presented. The types of effects on somatic and reproductive cells are tabulated. The results reported suggest that radiation appears to interact with weightlessness to produce a higher mortality, more chromosomal breakage followed by loss or exchange of genetic information, and more sex-linked recessive lethal mutations in actively growing and metabolizing individuals than are produced in those irradiated on earth. K.P.D.

N72-20052*# Rice Univ., Houston, Tex.
GENETIC EFFECTS OF THE SPACE ENVIRONMENT ON THE REPRODUCTIVE CELLS OF DROSOPHILA ADULTS AND PUPAE

Luolin S. Browning *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 55-78 refs Prepared in cooperation with St. Thomas Univ. Original contains color illustrations

(Expt-p-1159) Avail: NTIS; SOD \$3.50 CSCL 06C

An account is presented of some of the experimental findings resulting from the study of possible transmissible genetic damage in the fruit fly, *Drosophila melanogaster*, caused by exposure to the conditions of space flight. Results are reported on mutations occurring in mature sperm in inseminated females, and teratogenic and genetic effects produced in cells in various stages of maturation. K.P.D.

N72-20053*# California Univ., Berkeley.
SOME EFFECTS OF SPACEFLIGHT ON THE FLOUR BEETLE, TRIBOLIUM CONFUSUM

Brenda Buchhold, J. V. Slater, I. L. Silver, T. Yang, and C. A. Tobias *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 79-95 refs

(Expt-P-1039) Avail: NTIS; SOD \$3.50 CSCL 06C

Stock cultures of *Tribolium confusum* Duval pupae were

grown at 30 C in whole wheat flour with 2% yeast additive. Age sensitivity studies involving larval and pupal sensitivity to radiation were made. Postflight tests for wing abnormality and genetic mutations were made several months after the Biosatellite 2 flight. The results also indicate that there is internal compensation in animal development for changes in the gravitational field. K.P.D.

N72-20054*# Brookhaven National Lab., Upton, N.Y.
RADIOBIOLOGIC STUDIES OF TRADESCANTIA PLANTS ORBITED IN BIOSATELLITE 2

Arnold H. Sparrow, Lloyd A. Schairer, and Kodumudi M. Marimuthu *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 99-122 refs

(Expt-P-1123) Avail: NTIS; SOD \$3.50 CSCL 06R

The Biosatellite 2 *Tradescantia* experiment was designed to determine the effect of weightlessness and other spacecraft environmental conditions on spontaneous and radiation-induced somatic mutation rates and on selected cytologic changes. Data obtained from irradiated and nonirradiated plants flown in Biosatellite 2 were compared with data from nonflight irradiated and nonirradiated plants maintained under conditions similar to those of the flight material. Thirty-two flight control plants were flown in a package in the spacecraft behind the radiation shield, and identical nonflight control packages (with and without irradiation) were maintained at the launch site. All these plants were observed after the flight for (1) somatic mutation (blue to pink or colorless cells); (2) cell size (giant and dwarf condition); (3) loss of reproductive integrity (cell death and stunting in stamen hair growth); (4) pollen grain mortality (early and late stages); (5) megaspore development; (6) abnormal cell divisions; and (7) chromosome aberrations. K.P.D.

N72-20055*# Emory Univ., Atlanta, Ga.
THE EFFECT OF WEIGHTLESSNESS ON THE GROWTH AND ORIENTATION OF ROOTS AND SHOOTS OF MONOCOTYLEDONOUS SEEDLINGS

Stephen W. Gray and Betty F. Edwards *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 123-165 refs

(Expt-P-1020) Avail: NTIS; SOD \$3.50 CSCL 06C

Wheat seedlings were used in the experiment because of their convenient size, rapid and consistent germination, and measurable geotropic response. Selection, sterilization, and soaking the seeds; planting procedures; methods of fixation and measurement of seedlings; earth/controls and baseline testing; and germination and survival are discussed. Also considered are changes in gross morphology; seedling growth; seedling response to vibration and/or flight; histology and histochemistry; and cytology. Results are presented for studies of mortality, coleoptiles, root growth, malformations, starch grains, statoliths, metabolic rate, cell division and elongation, and nuclear size. K.P.D.

N72-20056*# Dartmouth Coll., Hanover, N.H.
GROWTH PHYSIOLOGY OF THE WHEAT SEEDLING IN SPACE

Charles J. Lyon *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 167-188 refs

(Expt-P-1096) Avail: NTIS; SOD \$3.50 CSCL 06C

The growing of wheat seedlings in Biosatellite 2 was an experiment designed to determine whether seeds would produce normal seedlings when they germinated in the absence of significant gravitational force. A culture method developed for germination of wheat seeds, with the seedlings suspended in sealed moist chambers, was successful in producing young plants with organ orientation like that of seedlings rooted in soil. The stresses of launch acceleration and vibration had no measurable effects on germinated wheat seeds, as determined by the physiology of their subsequent germination and seedling growth during an orbital flight of about 45 hours. Growth physiology of wheat seed germination and the development of wheat seedlings in their early stages were not disturbed enough

by the absence of gravity to be reflected in growth rates or external morphology of roots and coleoptiles. Author

N72-20057*# RPC Corp., El Segundo, Calif.
A STUDY OF THE EFFECT OF WEIGHTLESSNESS ON THE BIOCHEMICAL RESPONSE OF A MONOCOTYLEDONOUS SEEDLING

Herbert M. Conrad *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 189-212 refs
 (Expt-P-1138) Avail: NTIS; SOD \$3.50 CSCL 06C

The experimental program was designed to: (1) relate the anticipated response to metabolic and energetic reactions throughout the length of roots and shoots; (2) determine whether changes in metabolism which occur on the clinostat would also be found in space-grown seedlings; and (3) compare the biochemistry of epinastic curvature with that of geotropic curvatures. The activity of key enzymes associated with some of the pathways of intermediary metabolism and energetics was measured. The enzymes were examined for structural integrity because of possible weakening of the tertiary forces which hold protein molecules together in a highly ordered manner. The results are described for biochemical analyses performed on space-grown seedlings, their corresponding earth controls, and postflight verification experiments. It is shown that growth of seedlings on the clinostat simulates growth in a weightless environment. Author

N72-20058*# North American Rockwell Corp., Downey, Calif.
BIOCHEMICAL CHANGES IN THE ENDOSPERM OF WHEAT SEEDLINGS IN THE WEIGHTLESS STATE

Samuel P. Johnson, J. A. Green, and D. K. Chapman *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 213-221 refs

(Expt-P-1138) Avail: NTIS; SOD \$3.50 CSCL 06C

The biochemical analyses of wheat seedling endosperms exposed to 45 hours of weightlessness during the flight of Biosatellite 2 did not reveal any differences in the concentrations of carbohydrates, amino acids, and nitrogen fractions from those in control samples. Postflight tests designed to verify the results of the flight revealed differences in the concentrations of individual amino acids, but the pattern was irregular and not statistically significant. Author

N72-20059*# North American Rockwell Corp., Downey, Calif.
THE LIMINAL ANGLE OF A PLAGIOGEOTROPIC ORGAN UNDER WEIGHTLESSNESS

Samuel P. Johnson, T. W. Tibbitts (Wisconsin Univ.), J. A. Green, and D. K. Chapman *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 223-248 refs Original contains color illustrations

(Expt-P-1017) Avail: NTIS; SOD \$3.50 CSCL 06C

The experiment was designed to evaluate alterations in the behavior of the pepper plant, *Capsicum annuum*, in response to a weightless environment. The effects of rotation on the horizontal clinostat to simulate weightlessness and an orbital flight time of 45 hours were evaluated on 25- and 35-day-old pepper plants. Plant species selection, plant characteristics, environmental factors, and growing procedures are discussed. The samples prepared for chemical analyses were composed of the following components from the four control and flight packages: (1) leaves from large or prime plants, (2) leaves from small or auxiliary plants, (3) stems from small plants, and (4) growing tips from small plants. Carbohydrate, amino acid, and nitrogen analyses were made. Several vibration tests were conducted to determine the effect of the flight launch vibration profile on *Capsicum* plants. The plants were also subjected to acoustic levels that simulated the launch and recovery flight environments in order to determine the effect on liminal angle plant response. Author

N72-20060*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

THE EFFECT OF WEIGHTLESSNESS ON THE DIVIDING EGGS OF RANA PIPIENS

Richard S. Young, John W. Tremor, Richard Willoughby, Robert L. Corbett, Kenneth A. Souza, and Paul D. Sebesta *In* its The Expt. of Biosatellite 2 1971 p 251-271 refs Original contains color illustrations

(Expt-P-1047) Avail: NTIS; SOD \$3.50 CSCL 06C

The eggs of *Rana pipiens*, the grass or leopard frog, were chosen as the experiment material. The fertilized egg divided, differentiated, and developed normally in over two days of weightlessness in Biosatellite 2, despite initiation of exposure at the middle of the two-cell stage. Flight conditions may have effected a slight, transient abnormality that probably can occur under a variety of conditions. The significance of experimental variables is discussed. It is thought that earlier exposure of the egg to weightlessness, i.e. with and after fertilization, would complement the findings of earth-based studies in which gravity was implicated as a determiner of normal development. Author

N72-20061*# General Electric Co., Philadelphia, Pa.
NUCLEAR AND CELLULAR DIVISION IN PELOMYXA CAROLINENSIS DURING WEIGHTLESSNESS

Donald R. Ekberg, Elaine C. Silver, Judith L. Bushay, and Edward W. Daniels (ANL) *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 273-290 refs

(Expt-P-1035) Avail: NTIS; SOD \$3.50 CSCL 06C

In order to study the effects of weightlessness on a single cell, the giant multinucleate amoeba *Pelomyxa carolinensis* was chosen. Results of temperature measurement, plasmotomy rates, and clinostat studies are presented. No significant differences were found in division rates between the flight and earth control groups. There appeared to be a trend toward a higher division rate in well-fed *Polymyxae* during weightlessness. Nuclear division during weightlessness was synchronous. No difference was apparent in postflight cell division rates of flight and earth control groups. Flight vibration and acceleration had no observable effect upon the growth rate of amoebae. K.P.D.

N72-20062*# Colorado State Univ., Fort Collins.
EFFECTS OF WEIGHTLESSNESS ON THE NUTRITION AND GROWTH OF PELOMYXA CAROLINENSIS

John H. Abel, Jr., David W. Haack, and Richard W. Price *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 291-308 refs

(Expt-P-1035) Avail: NTIS; SOD \$3.50 CSCL 06C

A study was made in an attempt to answer the question: Can animal cells which are preformed and viable grow and divide in the absence or near absence of a gravitational field? The effects of the space environment, acceleration, and vibration on feeding, growth, and morphology were studied in amoebae, *Pelomyxa carolinensis*, that were starved for periods of 27 to 75 hours or were continuously fed. Results are presented for studies of gross morphology, effects of weightlessness on survival and growth, and cytology. The rate of digestion of ingested paramecia, *Paramecium micronucleatum*, was determined from the percentage distribution of various ages of food vacuoles (new to old). It was concluded that neither rate, nor normal processes, of digestion was changed as a result of the Biosatellite 2 flight or simulated flight conditions. K.P.D.

N72-20063*# California Univ., Berkeley.
INDUCTION OF LYSOGENIC BACTERIA IN THE SPACE ENVIRONMENT

R. H. T. Mattoni (NUS Corp.), E. C. Keller, Jr. (NUS Corp.), W. T. Ebersold, F. A. Eiserling, and W. R. Romig *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 309-324 refs

(Expt-P-1135) Avail: NTIS; SOD \$3.50 CSCL 06C

The Biosatellite 2 experiment using the lysogenic bacterium *Salmonella typhimurium* was designed to test the hypotheses that weightlessness, both with and without gamma irradiation,

would affect bacterial cell growth or induction of bacterial prophage. The bacterial data were analyzed by three methods: analysis of variance, t tests between flight and earth control data (where t is the percentage difference between experiment and control sets), and graphic presentation. The data on bacterial growth led to rejection of the hypotheses; space flight produced both increased density of *Salmonella typhimurium* when grown in liquid medium and interaction to give greater resistance to gamma irradiation at levels between 265 and 1648 R total dose (17 and 103 R per average cell generation). Tests of other variables eliminated all but weightlessness in accounting for the difference. On the basis of the t tests there was no difference in the free phage per bacterium produced under conditions of control and those of flight. The induced bacteriophage per viable bacterium showed significant differences between flight and control at two radiation levels (265 and 645 R). The flight set had consistently lower yields at all levels of radiation. K.P.D

N72-20064*# Oak Ridge National Lab., Tenn.
MUTAGENIC EFFECTIVENESS OF KNOWN DOSES OF RADIATION IN COMBINATION WITH ZERO GRAVITY ON NEUROSPORA CRASSA

Frederick J. DeSerres *In* NASA, Washington The Expt. of Biosatellite 2 1971 p 325-331 refs (Expt-P-1037) Avail: NTIS; SOD \$3.50 CSCL 06C

A study was made of the genetic effects on *Neurospora crassa* of space flight alone and of space flight in combination with known doses of radiation. A Sr-85 gamma ray source was used with a genetically marked, two-component heterokaryon, heterozygous for two different genes that control sequential steps in purine biosynthesis. An experiment was also performed to study the effects of anoxia on radiation-induced inactivation and induction of mutations. There was no difference between flight and earth control survival curves, nor between curves for the overall induction of ad-3 mutations. Data indicate that there is no difference between flight and earth control curves for either point mutations or chromosome deletions. K.P.D.

N72-20065*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
RADIATION EXPOSURES DURING THE BIOSATELLITE 2 FLIGHT

John E. Hewitt *In its* The Expt. of Biosatellite 2 1971 p 333-346 refs Avail: NTIS; SOD \$3.50 CSCL 06C

Seven of the experiments flown on Biosatellite 2 were designed to determine the combined effects of radiation and weightlessness on mortality and mutagenesis in a variety of living systems exposed to an onboard source of radiation. Several months after the flight, a series of ground tests was initiated to determine whether the observed effects of interaction were due to vibration and acceleration associated with the flight, rather than to weightlessness. The results of dosimetry measurements indicate that it is unlikely that any difference found to occur between the biologic response of the same experiment in the flight and earth control capsules can be attributed to radiation exposure differences. No unusual results are due to the presence in the capsules of a large component of low energy radiation produced by multiple scattering. K.P.D.

N72-20066*# National Aeronautics and Space Administration, Washington, D.C.
THE SCIENTIFIC CONCLUSIONS OF BIOSATELLITE 2

Orr E. Reynolds and Joseph F. Saunders *In its* The Expt. of Biosatellite 2 1971 p 347-352 ref Avail: NTIS; SOD \$3.50 CSCL 06C

The experiments of Biosatellite 2 were designed to obtain information related to: (1) the ability of a spectrum of living systems to maintain normal organization and function during exposure to a space environment; (2) the biological effects imposed on gravity-dependent life processes by the absence of gravity and rotational periodicity; and (3) how weightlessness

and quantified gamma radiation affect biologic processes during space flight. Observations were made on more than 100 end points at the molecular, cellular, and system levels of biological structure and physiological function. Author

N72-20067# RAND Corp., Santa Monica, Calif.
THE BIMOD SYSTEM IMPLEMENTATION
 R. L. Clark and G. F. Groner Jul. 1971 38 p refs (Grant GM-15896) (R-747-NIH) Avail: NTIS

The system employs an interactive graphics console comprising a cathode ray tube (CRT), a data tablet, and a keyboard. A high level of man-machine interaction is provided. The user may communicate with the system by using the data tablet to draw block diagrams, handprint text, and activate program functions, and also by typing with the keyboard. BIOMOD interprets user actions and provides immediate feedback on the CRT. The BIOMOD system features hierarchical model structuring and user-oriented model-definition languages. The user may represent a model by a block diagram, each component of which may be defined in more detail by another block diagram. The user ultimately defines model components by analog-computer-like primitive functions, algebraic, differential or chemical equations, or FORTRAN statements. This obviates the requirement that he translate his model description into a conventional simulation language. During model simulation, displayed curves are automatically and continually updated; a user may stop the simulation and then display curves for different variables, change scales, or alter simulation parameters. Author

N72-20068# RAND Corp., Santa Monica, Calif.
INTERACTIVE BIOCHEMICAL MODELING AND ANALYSIS
 DeLand E. C. Sep. 1971 11 p refs Presented at 70th Natl. Meeting, Am. Inst. of Chem. Engr., Atlantic City, 29 Aug. - 1 Sep. 1971 (P-4704) Avail: NTIS

A description is given of BIOMOD, a user oriented computer graphic system which allows both equilibrium and kinetic computations in the same program. It also allows the user to write differential equations and FORTRAN programs as required for the simulation of his biochemical or physiological problem. The system may also be used for non-chemical problems. E.H.W.

N72-20069# Council for Scientific and Industrial Research, Pretoria (South Africa).
A STUDY OF THE TRANSIENT STAGE OF SWEATING IN MAN

J. Timbal, J. Colin, and C. Boutelier Nov. 1970 12 p refs Transl. into ENGLISH from Arch. Ges. Physiol. (West Berlin), v. 318 1970 p 305-314 (Rept-877) Avail: NTIS

The quantitative relationship between a body temperature level or levels and the flow of sweat is investigated. The experiments were carried out on nude subjects at complete rest. They were subjected to shock temperatures for 90 minutes, then allowed 90 minutes rest at neutral temperatures. Results show sweat initiation varied between subjects as did the steady flow. It was determined that sweat flow is influenced by individual body heat storage and individual reaction to heat loads. No definite quantitative relationships were established due to inconclusive data on neurohormonal and psychological effects. E.H.W.

N72-20070*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
APPLICATION OF VARIOUS ELASTIC THIN SHELL THEORIES TO BLOOD FLOW PROBLEMS
 3 Apr. 1972 33 p refs Backup document for AIAA Synoptic, "Review and Application of Prestressed Shell Theories to Blood

Vessel Wave Propagation", scheduled for publication in AIAA Journal in Aug. 1972

(Grant NGL-05-020-223)

(NASA-CR-125827) Avail: NTIS CSCL 06P

Some existing theories, on elastic thin shells, are reviewed to ascertain their influence on the computation of phase velocities in fluid filled cylinders representing certain aspects of the behavior of arteries and veins in vivo. For physiologically meaningful parameters, including moderately large in plane prestrain that occurs in mammals, the results suggest that with one exception, the small differences in the formulations exercise little influence on the phase velocities. However, it is demonstrated that inclusion of the forces induced by the rotation of the hydrostatic pressure is essential or significantly erroneous torsional wave speeds result. Also the introduction of moderate inplane prestrains that are present in living mammals is shown to lead to nonselfadjoint differential equations of motion, whose biorthogonal eigenvectors differ slightly from each other. Author

N72-20071*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

EFFECTS OF NOISE ON THE PERFORMANCE OF A MEMORY DECISION RESPONSE TASK

Ben William Lawton Washington Apr. 1972 18 p refs

(NASA-TN-D-6675; L-8101) Avail: NTIS CSCL 05E

An investigation has been made to determine the effects of noise on human performance. Fourteen subjects performed a memory-decision-response task in relative quiet and while listening to tape recorded noises. Analysis of the data obtained indicates that performance was degraded in the presence of noise. Significant increases in problem solution times were found for impulsive noise conditions as compared with times found for the no-noise condition. Performance accuracy was also degraded. Significantly more error responses occurred at higher noise levels; a direct or positive relation was found between error responses and noise level experienced by the subjects. Author

N72-20072# Royal Aircraft Establishment, Farnborough (England).

THE CONTROL OF BODY TEMPERATURE IN MUSCULAR WORK

Marius Nielsen Sep. 1971 36 p refs Transl. into ENGLISH from Skandinav. Archiv., v. 79, 1938 p 193-230

(RAE-Lib-Trans-1610; BR-28413) Avail: NTIS

Body temperature rose in proportion to work rate but was found constant at a given working intensity in a wide range of ambient climatic conditions. This was due to a changing balance between heat dissipation by conduction and convection and by evaporation of sweat. It is inferred that the rise in body temperature during muscular work is a controlled effect and not a failure of heat dissipation. Author

N72-20073# Royal Aircraft Establishment, Farnborough (England).

BIOTECHNOLOGY AND APPLIED PSYCHOLOGY

Rune B. Johansson Jun. 1971 22 p Transl. into ENGLISH from Swedish report FOA-2-C2360-12

(RAE-Lib-Trans-1597; FOA-2-C-2360-12; BR-28317) Avail: NTIS

The current state-of-the-art of biotechnology and applied psychology in connection with Sweden's national defense is reviewed. Problems involving man/machine interaction in the perception and transfer of information are listed together with the present status of technology and the prognosis for future trends in research relating to these problems. D.L.G.

N72-20074*# Techtran Corp., Glen Burnie, Md.
GASTRIC MOTILITY DURING REST AND PHYSICAL EXERCISE

K. Lagemann and K. Hoffmann Washington NASA Mar. 1972 11 p refs Transl. into ENGLISH from Fortschr. Gebiete Roentgenstrahlen Nuklearmed. (Stuttgart), v. 115, no. 6, 1971 p 817-821

(Contract NASw-2037)

(NASA-TT-F-14207) Avail: NTIS CSCL 06P

Gastric motility was studied in 90 normal people at rest and during a period of tachypnoea produced by physical exercise. Statistical analysis of the parameters obtained showed no effect of physical exercise on gastric motility. Author

N72-20075# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany).

EXPERIMENTAL AND THEORETICAL INVESTIGATION OF THE DECOMPRESSION PROBLEM

S. Ruff 7 Oct. 1971 101 p refs In GERMAN; ENGLISH summary

(DLR-FB-71-48) Avail: NTIS; DEVL R Porz-Wahn: 2990 DM

The bubble in the organism is recognized as the governing quantity for the construction of safe decompressions. On this basis and using the empirical material, a set of allowed gas tensions in the tissue is proposed. From this, decompression schedules for arbitrary dives in helium-nitrogen mixtures can be calculated. An expression for the bubble growth in the organism during a decompression is developed and applied to the discussion of the allowed gas tensions proposed here. In the appendix dives of the institute and the decompression schedules of the U.S. Diving Manual are analyzed. Author

N72-20076# Japan Atomic Energy Research Inst., Tokyo.

NEW METHOD OF DOSE EVALUATION BY SPECTRUM DOSE CONVERSION OPERATOR AND DETERMINATION OF THE OPERATOR

Shigeru Moriuchi 9 Oct. 1970 39 p refs In JAPANESE; ENGLISH summary

(JAERI-1209) Avail: AEC Depository Libraries

A new method of dose evaluation by the spectrum dose conversion operator is very simple, because radiation dose can be evaluated directly from the observed pulse-height spectrum by applying an operator to the spectrum itself. The details of this method are described concentrating on determination of the operational function G(E) from the point of view of exposure measurements with NaI(Tl) scintillators. Tables of numerical values of G(E) functions of NaI(Tl) scintillators of 1 in. phi x 1 in. to 6 in. phi x 6 in., which were calculated using an electronic computer, are also given. Author (NSA)

N72-20077# Instituut voor Toepassing van Atoomenergie in de Lanbouw, Wageningen (Netherlands).

APPLICATION OF ATOMIC ENERGY IN AGRICULTURE Annual Report, 1970

1971 92 p refs

(NP-19016) Avail: AEC Depository Libraries

Work carried out during 1970 at the Association's Institute in Wageningen and at other institutes in Belgium, Germany, Italy, and the Netherlands is reported under the following headings: mutation breeding, methodology; mutation breeding, collaboration; radiogenetics, ontogenetic factors, radiogenetics, physical and chemical factors; related genetic studies; related in vitro studies; preservation of food by means of radiation; induction of male sterility in insects by means of radiation; the behavior of specific nuclides in plants and soil; and related physical studies. Author (NSA)

N72-20078# Paris Univ., Orsay (France). Faculte des Sciences.
QUANTITY OF BONE MARROW WHICH MUST BE PROTECTED IN ORDER TO ENSURE THE SURVIVAL OF PIGS IRRADIATED WITH A LETHAL DOSE Ph.D. Thesis

Jean Maas 18 Jun. 1971 53 p refs In FRENCH

(FRNC-TH-97) Avail: AEC Depository Libraries

Survival after a lethal dose of radiation occurs only if

sufficient bone marrow is protected or transfused. It is important to discover whether or not an irradiated animal can ensure the hemopoietic repopulation of its tissues. These problems were studied with swine which have a girth, weight, food intake, and radiosensitivity similar to man. The distribution of bone marrow was studied in swine Co-60 gamma irradiated with a dose of 890 rads; Fe-59 and Se-75 tracers were used. The degree of protection afforded by Pb screens was studied with different bones using different thickness screens and different extents of protection. It was possible in this way to calculate the number of surviving protected cells, and to evaluate the quantity of protected marrow necessary to ensure the survival of these animals. NSA

N72-20079# California Univ., Livermore. Lawrence Radiation Lab.

SENSITIVITY PROBLEMS IN BIOLOGICAL AND ENVIRONMENTAL COUNTING

G. A. Armantrout, A. E. Bradley, and P. L. Phelps Oct. 1971 25 p refs Presented at the Nucl. Sci. Symp., San Francisco, 3 Nov. 1971

(UCRL-73505; Conf-711111-6) Avail: NTIS

The general problem of sensitivity of Ge(Li) detectors for environmental counting is investigated. Analysis of biological and environmental samples differs from other physics applications in the need for very high sensitivity. A number of factors, including efficiency, geometry, resolution, and an interrelation of these, all affect sensitivity. An analysis, based on both experimental data and computations, indicates that in the range of equal detector volumes < 40 cu cm planar detectors are to be preferred over coaxial detectors due to their much better ability to quantitate data at energies below 500 keV without loss of performance at higher energies. For equal detector volumes in excess of 40 cu cm, coaxial detectors may be preferred for high energy use due to their better resolution, but performance at lower energies will still favor the planar detectors. Author (NSA)

N72-20080# Oak Ridge National Lab., Tenn.
EVALUATION OF LONG-TERM EFFECTS OF LOW LEVEL WHOLE BODY EXTERNAL RADIATION EXPOSURES

John B. Storer and Victor P. Bond Sep. 1971 10 p refs Presented at the 4th Intern. Conf. on The Peaceful Uses of Atomic Energy, Geneva, 6 Sep. 1971 Sponsored in part by AEC Prepared in cooperation with Brookhaven Natl. Lab., Upton, N. Y. (A/Conf-49/P-82; Conf-710901-19) Avail: NTIS

Late effects of exposure to high doses of ionizing radiation were studied in a number of human populations. Particular attention was paid to the induction of neoplastic disease, although other effects such as changes in the mortality rate, ocular lens changes, and other pathologic effects were looked for in some of these populations. Extensive animal experimentation was conducted under carefully defined conditions to try to assess effects of dose rate and the shape of the dose response curves for various end points. Data from human and experimental animal studies are reviewed, and an attempt is made to assess the risk of low levels of exposure. Author (NSA)

N72-20081# California Univ., Livermore. Lawrence Radiation Lab. Bio-Medical Div.

COMPILATION OF PUBLISHED INFORMATION ON ELEMENTAL CONCENTRATIONS IN HUMAN ORGANS IN BOTH NORMAL AND DISEASED STATES. 1: RAW DATA ORDERED BY ATOMIC NUMBER, SUBORDERED BY ORGAN AND SUBORGAN, LISTING METHOD OF ANALYSIS, GEOGRAPHICAL SOURCE, AGE, SEX, NUMBER OF INDIVIDUALS

L. R. Anspaugh, W. L. Robinson, W. H. Martin, and O. A. Lowe 27 Aug. 1971 161 p refs Revised

(Contract W-7405-eng-48)

(UCRL-51013-Pt-1-Rev-1) Avail: NTIS

The elemental concentrations and other raw data (coded by number) are presented for each of the papers entered into the

system. Also included is the key defining the code numbers and the reference list from which the data were obtained. The data are ordered by atomic number, subordered by organ and where appropriate by suborgan. Other information listed includes method of analysis, geographical source, age, sex, health state, concentration unit, and number of individuals. This report is primarily a listing of the raw data. Author (NSA)

N72-20082# Hungarian Academy of Sciences, Budapest.
TWO CODES FOR CALCULATION OF DOSE DISTRIBUTION IN HUMAN PHANTOMS IRRADIATED BY EXTERNAL PHOTON SOURCES

L. Koblinger [1971] 15 p refs

(KFKI-71-12) Avail: AEC Depository Libraries

Two Monte Carlo codes for calculation of dose in homogeneous or Synder-type inhomogeneous phantoms are presented. The calculation method and the possible choices of the phantom and external photon source are described. The input list and other notes for users are included. To save computer time a special method for estimation of the standard deviation is used. The codes can be applied to various problems in health physics and dosimetry; such as burden of medical x-ray application, irradiation from radioactive sources or accidental overexposure. Author (NSA)

N72-20083# Staatliche Zentrale fuer Strahlenschutz, Berlin (East Germany).

BIOCHEMICAL CHANGES IN BLOOD AND URINE INDICATING RADIATION DAMAGE: A LITERATURE REVIEW, PART-1

M. Solle and V. Orban Apr. 1971 26 p refs In GERMAN

(SZS-7/71-Pt-1) Avail: AEC Depository Libraries

A review is presented of 167 publications on radiation induced changes of the concentration of metabolites in blood and urine of several mammals and of humans. The literature was evaluated from the viewpoint of the assessment of these changes, i.e., the so-called biologic dosimetry. The material contains data on amino acids and some of their metabolites (taurine, metabolites of tryptophan, creatine, metabolites of nucleic acids, deoxyribosides, beta-amino isobutyric acid, pseudouridine, and purines) and mineral substances. Author (NSA)

N72-20084# Lamont-Doherty Geological Observatory, Palisades, N.Y.

[DATA SYNTHESIS OF BIOLOGICAL SAMPLES COLLECTED FOR RESEARCH IN NITROGEN METABOLISM IN THE SEA] Technical Progress Report, 1 Nov. 1970

31 Oct. 1971

O. A. Roels, C. Garside, J. Hillegas, and J. Currie 31 Oct. 1971

185 p refs

(Contract AT(30-1)-3826)

(CU-3826-22) Avail: NTIS

The methods used for the collection and results of an experiment on nitrogen metabolism in temperate waters are discussed. Efforts were made to collect and analyze all biological and non-living particulate matter from 0.45 microns to > 10,000 microns. Samples were taken from the slope waters of the U.S. Atlantic Coast, the Gulf Stream, and the Sargasso Sea. The data analyzed include (1) annual N₂ flux and the role of chemical and biological factors in the process, (2) effects of N₂ metabolism in marine food chains, and (3) effects of N₂ on biological productivity. An extensive appendix covers the results and conclusions in graphical and tabular form. E.H.W.

N72-20085# Rochester Univ., N.Y. Dept of Radiation Biology and Biophysics.

PRODUCTION AND CHARACTERIZATION OF AEROSOLS

T. T. Mercer 1971 42 p refs Sponsored by AEC

(UR-3490-3) Avail: NTIS

The use of monodispensed and polydispensed aerosols in investigating the hazards associated with inhalation of toxic particles and in medical treatment requiring the disposition of water droplets or particulate medication in the respiratory tract, is discussed. Some of the common methods for producing both types of aerosols, and the principles underlying those methods are also discussed. Author

N72-20086# Human Engineering Labs., Aberdeen Proving Ground, Md.

ADAPTATION LEVEL AND VISUAL SPACE PERCEPTION

Lloyd L. Avant and William Bevan Sep. 1971 30 p refs

(Contract N00014-67-A-0163-0001)

(AD-733918; HEL-TM-17-71) Avail: NTIS CSCL 05/10

A review of evidence demonstrating influence of adaptation level in the perception of the various aspects of visual space is presented. The data clearly indicate that the simplest detection of a briefly presented stimulus depends upon the spatial, temporal and chromatic properties of its surroundings. The data also demonstrate that the perception of such basic properties of spatially arrayed stimuli as extensity, location, distance and spatial organization depends upon a perceptual norm for the property being considered. Studies of geometrical illusions suggest an account of illusory perception within the formal model of adaption level theory. The problem of determining what conditions permit pooling of stimulus values to form adaptation levels is discussed. Author (GRA)

N72-20087# Naval Air Development Center, Johnsville, Pa. Crew Systems Dept.

IMPACT ANALYSIS OF THE SKULL-BRAIN SYSTEM

Interim Report

Stephen L. Gordon 2 Dec. 1971 48 p refs

(AD-733986; NADC-CS-7113) Avail: NTIS CSCL 06/5

A basic one-dimensional multi-plate impact computer program has been adapted to a model of a non-penetrating blow applied to a three-layered skull and brain system. Model layer thicknesses are equal to the average size of the corresponding anatomical head layers. Three models of the skull-brain have been studied: elastic tables and elastic diploe, elastic tables and elastic-plastic diploe, elastic tables and crushable diploe. All of these models are coupled to an inviscid, compressible fluid brain. The results showed that the energy transmitted to the brain layer with these three models was in the following decreasing order: elastic, elastic-plastic, and crushable hydrodynamic foam. Several special situations with enlarged diploe thickness and increased acoustic impedance mismatch resulted in changes in the energy transmitted to the brain. The existence of potential sites of coup, contrecoup, and intermediate coup was substantiated. Author (GRA)

N72-20088# School of Aerospace Medicine, Brooks AFB, Tex. **LISTENING LEVELS PREFERRED BY FLYING PERSONNEL** Progress Report, Feb. - Jul. 1971

Harrell C. Sutherland, Jr. and Donald C. Gasaway Nov. 1971 17 p refs

(AF Proj. 7755)

(AD-734778; SAM-TR-71-44) Avail: NTIS CSCL 06/16

Speech intensity was adjusted to the preferred listening level by 65 flyers in the presence of 9 aircraft noise conditions and in quiet. The noises represented highest, lowest, and average overall levels at the pilot position in jet, propeller, and rotary-wing type aircraft. Twelve listeners also performed with dry cotton in the ear canals and another 12 with V-51R earplugs in place. Average preferred levels ranged from 79.5 to 95 dB SPL (without ear protectors) for the 9 noise conditions. Average preferred intensity in the quiet condition was 75.5 dB SPL. Author (GRA)

N72-20089# Naval Submarine Medical Center, Groton, Conn. **ABSOLUTE DISTANCE PERCEPTION UNDER WATER AND IMPROVEMENT THROUGH TRAINING** Interim Report

Steven H. Ferris 28 Jun. 1971 23 p refs

(AD-734125; NSMRL-670) Avail: NTIS CSCL 06/16

A series of experiments obtained direct estimates of absolute distance under water, and to determine if visual judgment accuracy can be improved through training. Divers were noted to learn to make accurate judgments when they were informed of the correct distance after each of a series of judgments, but training did not adequately transfer to another body of water when there were large differences in turbidity. The results have implications for the training of divers. GRA

N72-20090# Ecole Pratique des Hautes Etudes, Paris (France). **BIOPHYSICAL AND CYTOLOGICAL STUDIES WITH LASER MICROBEAMS** Final Technical Report, Apr. 1970 - Mar. 1971

Marcel Bessis 1971 19 p refs

(Contract DAJA37-70-C-0678)

(AD-734181) Avail: NTIS CSCL 06/3

Microirradiation with a conventional UV source (2750A), ruby (6943), neodymium (5300 or 2650) lasers was used. The true absorption of laser light by Janus green-stained mitochondria was determined by comparison with models containing known amounts of the dye. In the same way it was possible to show that thermal denaturation is limited to the stained organelles, and to define radiation time limits. Flash photolysis with the Q-switched laser permitted the comparison of the results of exciting various chromophores of importance in cellular microirradiation. Differences between the effects produced by microirradiation with an ordinary UV source and with a laser source of the same wavelength have been noted. Upon irradiation of a small portion of the cell nucleus with an ordinary UV source cut-and-patch repair of the nucleic acid lesions was shown. Author (GRA)

N72-20091# Cincinnati Univ., Ohio. Coll. of Medicine.

RADIATION EFFECTS IN MAN: MANIFESTATIONS AND THERAPEUTIC EFFORT Annual Report, 1 May 1970 - 30 Apr. 1971

Eugene L. Saenger, Edward B. Silberstein, Bernard S. Aron, Harry Horwitz, James G. Kereiakes, I-Wen Chen, Carolyn Winget, and Goldine C. Gleser Washington Def. Nucl. Agency 1 Oct. 1971 97 p refs

(Contract DASA01-69-C-0131; DNA Proj. NWER-XAXM)

(AD-734209; DNA-2751T) Avail: NTIS CSCL 06/18

The goal of the program has been to obtain new information regarding the patho-physiologic, psychologic, immunologic, hematologic, and biochemical effects of total- and partial-body irradiation in human beings. The patients are irradiated, 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. Many laboratories have discovered that the extrapolation of results from laboratory animals to man to be fraught with error. The data contained in this report will suggest several potential biological dosimeters previously considered to be of some value have not fulfilled this expectation. Several new biological dosimeters are under evaluation. Author (GRA)

N72-20092# California Univ., Los Angeles. School of Engineering and Applied Science.

UNDERWATER WORK MEASUREMENT TECHNIQUES Final Report

Gershon Weltman, Glen H. Egstrom, Michael A. Willis, and William Cuccaro Jul. 1971 63 p refs

(Contract N00014-67-A-0111-0007; NR Proj. 196-069)

(AD-734014; UCLA-ENG-7140; TR-50) Avail: NTIS CSCL 05/10

The fourth and concluding report is given in a series describing yearly progress of the UCLA Research Project on

optimum underwater work measurement techniques. The previous reports have covered studies conducted in 1967, 1968 and 1969. This report, in addition to presenting the two major studies carried out in 1970, also provides a summary of work over the four year period. The cumulative list of project publications allows the reader to identify a topic of concern, determine primary findings, and explore the topic further in the literature or by reprint request. GRA

N72-20093# Randomline Inc., Willow Grove, Pa.
ON THE NATURE OF ELECTROSENSING IN THE FISH
 Allan H. Frey and Edwin E. Eichert, III Aug. 1971 76 p refs
 (Contract N00014-69-C-0181)
 (AD-734027) Avail: NTIS CSCL 06/3

An evaluative review of the electrosensing literature on fish was carried out with the intention of determining the nature of the electrosensing mechanism and its sensitivity. The biological data base was useful in the development of a mathematical model and a mathematical analyses of the sense mechanism and its function. In the course of the analyses, a working hypothesis is suggested on the nature of the sense mechanism. The function of the mathematical model developed for the sensor was explored with the use of a computer. The fishes' function at the system level was also considered and possible mechanisms defined. GRA

N72-20094# Army Medical Research Lab., Fort Knox, Ky.
AUDITORY EMG FEEDBACK DURING A SUSTAINED SUBMAXIMUM ISOMETRIC CONTRACTION Interim Report

Andree J. Lloyd 20 Sep. 1971 13 p refs
 (DA Proj. 3A0-61102-B-71-P)
 (AD-734300; USAMRL-949) Avail: NTIS CSCL 06/16

Two groups of male volunteers maintained a submaximum isometric contraction of the elbow flexors to exhaustion. During the endurance session, each subject was required to exert a force equal to 50% of his maximum voluntary strength and to subjectively rate the increasing intensity of pain resulting from the isometric pull. Continuous recordings of electromyographic activity of the biceps muscle were accomplished through standard surface electrode techniques. The experimental group was provided with direct auditory feedback of the EMG signals. Although endurance time did not increase when auditory EMG was provided, the level of muscle activity required to sustain the contraction was significantly reduced. These results suggested that auditory EMG provided a situation where the endurance task was accomplished with greater efficiency. Author (GRA)

N72-20095# Army Medical Research Lab., Fort Knox, Ky.
LATENCIES FOR MOVEMENT NAMING WITH CONGRUENT AND INCONGRUENT WORD STIMULI Progress Report

Frederick N. Dyer 17 Sep. 1971 14 p refs
 (DA Proj. 3A0-61102-B-71-P)
 (AD-734299; USAMRL-948) Avail: NTIS CSCL 05/10

Naming of movement directions was found to be almost immune to interference from incongruent names integrated with the movement stimuli. This is in sharp contrast to the large delay of color naming when colors and incongruent color names are combined in the Stroop test. A hypothesis that faster processing of movement directions than of colors is the basis of the difference in interference was tested by beginning the processing of the words at various intervals prior to their movement. No appreciable increase in interference resulted from these stationary preexposures of the words. The absence of naming interference for movement direction and other dimensions suggests a basic difference between the cortical processing of color and other dimensions. Author (GRA)

N72-20096* Litton Industries, Beverly Hills, Calif.
LIFE SUPPORT SYSTEM Patent

Daniel L. Curtis, inventor (to NASA) Issued 18 Jan. 1972 8 p
 Filed 29 Jan. 1968 Sponsored by NASA
 (NASA-Case-MSC-12411-1; US-Patent-3,635,216;
 US-Patent-Appl-SN-701244; US-Patent-Class-128-142.5;
 US-Patent-Class-128-402; US-Patent-Class-2-2.1) Avail: US
 Patent Office CSCL 06K

A description is given of a lightweight life support system for extravehicular space activity. The system may be mounted in a back pack or integrated into a protective suit. Two subsystems are provided to maintain the suit inhabitant in his environment. The first subsystem is an open loop, single pass ventilation system, having a high-pressure oxygen and mixed gas storage which is maintained within lightweight, stress-limited pressure vessels. A breathing bag cooperates with the open loop system to meet the peak respiratory demands. The second subsystem comprises a protective suit having a duct network, a liquid pump, and a sublimator-heat exchanger which in combination provide a suitable thermal condition.

Official Gazette of the U.S. Patent Office

N72-20097* National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

UNDERWATER SPACE SUIT PRESSURE CONTROL REGULATOR Patent

Billy R. Aldrich, Charles R. Cooper, inventors (to NASA), and John R. Rasquin Issued 25 Jan. 1972 17 p Filed 24 Oct. 1969

(NASA-Case-MFS-20332; US-Patent-3,636,966;
 US-Patent-Appl-SN-869260; US-Patent-Class-137-81;
 US-Patent-Class-137-469) Avail: US Patent Office CSCL 06K

A device for regulating the pneumatic pressure in a ventilated space suit relative to the pressure imposed on the suit when being worn by a person underwater to simulate space environment for testing and experimentation is described. A box unit located on the chest area of the suit comprises connections for suit air supply and return lines and carries a regulator valve that stabilizes the air pressure differential between the inside and outside of the suit. The valve and suit pressure are controlled by the suit occupant and the valve includes a mechanism for quickly dumping the suit pressure in case of emergency. Pressure monitoring and relief devices are also included in the box unit.

Official Gazette of the U.S. Patent Office

N72-20098* United Aircraft Corp., Windsor Locks, Conn.
METHOD OF FORMING A ROOT CORD RESTRAINED CONVOLUTE SECTION Patent

Michael A. Marroni, Jr. and John J. Korabowski, inventors (to NASA) Issued 7 Dec. 1971 5 p Filed 20 Dec. 1968
 Sponsored by NASA

(NASA-Case-MSC-12398; US-Patent-3,624,839;
 US-Patent-Appl-SN-785615; US-Patent-Class-2-2.1) Avail: US
 Patent Office CSCL 06Q

Root cords utilized to constrain restraint fabric so as to form convolutes in a pressurized suit are slidably disposed on the fabric, thereby permitting fabrication of root restrained fabric suit sections from sheets of fabric. This also permit adjustability of root diameters to vary the sizes of suits, and to accommodate minor tailored changes to improve comfort and mobility when the suit is being worn. Cords are restrained by stitching and cloth tunnels.

Official Gazette of the U.S. Patent Office

N72-20099# International Business Machines Corp., Philadelphia, Pa. Data Processing Div.

A TECHNIQUE FOR THE SOLUTION OF MASSIVE SET COVERING PROBLEMS, WITH APPLICATION TO AIRLINE CREW SCHEDULING

Jerrold Rubin Sep. 1971 29 p refs
 (TR-320-3004) Avail: NTIS

Recent set covering algorithms were able to solve problems for which the constraint matrix has as many as 10,000 columns. In certain applications, the number of columns is combinatorially dependent on the number of rows, and can reach many orders of

magnitude greater, for 500-1000 rows. For these problems, the constraint matrix cannot be generated, unless severe ad hoc limitations are imposed. One method of attack is to repeatedly use a set covering algorithm on much smaller matrices extracted from the overall problem, generating columns as needed. Such an approach was used on an airline crew scheduling problem, with excellent practical success on test cases involving close to 1000 rows. It utilizes some techniques which are more generally applicable, and some which make use of the structure of the crew scheduling problem. Author

N72-20100# International Business Machines Corp., Philadelphia, Pa. Data Processing Div.
AIRLINE CREW SCHEDULING: THE NON-MATHEMATICAL PROBLEM
 Jerrold Rubin Sep. 1971 18 p refs
 (TR-320-3006) Avail: NTIS

Methods of overcoming some difficulties for airline crew scheduling are reviewed. Several generalizations and analogies are drawn which may be applied to other areas. Author

N72-20101# Human Resources Research Organization, Alexandria, Va.
HUMAN RESOURCES RESEARCH ORGANIZATION BIBLIOGRAPHY OF PUBLICATIONS AS OF 30 JUNE 1971

Sep. 1971 363 p refs
 Avail: NTIS HC \$6.00/MF \$0.95

The Human Resources Research Organization (HumRRO) bibliography of publications as of 30 June, 1971 is presented. The reporting items issued during FY 1971 are listed separately as well as in the cumulative total output. Abstracts have been provided for most items in the cumulative list. A comprehensive and descriptive listing of research projects and experimental materials has been compiled. Author

N72-20102*# Naval Aerospace Medical Inst., Pensacola, Fla.
GOGGLE DEVICE FOR MEASURING THE VISUALLY PERCEIVED DIRECTION OF SPACE
 Earl F. Miller, II and Ashton Graybiel 30 Nov. 1971 6 p refs
 (NASA Order T-81633; NASA Order L-43518)
 (NASA-CR-125859; NAMRL-1151) Avail: NTIS CSCL 06B

A detailed description is given of a miniature line-target system that is illuminated by a radioactive source, collimated, and provided with suitable scales to indicate its position within the roll and pitch planes. These components are assembled in a lightweight, goggle that can be precisely positioned by means of a biteboard attachment. Uses of the goggle in the measurements of the perceived direction of space under ordinary and extraordinary test conditions are illustrated. Modifications are suggested that can extend its usefulness. Author

N72-20103*# National Academy of Sciences-National Research Council, Washington, D.C. Space Science Board.
HUMAN FACTORS IN LONG-DURATION SPACE FLIGHT
 1972 283 p refs
 (Contract NSR-09-012-911)
 (NASA-CR-125826; LC-70-189063; ISBN-0-309-01947-8)
 Avail: NTIS; Printing and Publishing Office, NAS, 2102 Constitution Ave., Washington, D. C. 20418 CSCL 05E

A study, covering the behavioral, psychological, physiological, and medical factors of long duration manned space flight, is presented. An attempt was made to identify and resolve major obstacles and unknowns associated with such a flight. The costs and maintenance of the spacecraft system are also explored. E.H.W.

N72-20104# RAND Corp., Santa Monica, Calif.
THE BIOMOD USER'S REFERENCE MANUAL

R. L. Clark, G. F. Groner, and R. A. Berman Jul. 1971 146 p refs
 (Grant GM-15896)
 (R-746-NIH) Avail: NTIS

BIOMOD is a computer graphics system for modeling continuous systems. It features man oriented machine interaction, hierarchical model structuring, and user oriented model definition languages. The user communicates with BIOMOD by using a data tablet to draw diagrams, handprint text, and activate program functions; he may also enter text through a keyboard. The user's input and the systems's responses are displayed on a cathode ray tube display screen. The user deals with two phases of BIOMOD: a construction phase, in which he describes a model, and simulation phase, which calculates and displays the results, and which allows him to interact with the simulation. A model is described by a block diagram. Each block of the diagram may represent an analog computer-like primitive function, a set of mathematical (algebraic or differential) equations, a set of chemical equations, a set of FORTRAN statements, or another block diagram. The simulation phase displays the values of simulation variables, either numerically or graphically, as the simulation proceeds. The simulation may be stopped at any point. Author

N72-20105*# Lockheed Missiles and Space Co., Sunnyvale, Calif.

WHOLE BODY MEASUREMENT SYSTEM Patent Application

John S. Ogle, inventor (to NASA) Filed 18 Nov. 1971 13 p
 (Contract NAS9-10742)
 (NASA-Case-MS-C-13972-1; US-Patent-Appl-SN-200040) Avail: NTIS CSCL 06B

A biomedical system for quantitatively determining the volume and volume change of a human body under weightlessness conditions, over a period of time, is described. The system consists of an enclosed chamber having a defined volume and arranged for receiving a human body. The system is provided with a means for infrasonically varying the volume of the chamber. The changes in volume produce resultant changes in pressure, and under substantially isentropic conditions, an isentropic relationship permits a determination of gas volume which, in turn, when related to total chamber volume permits a determination of the body volume. By comparison techniques, volume changes of a human independent of gravity conditions can be determined. NASA

N72-20106*# General Electric Co., Philadelphia, Pa.

AIR-CONDITIONED SUIT Patent Application

George R. Carl, inventor (to NASA) Filed 27 Oct. 1970 11 p
 (Contract NAS1-6537)
 (NASA-Case-LAR-10076-1; US-Patent-Appl-SN-84290) Avail: NTIS CSCL 06K

An environmentally controlled suit consisting of an airtight outer garment attached by an airtight bellows to the wall of a sterile chamber, an undergarment providing for circulation of air near the skin of the wearer, and circulation system comprised of air supply and distribution to the extremities of the garment and central collection and exhaust of air from the midsection of the undergarment has been developed. A workman wearing the undergarment and attached circulation system enters the outer garment through a tunnel in the chamber wall and the attached bellows to work in the chamber without any danger of spreading bacteria. NASA

N72-20107# Joint Publications Research Service, Washington, D.C.

HIGH ALTITUDE EQUIPMENT FOR CIVIL AVIATION AIRCRAFT

N. G. Grishanov 16 Mar. 1972 274 p refs Transl. into ENGLISH of the book "Vysotnoye Oborudovaniye Samoletov Grazhdanskoy Aviatsii" Moscow, Transport Publishing House, 1971 264 p

(JPRS-55454) Avail: NTIS

The physiological effects of high altitude flight and the development of life support systems for civil aircraft are discussed. Subjects presented are: (1) pressurized aircraft cabins, (2) aircraft cabin air conditioning systems, (3) aircraft oxygen systems, (4) aircraft cabin temperature and humidity control systems, and (5) servicing and maintenance of pressurized cabins and high altitude equipment. Line drawings of various items of equipment and systems are provided for clarification. P.N.F.

N72-20108*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DESIGN OF A SPECIALIZED COMPUTER FOR ON-LINE MONITORING OF CARDIAC STROKE VOLUME

John A. Webb, Jr. and Vernon D. Gebben Washington Apr. 1972 36 p refs

(NASA-TN-D-6658; E-6376) Avail: NTIS CSCL 06B

The design of a specialized analog computer for on-line determination of cardiac stroke volume by means of a modified version of the pressure pulse contour method is presented. The design consists of an analog circuit for computation and a timing circuit for detecting necessary events on the pressure waveform. Readouts of arterial pressures, systolic duration, heart rate, percent change in stroke volume, and percent change in cardiac output are provided for monitoring cardiac patients. Laboratory results showed that computational accuracy was within 3 percent, while animal experiments verified the operational capability of the computer. Patient safety considerations are also discussed. Author

N72-20109*# General Electric Co., Philadelphia, Pa. Missile and Space Div.

URINE SAMPLING AND COLLECTION SYSTEM Final Report

G. L. Fogal, J. K. Mangialardi, and C. G. Reinhardt Nov. 1971 162 p refs

(Contract NAS9-10741)

(NASA-CR-115507; DOC-70SD5414) Avail: NTIS CSCL 06B

This specification defines the performance and design requirements for the urine sampling and collection system engineering model and establishes requirements for its design, development, and test. The model shall provide conceptual verification of a system applicable to manned space flight which will automatically provide for collection, volume sensing, and sampling of urine. Author

N72-20110*# General Electric Co., Philadelphia, Pa. Space Div.

GENERAL PURPOSE BIOAMPLIFIER STUDY IBLMS phase B4 additional tasks. Task 4.0

[1972] 45 p

(Contract NAS9-10741)

(NASA-CR-115506; DOC-70SD5414) Avail: NTIS CSCL 06B

Based on known inputs and outputs, a set of specifications were developed for the major characteristics of a general purpose amplifier for use in the Integrated Medical, Behavioral, and Laboratory Measurement System. A.L.

N72-20111*# North American Rockwell Corp., Los Angeles, Calif.

AN IMPROVED PROSTHETIC DEVICE Patent Application

Walter L. Scott, inventor (to NASA) Filed 22 Feb. 1972 15 p Sponsored by NASA

(NASA-Case-MFS-16570; US-Patent-Appl-SN-228150) Avail: NTIS CSCL 06B

A prosthetic device with transducers for applying tactile stimuli to the stump of an amputated appendage is described. The sensors are supported in several flexible digits. There is also a slave unit for transporting the detected stimuli. The device is designed to specifically detect heat and pressure. NASA

N72-20112*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ERGOMETER Patent Application

Raymond L. Gause and Bobby G. Bynum, inventors (to NASA) Filed 29 Nov. 1971 18 p

(NASA-Case-MFS-21109; US-Patent-Appl-SN-202769) Avail: NTIS CSCL 06B

An ergometer system, which provides enhanced versatility in operation and more effective control of the work load imposed upon a body undergoing conditioning, is described. The system is composed of a pedal driven direct current motor, a frame for supporting the body in either a sitting or prone position, and an electric circuit means by which the load applied to the pedals is limited. To determine the load limit, the circuit measures the function of work being performed, the heart rate, and increases in heart rate. The ergometer system may be operated by hand or by foot. E.H.W.

N72-20113*# Quantum Dynamics, Tarzana, Calif.

RESPIRATORY ANALYSIS SYSTEM Patent Application

Frederick F. Liu, inventor (to NASA) Filed 19 Aug. 1971 19 p Sponsored by NASA

(NASA-Case-MSC-13436-1; US-Patent-Appl-SN-173190) Avail: NTIS CSCL 06B

A system for quantitatively analyzing the human respiratory processes in real time is described. The system is composed of a face mask with one way inlet and outlet valves where the gas flows through independent flowmeters and a mass spectrometer. The inhalation and exhalation are measured from the signals given off by opening and closing the valve system. The flowmeter produces electric pulses representative of the flow rate. The two systems are then connected to a computer for real time measurement by a one minute clock pulse. E.H.W.

N72-20114*# Emory Univ., Atlanta, Ga.

IMPROVED DIALYZER Patent Application

David A. Miller, inventor (to NASA) Filed 27 Apr. 1971 28 p (Grant NGR-11-001-009)

(NASA-Case-HQN-10741; US-Patent-Appl-SN-137913) Avail: NTIS CSCL 06B

An improved dialyzer for use in separating selected substances from a uniformly flowing body of fluid by diffusing the substance through a plurality of semi-permeable membranes into a counter-flowing body of dialysate is described. Each of the membranes is supported between a pair of planar mats, one of which is provided with a substantially smooth surface while the other is provided with a uniform arrangement of protuberances substantially conforming to right circular cones with the apex extended into deforming engagement with the adjacent surface of the membrane. With this arrangement, the opposite surface of the membrane is forced into a point-contact engagement with the smooth surface of the mat so that a fluid chamber having a plurality of angularly related channels is established for conducting the fluid along angularly related multiple paths. NASA

N72-20115# Welson (B.) and Co., Inc., Hartford, Conn.

A ROCKET PROPELLANT HANDLER'S SUIT FOR PROTECTION FROM CHLORIDE TRIFLUORIDE AND ELEMENTAL FLUORINE Final Technical Report, Sep. 1969 - Oct. 1970

Joseph A. Martone and Gail A. Bergen Edwards AFB, Calif. AFRPL Aug. 1971 65 p refs

(Contract F04611-69-C-0102; AF Proj. 3058)

(AD-731556; AFRPL-TR-71-44) Avail: NTIS CSCL 06/17

Extremely powerful and highly toxic oxidizers such as fluorine (F₂) and chlorine trifluoride (ClF₃) are currently being studied at the Air Force Rocket Propulsion Laboratory. A prototype propellant handler's suit for protection against gaseous fluorine and liquid chlorine trifluoride has been developed and operationally tested. The exposed components of this garment are made of perfluoropolymers and stainless steel. The complete suit and sample components were exposed to both gaseous

fluorine and liquid chlorine trifluoride. The suit reacted with liquid chlorine trifluoride and therefore failed to pass the operational test. Author (GRA)

N72-20116# Anacapa Sciences, Inc., Santa Barbara, Calif.
APPLICATION AND DESIGN CHARACTERISTICS OF GENERALIZED TRAINING DEVICES Final Report, 1970 - 1971

Edward L. Parker Orlando, Fla. Naval Training Device Center Sep. 1971 107 p
 (Contract N61339-70-C-0309)
 (AD-733471; NAVTRADEVEN-70-C-0309-1) Avail: NTIS CSCL 05/9

The purpose of the research reported was to identify areas of Naval electronic training that can potentially benefit from the development of generalized training devices, and to define the design and use characteristics of several such devices as appropriate. By direction, the primary emphasis of the study was on maintenance training, with the technical approach developed as also applicable to operator training. The single most promising generalized training device has been identified and its characteristics are discussed in considerable detail. GRA

N72-20117# Naval Personnel and Training Research Lab., San Diego, Calif.

INFORMATION FEEDBACK: CONTRIBUTIONS TO LEARNING AND PERFORMANCE IN PERCEPTUAL IDENTIFICATION TRAINING Final Technical Bulletin

Alvin J. Abrams and Richard L. Cook Dec. 1971 21 p refs
 (AD-733451; STB-72-5) Avail: NTIS CSCL 05/9

In training people to perform auditory identification tasks (e.g., training students to identify sound characteristics in a sonar classification task) it is important to know whether or not training procedures are merely sustaining performance during training or whether they enhance learning of the task. Often an incorrect assumption is made that superior performance during training is synonymous with a high level of learning. Two experiments were run in which the pacing of stimulus complexity and the fading of informational feedback (IF) were systematically varied. It was found that: The pacing of stimulus complexity during training serves to enhance the learning effectiveness of IF; continuous IF serves primarily to sustain performance, while fading IF enhances learning; the learning enhancement effect of IF is greatest when judgments of a stimulus dimension are made on a previously learned absolute scale, while the performance sustaining effect of IF is greatest when judgments of a stimulus dimension are made on a novel, relative scale. Author (GRA)

N72-20118# Dunlap and Associates, Inc., Darien, Conn.

TRAINING DEVICE EMPLOYMENT MATERIALS

Gabriel G. Jeantheau Orlando, Fla. Naval Training Device Center Nov. 1971 84 p refs
 (Contract N61339-70-C-0189)
 (AD-733962; NAVTRADEVEN-70-C-0189-1) Avail: NTIS CSCL 05/9

The study organized and analyzed a collection of training materials solicited from approximately one hundred training device activities in order to examine the similarities and differences among the collection, to make a preliminary determination of their training value, and to determine their utility for guidance in the preparation of materials for future devices. Criteria for effective materials that derive directly from criteria for effective device use were applied to the sample. Noteworthy documents are observed for trainers in aircraft weapon system trainers. Examples of selected ingredients are provided, and recommendations are made for improved solicitation procedures for future additions to the collection and for a study of the methodology of problem development. GRA

N72-20119# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

TECHNICAL FACILITIES SUMMARY

Denton M. Mays, comp. Nov. 1971 77 p
 (AD-734544; AMRL-TR-71-54) Avail: NTIS CSCL 06/12

The report identifies the major technical research and development facilities used by the aerospace medical research laboratory. Basic information, such as specifications, capabilities, and technical applications of these facilities, is provided. These facilities represent the critical link in the total integration of the laboratory resources toward accomplishing the stated mission (conducting human engineering and biomedical research): (1) defining the limits of human tolerances, (2) establishing human performance capability, and (3) establishing design criteria for Air Force systems. Author (GRA)

N72-20147# Joint Publications Research Service, Arlington, Va.
APPLICATION OF BIOTELEMETRY FOR RESEARCH IN THE PHYSIOLOGY OF LABOR AND SPORTS: EQUIPMENT FOR STUDYING FREELY MOVING PEOPLE c04

R. V. Unzhin and L. S. Dombrovskiy *In its* Biol. Telemetry 6 Mar. 1972 p 107-141 refs
 Avail: NTIS

Specific types of biotelemetric equipment for observation of freely moving people are discussed. Descriptions and circuit diagrams are presented for the following instruments: (1) TEK-1 teleelectrocardiograph; (2) KRP combination telemetric devices; (3) REK-1 radiopulsophone-electrocardiograph; (4) MRP-1K10 multipurpose radiotelemetric devices; (5) multipurpose modular radiotelemetric system 3MMRS; (6) three channel biotelemetric system with tape recorder 3BTS-M; (7) eight channel biotelemetric system; and (8) close-range miniature telemetric devices for EMG transmissions. A.L.

N72-20148# Joint Publications Research Service, Arlington, Va.
APPLICATION OF BIOTELEMETRY IN PHYSIOLOGY OF LABOR AND SPORTS c04

V. V. Rozenblat and L. S. Dombrovskiy *In its* Biol. Telemetry 6 Mar. 1972 p 142-175 refs
 Avail: NTIS

Biotelemetry in the physiology of labor is important because: (1) it can help provide a physiological basis for scientific organization of production; (2) studies of functional shifts give an idea not only of the nature of the work performed but also of the conditions of the production environment; and (3) physiological observations permit judgment of the nature of the course of certain pathological processes and deviations under the conditions of professional activity. In production physiological studies, just as in sports, dynamic systems are finding the greatest application. On the modern level of development of the physiology of sports and sports medicine the necessity for performing physiological examinations during the process of actual muscular activity of the sportsman is being felt more and more acutely. The physiology of sports can be considered one of the fields in which the telemetric procedure is especially necessary and has the broadest sphere of application. A.L.

N72-21041*# Colorado State Univ., Fort Collins.

METABOLIC EFFECTS OF ARTIFICIAL ENVIRONMENTS
Semiannual Status Report

John Patrick Jordan 31 Oct. 1971 40 p refs
 (Grant NGR-06-002-075)

(NASA-CR-62079) Avail: NTIS CSCL 06C

The mechanisms by which inert gases influence metabolism were investigated from several viewpoints. Groups of rats were exposed at the thermal neutral temperature of the respective mixtures, to normoxic (P sub A O₂ = 100 mm Hg) environments with argon, helium or nitrogen as the diluent at a total pressure of one atmosphere. The possible influence of diluent gases on oxygen transport to the cell was examined with hypoxic (P sub A O₂ = 70 mm Hg) mixtures of the same diluent gases. Metabolic measurements included food, water, and oxygen

consumption, CO₂ production, hematocrit and the rate C-1402 of expiration subsequent to intraperitoneal injection of acetate-1-C-14 or glucose UL-C-14. Argon-exposed animals showed a consistently decreased metabolic rate while, on the other hand, helium-exposed rats did not significantly alter metabolic rate relative to nitrogen. Certain indices, including acetate and glucose utilization, suggested that helium attenuated the imposed hypoxia at the cellular level while argon facilitated it as compared with nitrogen. These results suggest that metabolic influence of helium is largely thermal in nature while argon has a significant direct metabolic effect and that diluent gases may selectively influence oxygen availability to the interior of the cell.

Author

N72-21042*# Techtran Corp., Glen Burnie, Md.
A MICROMETHOD FOR RAPID AND SPECIFIC SERIES DETERMINATION OF THE PROTEIN CONTENT OF INTACT MICROORGANISMS

G. Hesse, R. Lindner, and R. Mueller Washington NASA Apr. 1972 14 p refs Transl. into ENGLISH from Z. Allg. Mikrobiol. (East Germany), v. 11, no. 7, 1971 p 585-594

(Contract NASw-2037)

(NASA-TT-F-14253) Avail: NTIS CSCL 06M

A method is described which makes it possible to determine in series fashion the absolute protein content in intact microorganisms. Yeasts were used as the material for developing and discussing the method; however, bacteria, cell organelles, fungoid spores, etc. may be studied without modification of the method. Samples with a dry mass of 25 microgram to 200 microgram were placed on filter paper squares, fixed by extraction and stained with bromophenol blue. The extinction of the elutriated dye was measured spectrophotometrically and found to be 598 nm. The color yield of the coloration is nearly linearly dependent on the mass of protein and independent of its structure and amino acid composition. Comparative studies using classical protein-determination methods (total nitrogen, protein nitrogen, amino acids following total hydrolysis) confirmed the protein values obtained using the dye method. Scattered light measurements in a methanol/water dispersion medium was used for dry weight determination of the smallest amounts of sample (removal of a small amount for inoculation from distinct colonies). The quantity of free amino acids is significantly lower in protein-rich yeasts than in protein-poor species. On the other hand, the amount of non-protein nitrogen was approximately the same in all of the investigated strains.

Author

N72-21043# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND MEDICINE, VOLUME 6, NUMBER 1, 1972

12 Apr. 1972 145 p refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Meditsina (Moscow), v. 6, no. 1, 1972 p 3-93

(JPRS-55687) Avail: NTIS

Concerning the selection and training of cosmonauts; evaluation and analysis of accumulated data to facilitate the on-going transition from orbital to interplanetary flights; research aimed at guaranteeing safety on long flights and reliability of the human component of the man-spaceship system; space psychology and physiology; environmental problems and control (spacecraft habitability, effects of radiation and weightlessness, etc.) and telemetry, are presented.

Author

N72-21044# Joint Publications Research Service, Arlington, Va.
EFFECTS OF HYPEROXIA ON COAGULATING AND ANTICOAGULATING SYSTEMS IN BLOOD

N. A. Agadzhanian and B. K. Rybakov 28 Mar. 1972 9 p refs Transl. into ENGLISH from Eksperim. Khirurgiya i Anesteziologya (Moscow), no. 6, Nov. - Dec. 1971 p 66-70

(JPRS-55553) Avail: NTIS

The effects of prolonged exposure to oxygen enriched atmospheres on the coagulating activity of human blood are investigated. Tests were also made to determine when changes

develop in the coagulating process. The results demonstrate that during a prolonged stay in a hyperoxic environment, blood coagulability changes in the direction of hypocoagulability. The degree to which the changes occur depend on exposure to partial oxygen pressure and the duration of the exposure to the hyperoxic atmosphere.

E.H.W.

N72-21045*# Translation Consultants, Ltd., Arlington, Va.
EXPERIMENTAL AND CLINICAL STUDIES IN THE TREATMENT OF ARRHYTHMIAS DUE TO DIGITALIS BY SODIUM CITRATE

W. Smolarz, S. Kosmider, and K. Zajusz Washington NASA Apr. 1972 9 p refs Transl. into ENGLISH from Z. Kreislaufforsch. (Berlin), v. 55, no. 5, 1966 p 521-527

(Contract NASw-2038)

(NASA-TT-F-14194) Avail: NTIS CSCL 06E

Cardiac arrhythmia caused by intravenously administered digoxin (0.15 mg/kg) into dogs was terminated by subsequent intravenous injections of Na citrate (0.6-1.4 g) alone or in combination with 0.5 g KC1. The best results were obtained giving Na citrate alone, for although positive results could be obtained at a lower dosage with the administration of the 2 compounds together, ventricular flutter appeared in several cases. The intravenous infusion of Na citrate (1.22 g) to patients with cardiac arrhythmia due to digitalis produced normalization of the rhythm in all patients observed; however, infusions of Na citrate had to be repeated in some cases due to remission of the rhythm disturbance. The use of Na citrate in the treatment of acute digitalis toxicity was suggested.

Author

N72-21046*# Techtran Corp., Glen Burnie, Md.
CHANGES IN THE NERVOUS SYSTEM DURING A 120 DAY CLINOSTATIC HYPOKINESIA AND THE PROPHYLAXIS OF HYPOKINESIC DISORDERS

T. N. Krupina and A. Ya. Tizul Washington NASA Apr. 1972 13 p refs Transl. into ENGLISH from Zh. Nevropatol. i Psikiatr. (Moscow), v. 71, no. 11, 1971 p 1611-1617

(Contract NASw-2037)

(NASA-TT-F-14225) Avail: NTIS CSCL 06S

The basic changes in the nervous system during a 120 day clinostatic hypokinesia are studied along with the effect of certain pharmacological preparations (pituitrin, deoxicortical steroid acetate, and nerabol) in the dynamics of hypokinesic disorders. Ten neurologically healthy men, ages 21 to 44, were test subjects; they were divided into three groups, one being a control group receiving no medication. As the experiment progressed there was an increase in the vegetative-vascular, electrolytic-humoral disorders and asthenization of the organism as well as a reduction in muscular tone, especially of the knee and femur. A gradual increase in neurological disturbances was observed towards the end of the third month and the beginning of the fourth. Most of the hypokinesic disturbances disappeared by the end of the second month following completion of the period of hypokinesia. It was concluded that certain pharmacological agents can be used to prevent hypokinesic disorders.

Author

N72-21047*# Exotech, Inc., Washington, D.C.
CONTAMINATION CONTROL THROUGH FILTRATION OF MICROORGANISMS

P. D. Stabekis and R. G. Lyle Apr. 1972 32 p refs

(Contract NASw-2062)

(NASA-CR-126035; TR-72-10) Avail: NTIS CSCL 06M

A description is given of the various kinds of gas and liquid filters used in decontamination and sterilization procedures. Also discussed are filtration mechanisms, characteristics of filter materials, and the factors affecting filter performance. Summaries are included for filter testing and evaluation techniques and the possible application of the filters to spacecraft sterilization.

Author

N72-21048*# Exotech, Inc., Washington, D.C.
CONTAMINATION CONTROL BY USE OF ETHYLENE OXIDE

R. H. Stroud and R. G. Lyle Apr. 1972 42 p refs
 (Contract NASw-2062)

(NASA-CR-126034; TR-72-11) Avail: NTIS CSCL 06M

The uses of ethylene oxide as a decontaminating agent for planetary quarantine related applications are reported. Aspects discussed include: applications and limitations, chemical and physical properties, germicidal activity, methods of applications, and effects on personnel.

F.O.S.

N72-21049*# Exotech, Inc., Washington, D.C.
PLANNING, EVALUATION AND ANALYTICAL STUDIES IN PLANETARY QUARANTINE AND SPACECRAFT STERILIZATION Final Report

Mar. 1972 34 p

(Contract NASw-2062)

(NASA-CR-126033; TR-72-15) Avail: NTIS CSCL 06M

The technical and analytical support used to aid in developing requirements for planetary quarantine are presented. The investigation was divided into 8 work tasks which are presented in tabular form. Data include methods of sterilization, safety margins for quarantine, revision of contamination logs for Mars and Venus, and estimates of encapsulated and 'free' microbial burden.

E.H.W.

N72-21050*# Exotech, Inc., Washington, D.C.
SAFETY MARGINS IN THE IMPLEMENTATION OF PLANETARY QUARANTINE REQUIREMENTS Interim Report

Samuel Schalkowsky and Itzhak Jacoby Apr. 1972 26 p
 (Contract NASw-2062)

(NASA-CR-126032; TR-72-14) Avail: NTIS CSCL 06M

The formulation of planetary quarantine requirements, and their implementation as determined by a risk allocation model, is discussed. The model defines control safety margins with particular emphasis on utility in achieving the desired minimization of excessive margins, and their effect on implementation procedures.

E.H.W.

N72-21051# Royal Aircraft Establishment, Farnborough (England).

THE EFFECT OF VIBRATION ON THE HUMAN BODY

V. P. Grebenyuk Jul. 1971 7 p Transl. into ENGLISH Zdravookhr Kaz. (USSR), v. 12, 1969 p 14-16

(RAE-Lib-Trans-1611; BR-28526) Avail: NTIS

Vibration sickness in workers using vibro-thickeners for the construction of ferro-concrete panels is reported, with emphasis on the effects on feet and ankles due to standing on the vibrating machinery. Clinical treatment of the condition is described. Re-positioning the vibro-thickeners so that workers need not stand on them, and adding vibration insulating material sharply reduced the incidence of vibration and other sickness.

Author

N72-21052*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

AUTOMATIC REAL-TIME PAIR FEEDING SYSTEM FOR ANIMALS Patent Application

Henry A. Leon, James P. Connolly, Maurice J. Hitchman, and John E. Humbert, inventors (to NASA) Filed 30 Nov. 1971 19 p

(NASA-Case-ARC-10302-1; US-Patent-Appl-SN-203271) Avail: NTIS CSCL 06C

A pair-feeding method and apparatus are provided for experimental animals where the amount of food consumed by the experimental animal is immediately delivered to a normal or control animal so that there is a qualitative, quantitative, and

chronological correctness in the pair-feeding of the two animals. Also provided is a feeding mechanism for delivering precisely measured amounts of food to a feeder. Circuitry is provided between master and slave feeders so that there is virtually no chance of a malfunction of the feeding apparatus, causing erratic results. Recording equipment is also provided so that an hourly record is kept of food delivery.

NASA

N72-21053# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Bad Godesberg (West Germany). Inst. fuer Flugmedizin.

THE RELATIONSHIP OF OXYGEN UPTAKE AND BODY TEMPERATURE IN MAN IN ACUTE AND SEVERE HYPOXIA

H. W. Holtmann, H. Bruener, and K. E. Klein 4 Aug. 1971 37 p refs In GERMAN; ENGLISH summary
 (DLR-FB-71-65) Avail: NTIS; DFVLR, Porz-Wahn 15, 30 DM

In ten healthy students (20 to 30 years of age), the responses of ventilation parameters, pulse rate, O₂-uptake, and body temperature were studied in a decompression chamber at atmospheric pressures of 750, 358, 335 and 312 mm Hg. The results showed significant changes of ventilation parameters (up to a maximum of + 87%) and pulse rate (up to a maximum of + 54%) in proportion to the different decompression levels. With increasing hypoxic stress the alterations of respiratory and circulatory values became more significant and concordant. In addition, the oxygen uptake revealed dependence from the different inspiratory partial oxygen pressures. The control experiments at 750 mm Hg suggest a significant dependence of oxygen uptake from the test situation itself. This fact was taken into consideration in the evaluation of the results obtained at different altitudes. The continuous registration of oxygen uptake during hypoxia shows a primary decrease which is followed by an increase, so that oxygen consumption is finally higher than the level at rest. O₂-uptake seems to approach an equilibrium, but at the end of the 30-minute test period is not yet in a steady state. The curves for body temperature and oxygen uptake show inverse courses which point to the existence of control systems.

Author

N72-21054# Lovelace Foundation for Medical Education and Research, Albuquerque, N.Mex.

THE BIODYNAMICS OF AIRBLAST

Clayton S. White, Robert K. Jones, Edward K. Damon, E. Royce Fletcher, and Donald R. Richmond 1 Jul. 1971 135 p refs
 Presented at the Symp. on Linear Acceleration of the Impact Type, Porto, Portugal, 23-26 Jun. 1971

(Contract DASA01-70-C-0075)

(AD-734208; DNA-2738T) Avail: NTIS CSCL 06/19

After pointing out that accelerative and decelerative events are associated with the direct (pressure) and indirect (translational events including penetrating and nonpenetrating debris and whole-body impact) 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 (GRA)

N72-21055# Bristol Univ. (England). Dept. of Physiology.
ANTARCTIC CLIMATE, CLOTHING AND ACCLIMATIZATION Final Report, 1 Sep. 1969 - 31 Mar. 1971

A. F. Rogers and R. J. Sutherland Wright-Patterson AFB, Ohio
AMRL Nov. 1971 143 p refs
(Grant EOOAR-0068-69; AF Proj. 7164)
(AD-734071; AMRL-TR-71-112) Avail: NTIS CSCL 06/19

A detailed computer analysis was made of the clothing worn by the members of the Trans-Antarctic Expedition, and the relevant climate data. The analysis covers a period of just over fourteen months and includes the 2,158 mile journey across Antarctica. The cold stress was severe. No evidence of whole body acclimatization to cold in man could be found. The clothing worn was clearly shown to be more closely correlated with temperature than with windchill. The measured clo values of twentyeight different assemblies of Antarctic clothing were compared. A simple direct relationship between a weighted number of layers count and the clo value of an assembly was shown to exist. This relationship is of immediate use in comparing the relative thermal insulation of two cold weather clothing assemblies. Other data, including weight fat thickness and sleep records, are discussed. The data presented are consistent with the suggestion that man creates and controls his own micro climate. Author (GRA)

N72-21056# Connecticut Univ., Storrs.
SONAR DOPPLER DISCRIMINATION IN HIGH NOISE ENVIRONMENTS Interim Report
Paul F. Smith (Naval Submarine Med. Center, Groton, Conn.) and Martha Koch 10 Feb. 1971 18 p refs
(Contract N00014-67-A-0197-0001)
(AD-734118; NAVMED-MF12.524.004-9010D) Avail: NTIS CSCL 05/10

The experiment was concerned with the ability of anti-submarine warfare helicopter-borne sonar men to perform Doppler discrimination in the high background noise existing aboard rotary winged aircraft. Performance on a frequency discrimination task was measured under conditions in which the background noise was varied in intensity up to levels approaching those found aboard helicopters. The level of the signal was also varied such that under some conditions the signal was only slightly audible above the noise while under some conditions the signals were clearly audible. It was found that the intensity of the noise was not, of itself, related to the acuity of frequency discrimination. Rather, the differences between the signal level and noise level was most directly related to pitch discrimination performance. It was concluded that, if the signal level could be maintained well above the background noise level, doppler discrimination would not be seriously impaired. Author (GRA)

N72-21057# Naval Submarine Medical Center, Groton, Conn.
BIOCHEMISTRY OF SUBMARINE AND DIVING STRESS. 1: LACTATE-PYRUVATE AND REDOX CHRONIC HYPERCAPNIA Interim Report
Michael J. Jacey and Karl E. Schaefer 22 Feb. 1971 17 p refs
(AD-734120; NSMRL-652; NAVMED-MF12.524.006-9028B)
Avail: NTIS CSCL 06/19

Lactate and pyruvate concentrations were measured in blood and various tissues of guinea pigs exposed to 15% CO₂ in 21% O₂, balance N₂, for varying periods of time up to one week. Acute exposure resulted in reduction of lactate/pyruvate ratios (L/P) of blood, heart, and muscle but not liver. Blood L/P further decreased after one day of exposure and slowly increased during the chronic phase of respiratory acidosis. Heart L/P returned to control values by six hours while muscle L/P remained depressed for the duration of hypercapnia. Since L/P reflect the redox state of the free glycolytic nicotinamide-adenine dinucleotide couplet, the redox state, NAD(-)/NADH was calculated from the L/P and pH of blood for the various periods of hypercapnia. During acute hypercapnia NAD(-)/NADH increased in blood markedly indicating the existence of a more oxidized state during this period. Chronic hypercapnia returned blood NAD(-)/NADH toward initial values suggesting a normalization of glycolytic metabolism. The observed differences

in L/P in the various tissues are apparently related to the different CO₂ buffering capacities of tissues. Author (GRA)

N72-21058# Naval Submarine Medical Center, Groton, Conn.
BIOCHEMISTRY OF SUBMARINE AND DIVING STRESS. 3: PLASMA CREATINE, CREATINE PHOSPHATE AND CREATINE PHOSPHOKINASE RESPONSES TO HYPERCAPNIA Interim Report
Donald V. Tappan 14 Apr. 1971 14 p refs
(AD-734126; NSMRL-661; NAVMED-MF12.524.006-9028B)
Avail: NTIS CSCL 06/19

Creatine phosphokinase, the enzyme which is currently the most sensitive tool for detecting myocardial infarction, has been shown to also be useful for the detection of serious or irreversible damage to animals exposed to stressful levels of environmental carbon dioxide. Since accumulation of carbon dioxide is a problem for which Navy divers must be constantly alert and which may affect workers in any confined environment, this analysis is suggested as a clinical test for monitoring potential damage to the health of operational personnel. Author (GRA)

N72-21059# Naval Submarine Medical Center, Groton, Conn.
BIOCHEMISTRY OF SUBMARINE AND DIVING STRESS. 4: RESPONSES OF BLOOD LACTATE-PYRUVATE AND REDOX STATE TO CHRONIC EXPOSURE TO 3 PERCENT CO₂ Interim Report
Michael J. Jacey, Arthur A. Messier, and Karl E. Schaefer 15 Apr. 1971 11 p refs
(AD-734122; NSMRL-662; NAVMED-MF12.524.006-9028B)
Avail: NTIS CSCL 06/19

Lactate and pyruvate concentrations were measured in blood of guinea pigs exposed to 3% CO₂ in 21% O₂, balance N₂ for varying periods of time up to a week. The redox state, NAD-/NADH ratio was calculated from the lactate/pyruvate ratio and H(-) concentration for each time point. Blood lactate-pyruvate concentrations as well as redox states, were virtually unaffected. It would appear that a respiratory acidosis, induced by exposure to 3% CO₂ with a maximum pH decrease of .12 units, is in itself not sufficient to alter glycolytic metabolism of blood in guinea pigs. Author (GRA)

N72-21060# Stanford Research Inst., Menlo Park, Calif.
MATHEMATICAL ANALYSIS AND DESCRIPTION OF CONTINUOUS HUMAN BEHAVIOR Annual Status Report, 1 Nov. 1970 - 31 Oct. 1971
Lawrence R. Pinney 20 Dec. 1971 7 p
(Contract N00014-71-C-0139; NR Proj. 145-270; SRI Proj. LSU-8961)
(AD-734681; ASR-1) Avail: NTIS CSCL 05/10

To record and analyze sequential (i.e. continuous) motor behavior in the human during performance of a task, a method is being devised whereby the relations of body units during spontaneous activity are measured using the angular displacement of each unit with respect to a reference body unit as a function of time. For any given sequence of behavior, the angular displacements are being reduced to linear differential equations. In addition, the sequences of behavior are being related to important physiological substrates such as brain function, cardiac output, muscle tension, respiration rate and volume, body temperature and the like. Author (GRA)

N72-21061# Texas Univ., Austin, Electronics Research Center.
THE EXTRACTION OF SLEEP INFORMATION FROM HEART RATE DATA: ANALYSIS OF THE SLEEP CYCLE
Joanne L. Aldredge, Ashley J. Welch, Philip C. Richardson, and Fred B. Vogt 5 Aug. 1971 128 p refs

(Contract F44620-71-C-0091; AF Proj. 4751)
(AD-734283; TR-107; AFOSR-71-2633-TR) Avail: NTIS
CSCL 06/16

The report describes some of the characteristics of heart rate information during sleep and suggests the possibility of extracting sleep information from heart rate data. The average heart rate and variance of heart rate are presented on ten subjects during two nights of sleep using epochs of 128 consecutive R to R intervals recorded during known stages of sleep. The significance of these measures as indicators of sleep as a function of the sleep cycle in a night's sleep is computed using the Analysis of Variance. The hypothesis that the mathematical expected mean heart rate values for each sleep cycle (each approximately 90 minutes long (8)) of a particular night and stage are equal is rejected. Average variance of heart rate for each sleep cycle remained more constant throughout a night than did the mean averaged heart rate (the mean of the averaged heart rate values of each epoch for a cycle). In some cases, the mean averaged heart rate and average sample standard deviation values varied with each cycle according to certain increasing and decreasing trends. Author (GRA)

N72-21062# Arizona State Univ., Tempe.
A RESEARCH PROGRAM ON HYPERBARIC ENVIRONMENTAL EFFECTS UPON PRIMATES AND OTHER ANIMALS Final Report

Dwight Sutton and Eugene M. Taylor 1 Nov. 1971 25 p refs
(Contract N00014-68-A-0150; NR Proj. 196-077)
(AD-735117; Rept-71-F) Avail: NTIS CSCL 06/19

The contract developed and tested sensitive methodologies for measuring sensory and motor impairment in hyperbaric environments. The measures are generally applicable to various animal species, and their results are similarly generalizable. Author (GRA)

N72-21063# Army Medical Research Lab., Fort Knox, Ky.
VISUAL ACUITY UNDER CONDITIONS OF CHROMATIC DIFFERENCES WITHOUT DIFFERENCES IN LUMINANCE
R. Hilz and C. R. Cavanaugh Apr. 1971 15 p refs Transl. into ENGLISH from Vision Research (London), v. 10, 1970 p 1393-1398

(AD-734931) Avail: NTIS CSCL 05/10

Visual acuity was measured for gratings in which alternate sets of bars differed in wavelength, but not in luminance. This chromatic acuity increases with increasing wavelength difference, but does not reach values as high as achromatic acuity, contrary to earlier reports. Author (GRA)

N72-21064# Howard Univ., Washington, D.C. Dept. of Physiology.
EFFECTS OF ALTITUDE ON CELLULAR METABOLISM AND TERMINAL OXIDATION Final Report, 15 Apr. 1968 - 30 Jun. 1971

Leslie C. Costello and Armand J. Gold Dec. 1971 27 p
(Grant DAHC19-70-C-0020; DA Proj. 2N0-61102-B-71-D)
(AD-734933; Rept-3) Avail: NTIS CSCL 06/9

The program was concerned with a study of the cellular metabolic effects of altitude exposure, particularly in relation to energy metabolism. The experimental conditions employed (18,000 or 25,000 feet exposure for 6-7 days) resulted in hypophagia, weight loss, increased hematocrit, increased plasma pyruvate and plasma lactate. The hypophagic response indicated the need to include a food control group in these studies as well as a normal control. Altitude exposure did not alter cytochrome oxidase activity of kidney, liver, or heart mitochondria. Mitochondrial oxidative phosphorylation was not impaired in liver or kidney mitochondria. Most significantly the respiratory capacity of kidney mitochondria was markedly decreased in response to altitude exposure. Histological studies revealed pulmonary congestion, liver glycogen depletion, and increased adrenal cortical cytochrome oxidase activity occurring in altitude exposure. Author (GRA)

N72-21065# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

INVESTIGATION OF THE PRIMATE VESTIBULAR SYSTEM FUNCTION THROUGH ANALYSIS OF THE VESTIBULO-OCULAR REFLEX RESPONSE TO VARIOUS INPUT STIMULI

Marvin H. Chasen, James W. Guthrie, Clyde R. Replogle, and Andrew M. Junker Aug. 1971 33 p refs
(AF Proj. 7222)

(AD-734545L; AMRL-TR-71-4) Avail: NTIS CSCL 06/19

An indirect measurement of dynamic responses of the primate vestibular system was obtained through the measurement of eyeball counterroll from six Rhesus monkeys. A control system was developed to provide three types of input stimuli. These stimuli consisted of constant speed rotations, pendular oscillations, and Gaussian random noise. The experimental data was analyzed by use of correlation functions, power spectral density functions, and probability densities. Results show that angular acceleration and the acceleration resulting from centripetal force affect the counterroll response. Gaussian noise position inputs failed to produce counterroll distributions that are Gaussian. However, because of the two acceleration inputs, this evidence is not sufficient to conclude that the system is nonlinear. Suppression of response to random inputs was observed, indicating that suppression does not necessarily result from anticipation of the input as was suggested by previous investigators. Author (GRA)

N72-21066# School of Aerospace Medicine, Brooks AFB, Tex.
BODY WEIGHT VARIATION IN PRIMATES EXPOSED TO 55 MeV PROTONS Final Report, Jan. 1965 - Sep. 1971

John H. Kirk Nov. 1971 11 p refs

(AF Proj. 7757)

(AD-734779; SAM-TR-71-48) Avail: NTIS CSCL 06/18

Sham-exposed controls and 55-Mev-proton irradiated primates have been periodically weighed for 7 years following whole-body surface exposure. The primates exposed at the 400- and 600-rad levels have smaller body weights than the age- and sex-matched control primates. This finding indicates a possible chronic radiation effect. Author (GRA)

N72-21067# Naval Aerospace Medical Inst., Pensacola, Fla.
SELECTED ANTHROPOMETRIC DIMENSIONS OF NAVAL AVIATION PERSONNEL

William F. Moroney, Robert S. Kennedy, Edmund C. Gifford, and Joseph R. Provost 10 Aug. 1971 28 p refs

(AD-735101; NAMRL-1141; NAVMED-MF12.524.002-5012D)
Avail: NTIS CSCL 06/14

Since the previous study of the anthropometric features of naval aircrewmembers, the physical and academic requirements for entrance into the flight program have been changed. The present study was undertaken to determine whether these changes combine with changes in the anthropometric features of the population in general to influence certain anthropometric dimensions. The dimensions of the aviation training candidates in this study differed significantly from those reported in the other samples. Possible reasons for these differences include: growth of the population in general, characteristics of the samples involved, and different anthropometric and academic requirements for acceptance into the aviation training program. Author (GRA)

N72-21068# Naval Research Lab., Washington, D.C.
BIOCIDAL PROPERTIES OF AN ANTI-ICING ADDITIVE Final Report

N. I. Hendey, V. U. Bagdon, G. E. Ernst, D. E. Klemme, and J. M. Leonard 15 Nov. 1971 12 p refs

(NRL Proj. G04-01)

(AD-735451; NRL-7337) Avail: NTIS CSCL 06/13

Three laboratories collaborated in evaluating the fungicidal potency of an anti-icing additive for jet fuel. The material is more than 99% 2-methoxyethanol. The assay procedure was standardized by mutual agreement among the participants; the

assay organism was *Cladosporium resinae*, the most common fungal contaminant of jet fuel. The results are in fairly good accord, and though the test was not intended to represent field conditions of use, the data indicate that the additive is lethal to the fungus at concentrations easily attainable in the various water bottoms of fuel-handling systems. Author (GRA)

N72-21069# Naval Air Development Center, Johnsville, Pa. Crew Systems Dept.

ASSESSMENT OF TEMPERATURE RISE SUPPRESSION BY EDGE LOSSES DURING IRRADIATION Summary Report

Alice M. Stoll 3 Dec. 1971 18 p refs
(AD-735881; NADC-CS-7104) Avail: NTIS CSCL 06/19

A method to be utilized for human skin protection is described for determining: (1) the minimum aperture size required to yield temperature rise data free from edge loss effects in measurements made at the center of a site during thermal irradiation of a semi-infinite solid; (2) the magnitude of edge losses due to restriction of the irradiated area to less than the 'no loss' size, and its variation with respect to irradiance level and exposure time; and (3) where the thermal properties of the material are known, the energy absorption rate. The latter, on comparison with the measured incident energy also yields a measure of the absorptivity of the materials. GRA

N72-21070# Bureau of Radiological Health, Rockville, Md. Div. of Electronic Products.

KWIC INDEX TO BIOLOGICAL EFFECTS AND RELATED TECHNOLOGY OF LASERS AND LIGHT

Anne M. Lutz, ed. Dec. 1971 532 p refs
(PB-205091) Avail: NTIS CSCL 06R

A key-world-in-context index and bibliography with author index to significant literature dealing with the biological effects and related technology of lasers and light are presented. Over 2000 references are cited. GRA

N72-21071# Naval Medical Research Inst., Bethesda, Md. **BIBLIOGRAPHY OF REPORTED BIOLOGICAL PHENOMENA (EFFECTS), AND CLINICAL MANIFESTATIONS ATTRIBUTED TO MICROWAVE AND RADIO FREQUENCY RADIATION** Medical Research Interim Report

Zorach R. Glaser 4 Oct. 1971 99 p refs
(AD-734391; NAVMED-MF12.524.015-0004B) Avail: NTIS CSCL 06/18

More than 2100 references on the biological responses to radio frequency and microwave radiation, published up to September 1971, are included in the bibliography. Particular attention has been paid to the effects on man of non-ionizing radiation at these frequencies. The citations are arranged alphabetically by author, and contain as much information as possible so as to assure effective retrieval of the original documents. An outline of the effects which have been attributed to radio frequency and microwave radiation is also part of the report. Author (GRA)

N72-21072# Army Medical Research Lab., Fort Knox, Ky. **THE PHYSICAL PERFORMANCE OF THE HYPERVENTILATOR** Interim Report

Andree J. Lloyd 16 Sep. 1971 16 p refs
(DA Proj. 3AO-61102-B-71-R)
(AD-734298; USAMRL-947) Avail: NTIS CSCL 06/16

The maximum voluntary endurance of an isometric muscle contraction was examined in three groups of subjects: chronic hyperventilators, a control group with voluntary hyperventilation, and a second control group. During each endurance session subjects were requested to estimate task related levels of pain on a five-point scale. Continuous surface electromyographic monitoring was made of the dominant muscle. The results indicated that individuals with a chronic hyperventilation syndrome

were more efficient in the utilization of muscles during a strenuous physical task when measured by mean amplitudes of the electromyographic representation of neuromuscular activity. It was proposed that a therapeutic approach to the syndrome might incorporate strenuous exercise to the symptomatology of excessive breathing. Author (GRA)

N72-21073# Syracuse Univ., N.Y. Lab. of Sensory Communication.

OPTIC AND AUDITORY NERVE AND PERCEPTION STUDIES Semiannual Research Report, 1 May - 1 Nov. 1971

1 Nov. 1971 33 p refs
(Contract N00014-67-A-0378-0003; Grant NSF GB-8412)
(AD-734017; LSC-15) Avail: NTIS CSCL 06/16

Contents: Physiology of the Limulus Visual System; Conditioning of Limulus Behavior; Properties of Lateralization in the Intact Limulus Eye; A Mechanoreceptor on the Limulus Shell; Development of electronic neuron models; Short-term adaptation in single auditory neurons; Effect of contactor area on subjective magnitude functions; Loudness as a function of tone duration; Loudness effects in pairs of short sound bursts. GRA

N72-21074*# General Electric Co., Philadelphia, Pa. Missile and Space Div.

PRESSURE RAMP PROGRAMMER; IMBLS PHASE B4 ADDITIONAL TASKS: TASK 3.0 PRESSURE RAMP PROGRAMMER Final Report

G. L. Fogal and C. G. Reinhardt Jan. 1972 81 p
(Contract NAS9-10741)

(NASA-CR-115508; DQC-70SD5414) Avail: NTIS CSCL 06B

A pressure ramp programmer model was designed, fabricated and tested. This model, in conjunction with an automatic blood pressure monitor, automatically controls the pressure in the blood pressure monitor arterial cuff. The cuff pressurization cycle is designed to maximize accuracy and repeatability of blood pressure measurements. The key feature of this automatic cycle is rapid blood pressure cuff bleed down from an initial setting until systolic (diastolic) pressure is encountered followed by a short repressurization and slow bleed, long enough to permit accurate systolic (diastolic) pressure determination. The system includes a pressure reservoir which bleeds the cuff through a precision needle valve; a solenoid valve which permits rapid pressurization from the reservoir; and a pressure sensor which provides information for bleed rate and set point controls. Korotkoff sound signals from a microphone in the blood pressure cuff (not part of the system) provide decision information to the digital control system. The system completed a series of engineering tests using simulated Korotkoff sound inputs. The system performed successfully in all cases and was stable over an extended period of time. Author

N72-21075*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

RESULTS OF INTRA-VEHICULAR MANNED CARGO-TRANSFER STUDIES IN SIMULATED WEIGHTLESSNESS

Amos A. Spady, Jr., Gary P. Beasley, Kenneth R. Yenni, and Donn F. Eisele Washington Apr. 1972 30 p refs
(NASA-TN-D-6774; L-8099) Avail: NTIS CSCL 06S

A parametric investigation was conducted in a water immersion simulator to determine the effect of package mass, moment of inertia, and size on the ability of man to transfer cargo in simulated weightlessness. Results from this study indicate that packages with masses of at least 744 kg and moments of inertia of at least 386 kg-m² can be manually handled and transferred satisfactorily under intravehicular conditions using either one- or two-rail motion aids. Data leading to the conclusions and discussions of test procedures and equipment are presented. Author

N72-21076*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MODIFICATION OF ONE MAN LIFE RAFT Patent Application
 Ernest J. Soter, inventor (to NASA) Filed 29 Oct. 1971 8 p
 (NASA-Case-LAR-10241-1; US-Patent-Appl-SN-193672) Avail: NTIS CSCL 06K

A detailed description is given of a one man life raft that maintains its inflatability and flotation properties after a puncture of the main wall. The peripheral tube is divided by an airtight fabric bulkhead so that when either section of the tube is punctured, the bulkhead moves into the section. The raft is constructed so that either side can be the up side. E.H.W.

N72-21077# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
THE BENEFITS OF THE USE OF SHOULDER HARNESSSES IN GENERAL AVIATION AIRCRAFT
 Joseph A. Sirkis Feb. 1972 7 p refs
 (FAA-AM-72-3) Avail: NTIS

The installation and use of shoulder harnesses is a practical and relatively inexpensive solution to the problem of maintaining separation between man and machine during an aircraft crash sequence. The addition of shoulder harness to the tiedown chain of the general aviation aircraft occupant will increase the probability of the user surviving a severe crash and minimize injuries resulting from light-to-moderate crashes. It is concluded that if shoulder harnesses were installed in all general aviation aircraft, considerable benefit to the users of these harnesses would accrue. The user-occupant of older general aviation aircraft would realize a level of safety approaching that enjoyed by the user-occupant of normal utility, or acrobatic category airplanes manufactured under Approved Type Certificates applied for after September 14, 1969. Author

N72-21078# Federal Aviation Administration, Washington, D.C.
EFFECTIVENESS OF RESTRAINT EQUIPMENT IN ENCLOSED AREAS
 D. L. Lowrey, E. D. Langston, W. Reed, and John J. Swearingen Feb. 1972 30 p refs
 (FAA Proj. AM-A-71-PRS-37)
 (FAA-AM-72-6) Avail: NTIS

A series of 20-g decelerations of a crash sled was conducted to determine the magnitude of head impact decelerations while wearing various types of restraint equipment in small confined areas. Restraint webbing loads and head impact decelerations are presented for three directions of impact (straight forward, and 90 degrees to left and right). Restraint webbing undoubtedly reduces head impact velocities, especially in the forward direction. However, this study shows that, in most instances, head strikes may be expected even while using upper and lower torso restraint because of the close proximity of surrounding structure in general aviation aircraft. Introduction of upper torso restraint along with lap belts in general aviation aircraft will not relieve the need for dealthalizing surrounding structures. Author

N72-21079*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VISUAL EXAMINATION APPARATUS Patent Application
 Richard F. Haines, James W. Fitzgerald, and Salvadore A. Rositano, inventors (to NASA) Filed 6 Jul. 1971 22 p
 (NASA-Case-ARC-10329-1; US-Patent-Appl-SN-159857) Avail: NTIS CSCL 06B

An automated visual examination apparatus, for measuring visual sensitivity and mapping blind spot size, shape and position, is described. The system has a projection system for displaying to a patient a series of visual stimuli, a response switch enabling him to indicate his reaction to the stimuli, and a recording system responsive to both the visual stimuli and the patient's response. The recording system provides a correlated permanent record of stimuli and response from which a substantive and readily apparent visual evaluation can be made. NASA

N72-21080# Human Resources Research Organization, Alexandria, Va.
SYSTEMS ENGINEERING OF COAST GUARD AVIATOR TRAINING
 Eugene R. Hall and Paul W. Caro Aug. 1971 10 p refs
 Presented at the Psychology in the Air Force Symp., Colo. Springs, Colo., Apr. 1971
 (Contract DOT-CG-2310-A)
 (AD-735051; HumRRO-PP-17-71) Avail: NTIS CSCL 05/9

The paper describes a total-program application of the systems engineering concept to the U.S. Coast Guard aviation training programs. The systems approach used treats all aspects of the training to produce the most cost-effective integration of academic, synthetic, and flight training for the production of graduate Coast Guard aviators. The paper describes the techniques used to develop job-relevant terminal behavioral objectives (the Coast Guard search and rescue flight mission provides the operational context); the assignment of objectives to academic, synthetic, and flight training; the integration of these components into a systems-engineered training program; the development of relatively objective proficiency assessment techniques; and the development of a flying training quality control system for maintaining and enhancing instructional efficiency and for management of the training system. Author (GRA)

N72-21081# International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
AIRWAY RESISTANCE MEASUREMENT AT DEPTH Final Report
 Stephen B. Cades and Morton R. Kagan 17 Jan. 1972 107 p refs
 (AD-735462; FSC-72-5010) Avail: NTIS CSCL 06/2

The report discusses the design and development of a whole body plethysmograph system intended for ultimate use as a means of measuring airway resistance under ambient hyperbaric conditions for normal breathing patterns. A customer supplied plethysmograph was greatly modified towards achieving this goal. At present the plethysmograph can be used to make measurements of airway resistance for any breathing patterns at BTPS conditions. A computer program has been written which provides automatic correction of the data for a pressure/flow lag. In addition, the program includes compensation techniques (requiring additional validation) which should allow data obtained at ambient conditions to be utilized. The hardware design and modifications are discussed with respect to the guidelines used, the approach taken, and the design achieved. The operational use of the system is described in the sections concerning installation and calibration, operating procedures, data analysis techniques and the computer program. Present capabilities, potential error sources, and specific recommendations round out the project description. Author (GRA)

N72-21082# Navy Clothing and Textile Research Unit, Natick, Mass.
DEVELOPMENT AND EVALUATION OF AN OXYGEN-SENSING WARNING DEVICE
 Norman F. Audet and George M. Orner Dec. 1971 33 p refs
 (AD-735377; TR-98; Rept-6-71) Avail: NTIS CSCL 06/11

The Navy Clothing and Textile Research Unit has evaluated an oxygen-sensing warning device, developed by Beckman Instruments, Inc., to be used as a safety feature in a Damage Control Suit System (DCSS) presently under development. The O₂ warning device, which employs a polarographic oxygen sensor in conjunction with control electronics and a visual output, provides a visual warning in the event oxygen concentrations in the DCSS are above or below certain preselected thresholds. GRA

N72-21083# American Optical Co., Southbridge, Mass. Central Research Lab.
RESEARCH AND DEVELOPMENT OF AN OCULAR LASER PROTECTIVE FILTER Final Report, Jul. 1969 - Mar. 1971

Richard F. Woodcock and Richard J. Hovey Brooks AFB, Tex. School of Aerospace Med. Jul. 1971 41 p (Contract F41609-69-C-0050; AF Proj. 7784) (AD-735799; SAM-CR-71-3) Avail: NTIS CSCL 06/17

The goal of this work was the development of an ocular filter for protection against laser radiation. For its ideal embodiment this filter must possess an optical density of 3.5 or greater for all laser wavelengths and have a luminous transmission of 60 percent or better. Because the wearer must be able to identify color coding, the filter must have narrow band absorption at the laser wavelengths and suitable transmitting windows throughout the visible region. Research was carried out on Cu-containing plastic materials with broad band absorption in the blue and near infrared regions of the optical spectrum and on glass materials with appropriate narrow band absorption throughout the visible spectrum provide by Er-3(+) and absorption in adjacent spectral regions provided by Ce, Cu, or Fe or combinations thereof.

Author (GRA)

N72-21084# Naval Air Development Center, Johnsville, Pa.
PORTABLE DETECTOR OF LOW AMPLITUDE ELECTRO-CARDIOGRAPHIC ACTIVITY

George E. Bergey, William J. Miller, and Russell D. Squires 28 Oct. 1971 20 p ref (AD-735882; NADC-CS-7110) Avail: NTIS CSCL 06/2

A portable instrument is described which quickly indicates the presence or absence of myocardial activity. The instrument consists of two probes connected by a flexible retractable coiled cable. The stainless steel tips of each probe constitute the input connections of the enclosed circuitry and, in use, are placed in contact with the skin on the precordium. The electrical signal present between probe tips is processed by a network of filter, trigger, and logic circuits, the result of which is a bright flash of a light-emitting diode for each ORS complex present at the input. Because of its simplicity of operation, this device could easily be used by paramedical personnel as well as physicians in a variety of emergency situations.

Author (GRA)

N72-21085# National Aviation Facilities Experimental Center, Atlantic City, N.J.

THE DEVELOPMENT OF A MOTION PICTURE MEASUREMENT INSTRUMENT FOR APTITUDE FOR AIR TRAFFIC CONTROL Final Report, Nov. 1970 - Nov. 1971

E. P. Buckley and Tom Beebe Jan. 1972 34 p refs (AD-735942; FAA-NA-72-7; FAA-RD-71-108) Avail: NTIS CSCL 15/5

A motion picture test for aptitude for air traffic control was developed and pretested with 19 air traffic control specialists. The test was developed at the National Aviation Facilities Experimental Center (NAFEC) during this project for use in a project being conducted for Federal Aviation Administration by Education and Public Affairs (EPA). That project report will contain data on use of the test with a much larger sample. This report describes the test and gives estimates of reliability and validity as obtained from the administration of the test to the above-mentioned sample of 19 air traffic control specialists.

Author (GRA)

N72-21086# Thermo Electron Engineering Corp., Waltham, Mass.

VAPOR CYCLE ENERGY SYSTEM FOR IMPLANTABLE CIRCULATORY ASSIST DEVICES Annual Progress Report, Jun. 1970 - Jun. 1971

F. N. Huffman and K. Hagan Aug. 1971 285 p refs (Contract PH-43-68-1455-3) (PB-205474; TE4100-6-72; PH-43-68-1455-3) Avail: NTIS CSCL 06L

A description is given of the development status of a heart assist system driven by an electronically-controlled tidal regenerator engine (TRE) which contains neither valves nor sliding seals. The TRE pressurization (typically from 5-160 psia) is controlled by a displacer piston actuated by a latching binary

solenoid. The electrical power of the sensor, electronic logic and solenoid is interposed between the superheater and the boiler. A power condition unit provides the proper potential levels. The TRE is directly coupled to an assist blood pump which also acts as a blood-cooled heat exchanger, pressure-volume transformer and sensor for the electronic logic.

GRA

N72-21087# School of Aerospace Medicine, Brooks AFB, Tex.
A PORTABLE, SELF-CONTAINED DIGITAL THERMOMETER Final Report, Feb. - Sep. 1969

Wendell R. Peters Jan. 1972 17 p Submitted for publication (AF Proj. 7996) (AD-735662; SAM-TR-72-2) Avail: NTIS CSCL 06/12

The digital thermometer was designed and developed in response to an Air Force requirement for a special multipurpose thermometer. The instrument is 3 in. wide, 4.5 in. long, and 1 in. thick. It weighs 13 oz. including the self-contained silver zinc batteries. One temperature range incorporated in the unit measures temperatures from 32 to 212 F., with an accuracy of 1 degree. The second range measures oral temperatures from 95 to 105 F., with 0.1 degree accuracy. A number of interchangeable temperature sensors are available for measuring oral or skin temperature, air temperature, liquid temperature, and the temperature of metal surfaces. The time required to take an oral measurement is less than 1 minute. Immediate, accurate readout of temperature is possible because of the digital feature. The thermometer, because of its portability, size, accuracy, and fast readout, holds potential promise for use as a general instrument for clinical medicine.

Author (GRA)

N72-21088# Stanford Univ., Calif.
OPTIMAL REGULATION OF PHYSIOLOGICAL SYSTEMS VIA REAL-TIME ADAPTIVE MODEL SYNTHESIS Information Systems Lab.

Cristy M. Schade Aug. 1971 97 p refs (Contract N00014-67-A-0112-0044) (AD-735900; SU-SEL-71-033; SU-TR-6792-2) Avail: NTIS CSCL 06/2

Optimal control algorithms that use an adaptive non-recursive digital filter model for on-line closed-loop blood pressure regulation have been developed. This Automatic Therapeutic Control System was designed specifically for the regulation of physiological systems, but the design assumptions are such that it should prove very useful for a much broader class of control problems. An Adaptive Model Control system has been developed, the analysis of which is presented in two parts: (1) the real-time adaptive model synthesis procedure, and (2) the optimal forward-time controller. The adaptive modeling process is accomplished by the rapidly converging Alpha-LMS Algorithm. The conditions necessary to guarantee convergence for deterministic inputs are presented for zero mean and nonzero mean additive-output noise system and also for the low-order approximation problem. The optimal forward-time controller is described. The results of an experimental run are included in which these algorithms were used to regulate the blood pressure of a dog that had been artificially placed in a hypotensive state (shock). The results of this and similar experiments have been very successful from both an engineering and medical point of view, and if the necessary arrangements can be made with the local hospitals, this system will be used in the near future as part of an intensive care unit.

Author (GRA)

N72-21089# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

PEDAL OPERATION BY THE SEATED OPERATOR

K. H. Eberhard Kroemer Jan. 1972 13 p refs Presented at the Soc. of Automotive Eng. Congr., Detroit, 10-14 Jan. 1972 (AF Proj. 7184)

(AD-735315; AMRL-TR-71-102) Avail: NTIS CSCL 05/5

The paper attempts to serve three purposes: (1) To summarize the open scientific literature on muscular force applicable to pedals, and on the efficiency of foot motions on or

N72-21090

between pedals depending on the body support and the body posture of the seated operator. (2) To discuss the applicability of such studies in automobile (or other equipment) design, especially to the design, selection, and arrangement of foot-operated controls. (3) To point out that for most conventional vehicles and equipment, modes of seating, and of a pedal arrangement and operation follow largely common experience and tradition, and only partly scientific findings. For new man-machine systems, new solutions seem possible. Author (GRA)

N72-21090# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

AUTOMATED INSTRUCTIONAL MONITORS FOR COMPLEX OPERATIONAL TASKS Final Report

Wallace Feurzeig and George Lukas 31 Oct. 1971 43 p

(Contract N00014-69-C-0127; NR Proj. 154-285)

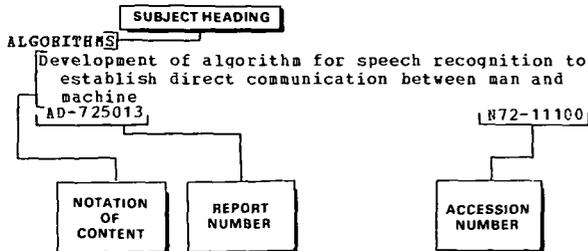
(AD-736212; BBN-2272) Avail: NTIS CSCL 05/9

The report describes research on computer-based instructional techniques incorporating diagnosis of student difficulties in acquiring complex concepts and skills. A computer automatically generates a simulated display. It then monitors and analyzes a student's work in the performance of assigned training tasks; hypotheses describing specific learning difficulties are tested and appropriate advice is given. Two major task areas were studied. Implications for the development of improved methods of behavior modification and their incorporation in training programs are discussed. Author (GRA)

Subject Index

AEROSPACE MEDICINE AND BIOLOGY / *A Continuing Bibliography (Suppl. 104)* JULY 1972

Typical Subject Index Listing



The Notation of Content (NOC), rather than the title of the document, is used to provide a more exact description of the subject matter. The NASA or AIAA accession number is included in each entry to assist the user in locating the abstract in the abstract section of this supplement. If applicable, a report number is also included as an aid in identifying the document.

A

ABIOTGENESIS

Life origin and primordial organic chemistry, considering Darwinian evolution, spontaneous generation, primitive atmospheres, interstellar matter, energy sources, macromolecular synthesis, moon and Jupiter

A72-27529

Abiogenic formation of nucleic acid bases and nucleosides in photochemically synthesized self sustaining coacervates

A72-27657

ABSTRACTS

Abstracts on space biology and medicine involved in cosmonaut training [JPRS-55687]

N72-21043

Medical research abstracts on limulus visual system, electronic neuron model development, and auditory adaptation in horseshoe crab [AD-734017]

N72-21073

ACCELERATION (PHYSICS)

Positive acceleration force-produced displacements of helmet-attached reticle in front of left eye

A72-28330

Effects of space environment, acceleration, and vibration on feeding, growth, and morphology of amoeba, *Pelomyxa carolinensis* [EXPT-P-1135]

N72-20062

ACCELERATION PROTECTION

Dynamic deceleration anthropomorphic dummy tests of general aviation occupant lap belt/shoulder harness restraint systems [SAE PAPER 721325]

A72-25588

Acceleration protection properties of modified partial pressure suit, determining tolerance limits by vision impairment criteria during centrifuge tests

A72-28319

ACCELERATION STRESSES (PHYSIOLOGY)

Motion sickness experience correlations to vestibular tests in pilots and nonpilots

A72-28257

Vision influence on acute motion sickness elicitation in slow rotation room, comparing with vestibular factors

A72-28258

Supine human body mechanical impedance under combined stress of vibration and sustained acceleration

A72-28270

Modified Van der Pol wave motion oscillator model for prediction of aortic dynamic response to

negative g impact accelerations

A72-28271

Ear oximeter design for human subject blood oxygen saturation estimation during increased g-loads

A72-28278

Acceleration stress effects on splanchnic blood flow due to organ displacement and neurogenic vasoconstriction in vascular beds

A72-28285

Tilt table test for gravitational stress effects on human pulmonary capillary blood flow

A72-28286

Human centrifuge studies of high positive acceleration effects on blood oxygenation and arterial oxygen and carbon dioxide tension

A72-28287

Pilot and back-seat man physiological responses during high-g aerial combat maneuvers in F-4E aircraft, discussing ECG, respiratory rate and minute volume

A72-28317

Pilot pursuit tracking performance under acceleration stress, simulating high performance aircraft dynamics via human centrifuge equipped with simulated head-up predictive gunsight

A72-28320

Human acceleration stress tolerance monitoring techniques for temporal, brachial and radial arterial blood flow and indirect systolic and diastolic blood pressure measurements

A72-28328

ACCELERATION TOLERANCE

Positive acceleration effects on human cardiovascular system during centrifuge tests, studying ECG changes in terms of cardiac rhythm, heart rate and wave parameters

A72-26015

Centrifugation tolerance reduction after 14 days bed rest with moderate exercise, determining rehydration effects

A72-28295

Bed rest and positive radial acceleration effect on peripheral visual response time, considering blackout or grayout prediction possibilities

A72-28297

Valsalva and M-1 maneuvers acceleration tolerance protective effects during high-g centrifuging with and without anti-g suits

A72-28318

Acceleration protection properties of modified partial pressure suit, determining tolerance limits by vision impairment criteria during centrifuge tests

A72-28319

Miniature swine as human analog to investigate physiological response to high positive acceleration, comparing human and animal tolerances

A72-28329

ACCIDENT PREVENTION

Asbestos reinforced plastics safe handling and manipulation ensured by regulations provided precautions

A72-25549

ACID BASE EQUILIBRIUM

Mathematical model of extracellular pH in brain tissue from blood and cerebrospinal fluid acid-base parameters for respiration central chemosensitive mechanism study

A72-26660

ACTIVATION ANALYSIS

Solar activity effects on biosphere processes, discussing radiation-induced molecular activation mechanisms in water and biological plasma calcium ion concentration changes

- A72-28213
ACTIVITY (BIOLOGY)
 Solar activity effects on biospheric processes for biological and physicochemical systems in unsteady state, considering maximum effects on man at certain electromagnetic wave frequencies
- A72-28211
 Electrocardiograph monitoring of central nervous system state in dogs reanimated by artificial blood circulation after prolonged clinical death by drowning
- A72-28215
 Role of nitrogen metabolism in biological productivity and marine food chain in temperate seas
 [CU-3826-22] N72-20084
- ACTIVITY CYCLES (BIOLOGY)**
 Sleep-wakefulness cycle variations effect on reaction time and spontaneous tempo during time isolation experiment, showing tendency toward circadian rhythm A72-26687
- ADAPTATION**
 Metabolic and hormonal response adaptation to prolonged hypodynamics in water immersion/head out/, noting diurnal and nocturnal differences in circadian rhythms A72-28267
 Influence of adaptation level in perception of various aspects of visual space
 [AD-733918] N72-20086
- ADRENAL METABOLISM**
 Adrenocortical response to prolonged high altitude hypoxia in hypothalamic deafferented rats, showing rapid neural stimulation with delayed humoral activation A72-27829
- ADRENERGICS**
 Beta-adrenergic blocking effect on canine coronary and systemic hemodynamic adaptation during treadmill exercise A72-25802
 Acute hypoxia effects on dog coronary blood flow and cardiac function from cardiac beta-adrenergic and hemodynamics study A72-27482
- AERIAL EXPLOSIONS**
 Effects of exposure to blast induced winds and pressure variations on biophysical parameters
 [AD-734208] N72-21054
- AEROREMBOLISM**
 Computer assisted monitoring of ECG waveforms and heart sounds frequency spectra to detect bubble laden blood during decompression sickness A72-26626
- AEROSINUSITIS**
 Statistical survey of barosinusitis incidence in U.S. Navy flying personnel during altitude chamber training, discussing diagnostic methods and clinical management A72-28274
- AEROSOLS**
 Production and use of aerosols in treating respiratory tract disorders
 [UR-3490-3] N72-20085
- AEROSPACE ENVIRONMENTS**
 Space flight ecology and physiology, discussing atmospheric temperatures and radiation, biological effects of acceleration, deceleration and weightlessness and physiological stresses A72-26018
 Radiation effects in Drosophila due to space environment
 [EXPT-P-1160] N72-20051
 Teratogenic and genetic effects in Drosophila caused by space environment
 [EXPT-P-1159] N72-20052
 Effect of weightlessness and spacecraft environment on spontaneous and radiation induced somatic mutation rates and cytologic changes in Tradescantia
 [EXPT-P-1123] N72-20054
 Effects of space environment, acceleration, and vibration on feeding, growth, and morphology of amoeba, *Pelomyxa carolinensis*
 [EXPT-P-135] N72-20062
- AEROSPACE MEDICINE**
 Medical evaluation of manned space flight physiological effects, considering Mercury, Gemini and Apollo programs A72-26100
 Russian book on pathophysiological principles of air and space pharmacology covering stress and fatigue reduction and pilots and astronauts performance improvement A72-27926
 Aerospace medicine - Conference, Bal Harbour, Florida, May 1972 A72-28251
 Low cost real time computerized C 14 radiorespirometry telemetering system for monitoring human metabolism data during space missions A72-28277
 Review of aeromedical records for grounding USAF flying personnel during 1956-1970, noting increased age factor effect A72-28316
 Problems and techniques of space pharmacology N72-20044
 Major technical facilities for aerospace medical research and development
 [AD-734544] N72-20119
 Abstracts on space biology and medicine involved in cosmonaut training
 [JPRS-55687] N72-21043
- AEROSPACE VEHICLES**
 Biological effect of cosmic radiation under flight conditions as analyzed from data collected in experiments conducted during past 40 years N72-20046
- AFFERENT NERVOUS SYSTEMS**
 Russian book on visual sensor signal dynamics covering nerve signal transformation, light stimuli responses, afferent flow, bionics, neurocybernetics and communication theory A72-26049
 Amygdala projection to accessory olfactory bulb in rats, discussing main bulb, olfactory tubercle, pyriform cortex accessory bulb and amygdala relationships A72-26770
- AGE FACTOR**
 EEG measurement of sleep behavior patterns, discussing sleep stages, temporal patterns, circadian rhythm, intrasleep process stability and age factor A72-26679
 Hemodynamic criteria for physical fitness in airmen, discussing age dependent variations in heart beat, arterial pressure and body temperature A72-26987
 Physiological index changes in parachutists of various ages, considering plasma recalcification, blood prothrombin, heparin time, fibrinolytic activity, pressure and heart beat A72-26988
 Triglyceridemia relation to age, relative weight and ischemic cardiopathy probability from ECG, anthropometry and lipid and glucid metabolism studies A72-27238
 Review of aeromedical records for grounding USAF flying personnel during 1956-1970, noting increased age factor effect A72-28316
- AGING (BIOLOGY)**
 Vascular-capillary study of age related angioarchitectonic features of human brain optic lobe A72-26675
- AIR CONDITIONING**
 Air conditioned undergarment for use in environmentally controlled suit in sterile chamber
 [NASA-CASE-LAR-10076-1] N72-20106
- AIR PURIFICATION**
 Sealed cabin air regeneration by means of potassium superoxide, noting weight and space savings A72-26594
- AIR TRAFFIC CONTROL**
 Short sleep period and oxygen breathing effects on arousal level of air traffic controller during detection task performance A72-26686
 Aptitude screening test of ATC training applicants, using directional heading determination under aural distraction A72-29252

- Potential coronary heart disease susceptibility indicators in ATC population, using Framingham age/obesity parameters
A72-29265
- Motion picture test for air traffic control aptitude for use in personnel selection and evaluation [AD-735942]
N72-21085
- AIRCRAFT ACCIDENT INVESTIGATION**
Human, technical and environmental factors in accidents of naval F-104 squadron, considering temporal distribution of accidents and pilot physical condition
A72-27826
- AIRCRAFT ACCIDENTS**
USAF aircraft accidents/incidents involving aircrewmembers with medical waiver on various visual, cardiopulmonary and other chronic pathological and psychiatric conditions
A72-28315
- Head-up omnidirectional two dimensional auditory display device for visual detection facilitation in aircraft collision avoidance systems
A72-28327
- Use of shoulder harness in general aviation aircraft to prevent or minimize injury during crashes [FAA-AM-72-3]
N72-21077
- Effectiveness of restraint equipment in controlling head impact forces and body kinematics in enclosed aircraft areas [FAA-AM-72-6]
N72-21078
- AIRCRAFT CONTROL**
Pilot-aircraft system model for relationship between weapons delivery accuracy and manual flight control system design, noting display, computation and control aids to pilot
A72-28121
- FAA program for revision of aviation aircraft maximum allowable control forces specifications, taking into account female pilots capabilities
A72-28325
- AIRCRAFT DESIGN**
Energy absorbing seat design for light aircraft, describing development and static and dynamic testing [SAE PAPER 720322]
A72-25585
- LOX supply systems installation for civil transport aircraft crew and/or passenger breathing oxygen [SAE AIR 1223]
A72-26030
- AIRCRAFT LANDING**
Workload modification effects on pilot neurological changes during Boeing 707 letdown, approach and landing
A72-28290
- AIRCRAFT PILOTS**
Aircraft pilot seating protection from dynamic environment by active vibration isolation, discussing human frequency response characteristics
A72-26391
- Life support equipment and pressure suit operational requirements from viewpoint of flight crews and test pilots
A72-27516
- Multivariate algorithms of optimum content and form for cardiovascular risk assessment in pilots and air transport personnel
A72-28264
- AIRCRAFT SAFETY**
Dynamic deceleration anthropomorphic dummy tests of general aviation occupant lap belt/shoulder harness restraint systems [SAE PAPER 720325]
A72-25588
- Flight crew training programs cost and quality, emphasizing safety and flight simulator application
A72-26998
- AIRCRAFT SPECIFICATIONS**
FAA program for revision of aviation aircraft maximum allowable control forces specifications, taking into account female pilots capabilities
A72-28325
- ALGORITHMS**
Multivariate algorithms of optimum content and form for cardiovascular risk assessment in pilots and air transport personnel
A72-28264
- Set covering algorithm for extracted small matrices, applied to airline crew scheduling [TR-320-3004]
N72-20099
- ALTITUDE ACCLIMATIZATION**
Erythrocyte life span in mice under normal atmospheric pressure and various degrees of hypoxia acclimatization, using radioactive labeled diisopropyl phosphorofluoridate
A72-26608
- Chronic hypoxia adapted rat myocardial tissue sensitivity to increased carbon dioxide tension
A72-26616
- High altitude hypoxia preadaptation effects on left ventricle myocardium noradrenaline concentration in rats with experimental vitium cordis
A72-27648
- Exercise role in ventilatory acclimatization to graded hypoxia in goats from carbon dioxide response curve measurements
A72-27727
- Adrenocortical response to prolonged high altitude hypoxia in hypothalamic deafferented rats, showing rapid neural stimulation with delayed humoral activation
A72-27829
- ALTITUDE SICKNESS**
Mountain sickness relation to ventilation response to hypoxia, noting response intensity dependence on peripheral chemoreceptor sensitivity
A72-27481
- ALTITUDE SIMULATION**
Physiological and clinical effects of long distance flight in pressurized commercial planes with simulated altitudes over 1500 meters
A72-27486
- ALTITUDE TOLERANCE**
Statistical survey of barosinusitis incidence in U.S. Navy flying personnel during altitude chamber training, discussing diagnostic methods and clinical management
A72-28274
- ALVEOLI**
Sheet flow theory for pulmonary alveolar blood flow, discussing blood pressure effects, membrane tension, blood volume and transit time distribution
A72-26702
- AMBIENT TEMPERATURE**
Environmental temperature effect on motion sickness sweating, discussing nausea and discomforting symptomology prediction
A72-28302
- AMINO ACIDS**
Evolutionary significance of primary amino acid or nucleotide base sequences of DNAs within various phylogenetic groups
A72-27160
- AMPLIFIERS**
Equipment specifications for general purpose bioamplifier for use in Integrated Medical, Behavioral, and Laboratory Measurement System [NASA-CR-115506]
N72-20110
- ANALOG COMPUTERS**
Dynamic electrocardiography with analog computer program to detect, count and classify atypical ventricular depolarization complexes
A72-28281
- Design of specialized analog computer for on-line monitoring of cardiac stroke volume by means of modified version of pressure pulse contour method [NASA-TN-D-6658]
N72-20108
- ANALOG TO DIGITAL CONVERTERS**
Arterial pressure data recording technique using magnetic tape recorder and automatic conversion to digital form
A72-27649
- ANALOGS**
Miniature swine as human analog to investigate physiological response to high positive acceleration, comparing human and animal tolerances
A72-28329
- ANIMALS**
Biological experiments on plants, animals and bacteria aboard Zond 5, 6 and 7 space probes, noting flight conditions effect on physiological functions and hereditary structures
A72-25941
- Automatic pair feeding device for controlled feeding of test animals [NASA-CASE-ARC-10302-1]
N72-21052

ANTARCTIC REGIONS

- Computer analysis of clothing and human acclimatization to Antarctic Region [AD-73471] N72-21055
- ANTHROPOMETRY**
Anthropometric data utilization for military pilot/aircraft compatibility evaluation, discussing cockpit exclusion code development and implementation A72-28324
Anthropometric requirements for entrance into naval flight training program [AD-735101] N72-21067
- ANTIADRENERGICS**
Beta-adrenergic blocking effect on canine coronary and systemic hemodynamic adaptation during treadmill exercise A72-25802
- ANTICOAGULANTS**
Ascorbic acid influence on blood coagulation and anticoagulation systems in dogs with acute hypoxia, discussing plasma recalcification time and heparin tolerance A72-28217
- ANTIDIURETICS**
Renal clearance studies of left atrial distention effect in dog, indicating antidiuretic hormone inhibition mechanism of diuresis A72-27828
- ANTIICING ADDITIVES**
Fungicidal potency of antiicing additive for jet fuel [AD-735451] N72-21068
- ANXIETY**
Anxiety relation to success or failure in naval flight training program A72-28263
- AORTA**
Hemodynamic assessment of arterial blood flow from radiograph measurements of aorta branching points A72-26774
Fluid mechanics of left ventricle model with mitral and aortic valves, showing ring vortex relation to diastole and closure A72-26775
Single linear measure of systolic pressure gradient for calculation of aortic valve area in stenosis severity assessment A72-27734
Modified Van der Pol wave motion oscillator model for prediction of aortic dynamic response to negative g impact accelerations A72-28271
- APOLLO FLIGHTS**
Ground and flight crews coordinated effort in Apollo mission operations, noting experts on ground and spacecrew spot judgments capability [AIAA PAPER 72-236] A72-26557
Red cell mass plasma volume decrease in Apollo mission crews, indicating erythropoiesis inhibition A72-28266
- APOLLO 12 FLIGHT**
Apollo 12 material effect on tobacco tissue cultures, noting pigment increase A72-27626
- APPROACH CONTROL**
Workload modification effects on pilot neurological changes during Boeing 707 letdown, approach and landing A72-28290
- APTITUDE**
Aptitude screening test of ATC training applicants, using directional heading determination under aural distraction A72-28252
Motion picture test for air traffic control aptitude for use in personnel selection and evaluation [AD-735942] N72-21085
- ARMED FORCES (UNITED STATES)**
Application of systems engineering concept to US Coast Guard aviator training programs [AD-735951] N72-21080
- AROUSAL**
Short sleep period and oxygen breathing effects on arousal level of air traffic controller during detection task performance A72-26686
- Circadian rhythm effects on introverts and extroverts biochemistry, physiology and performance, suggesting arousal mechanism differences A72-26693
- ARRHYTHMIA**
QRS wave detectors for arrhythmia and hemodynamic data analysis, using standardized FM magnetic tape containing various artifacts for evaluation A72-25499
ECG diagnostics for arrhythmia assessment in flying personnel flight fitness examination A72-28294
Experimental and clinical studies in treating digitalis caused cardiac arrhythmias with sodium citrate using heart patients and dogs [NASA-TT-F-14194] N72-21045
- ARTERIES**
Hemodynamic assessment of arterial blood flow from radiograph measurements of aorta branching points A72-26774
Hemodynamic response to physical exercise stress in dogs with angiotensin-induced acute arterial hypertension A72-28216
Arterial blood gas tensions, using sequential phased dilution for pilot oxygen delivery A72-28255
- ARTERIOSCLEROSIS**
Serum cholesterol, phospholipid and lipoprotein levels relation to atherosclerotic heart disease occurrence in USAF personnel A72-28292
Clofibrate treatment for atherosclerotic cardiovascular disease prevention among Sabena flying personnel A72-28293
- ARTHRITIS**
Two stage description of middle germ layer chronic polyarthritis, noting heart muscle and vascular wall tissues necrosis A72-27822
- ARTIFICIAL GRAVITY**
Weightlessness effects on human organism, discussing physiological changes, artificial gravity by spacecraft rotation and exercise to counter adverse reactions A72-26891
- ARTIFICIAL HEART VALVES**
Vapor cycle engine for driving Pu 238 fueled heart assist system [PB-205474] N72-21086
- ASBESTOS**
Lungs fibrosis and cancer caused by asbestos fibers inhalation, noting environment control for protection against workers health hazards A72-25548
Asbestos reinforced plastics safe handling and manipulation ensured by regulations provided precautions A72-25549
- ASCORBIC ACID**
Ascorbic acid influence on blood coagulation and anticoagulation systems in dogs with acute hypoxia, discussing plasma recalcification time and heparin tolerance A72-28217
- ASTRONAUT PERFORMANCE**
Ground and flight crews coordinated effort in Apollo mission operations, noting experts on ground and spacecrew spot judgments capability [AIAA PAPER 72-236] A72-26557
Russian book on pathophysiological principles of air and space pharmacology covering stress and fatigue reduction and pilots and astronauts performance improvement A72-27926
- ASTRONAUT TRAINING**
Abstracts on space biology and medicine involved in cosmonaut training [JPRS-55687] N72-21043
- ATAXIA**
Tandem walking on floor with eyes closed as ataxia test for vestibular function assessment A72-27476
- ATELECTASIS**
Pulmonary atelectasis and arterial-venous shunting and heart displacement prevention during centrifuging of dogs breathing oxygenated liquid

- fluorocarbon in water immersion respirator
A72-26609
- ATHLETES**
Biotelemetric measurements of physiological responses during labor and sports activities
N72-20148
- ATMOSPHERIC COMPOSITION**
Life on Mars, investigating ground based and probe observations of atmospheric composition and pressure, surface temperature and features and UV radiation
A72-27624
Hypoxia effect on aircraft pilot performance, using Link GAT 1 trainer and controlled composition atmosphere under varied altitude conditions for simulated ILS landing approaches
A72-28310
- ATMOSPHERIC DENSITY**
Diving operations medical aspects significance for manned planetary surface exploration in high density atmospheres, considering protective clothing, breathing apparatus and gas mixtures, etc
A72-27415
- ATTENTION**
Character recognition experiments to determine attention control and temporal-spatial capacity limitation during visual information processing
A72-27074
Self estimated distractibility in subjects related to attention lapses during perceptual motor performance, indicating psychophysiological changes
A72-28307
- AUDITORY PERCEPTION**
Audiometric determination of human temporary threshold shifts due to steady state and impulsive noise
A72-25873
Auditory flutter fusion frequency changes in humans during prolonged visual deprivation
A72-27418
Vestibular, auditory, acceleration and altitude decompression testing of pilot following endolymphatic shunt surgery for Menieres disease
A72-27485
Doppler discrimination in high background noise of rotary winged aircraft
[AD-734118] N72-21056
- AUDITORY SENSATION AREAS**
Cat auditory cortex neurons response to auditory and medial geniculate body electrical stimulation
A72-27651
Medical research abstracts on limulus visual system, electronic neuron model development, and auditory adaptation in horseshoe crab
[AD-734017] N72-21073
- AUDITORY SIGNALS**
Head-up omnidirectional two dimensional auditory display device for visual detection facilitation in aircraft collision avoidance systems
A72-28327
Training in identification of sound characteristics in sonar classification task
[AD-733451] N72-20117
- AUDITORY STIMULI**
Jet aircraft noise effect on sleeping EEG and subsequent waking performance, showing presence of carry-over effects
A72-27474
Cat auditory cortex neurons response to auditory and medial geniculate body electrical stimulation
A72-27651
Periodic, continuous and aperiodic white noise effects on human serial decoding performance, relating subjective and autonomic responses
A72-28289
- AUDITORY TASKS**
Cumulative partial sleep deprivation effects on human performance in auditory vigilance, routine addition and running digit span tests, observing circadian rhythms
A72-26683
- AUTONATA THEORY**
Semi-automatic methods for airlines crew scheduling
[TR-320-3006] N72-20100
- AUTOMATIC CONTROL**
Data display techniques in man operated automatic control system, assessing information volume
- versatility and operability
A72-26451
- AUTOMATIC GAIN CONTROL**
Gain control of cat retina rapid light adaptation process to attenuate signals reaching retinal ganglion cells from photoreceptors
A72-27299
- AUTOMATIC TEST EQUIPMENT**
Automatic pair feeding device for controlled feeding of test animals
[NASA-CASE-ARC-10302-1] N72-21052
Pressure ramp programmer for automatic blood pressure measurements
[NASA-CR-115508] N72-21074
Automated visual sensitivity tester for determining visual field sensitivity and blind spot size
[NASA-CASE-ARC-10329-1] N72-21079
- AUTOMATION**
Automatic ECG recording and analysis by electronic data processing equipment, discussing methods of data acquisition and transmission for routine diagnosis and prophylactic mass examinations
A72-27821
- AUTOMOBILES**
Analysis of pedal operation by seated operator with application to design of foot controls for automobiles and other equipment
[AD-735315] N72-21089
- AUTONOMIC NERVOUS SYSTEM**
Autonomic nervous system role in controlling coronary and cardiac responses to hypoxic hypoxia, measuring blood flow with Doppler ultrasonic flow transducer
A72-28313

B

- BACKGROUND NOISE**
Cryogenic Josephson junction magnetometer in magnetocardiography, discussing high ambient noise levels in unshielded environment
A72-27288
Doppler discrimination in high background noise of rotary winged aircraft
[AD-734118] N72-21056
- BACTERIA**
Biological experiments on plants, animals and bacteria aboard Zond 5, 6 and 7 space probes, noting flight conditions effect on physiological functions and hereditary structures
A72-25941
- BACTERIOPHAGES**
Effects of gamma radiation and weightlessness on cell growth of Salmonella typhimurium or induction of bacterial prophage
[EXPT-P-1135] N72-20063
- BAROTRAUMA**
Statistical survey of barosinusitis incidence in U.S. Navy flying personnel during altitude chamber training, discussing diagnostic methods and clinical management
A72-28274
- BED REST**
Bed rest and centrifuging effects on human plasma thyroid hormone level, discussing total protein, albumin and thyroxin binding globulin concentrations
A72-27477
Centrifugation tolerance reduction after 14 days bed rest with moderate exercise, determining rehydration effects
A72-28295
Plasma protein concentration, volume and hematocrit changes during exercise, bed rest and high forward acceleration
A72-28296
Bed rest and positive radial acceleration effect on peripheral visual response time, considering blackout or grayout prediction possibilities
A72-28297
Thermoregulation changes during simulated weightlessness of prolonged bed rest, noting lower sweating threshold and decreased vasodilation /autonomic dysfunction/
A72-28301
- BEHAVIOR**
Behavior alterations in pepper plant, Capsicum annuum, in response to weightlessness, rotation, vibration, and acoustic stress

- [EXPT-P-1017] N72-20059
- BIBLIOGRAPHIES**
- Human Resources Research Organization bibliography of publications as of 30 June, 1971 N72-20101
- KWIC index and bibliography on biological effects related technology of lasers and light [PB-205091] N72-21070
- Bibliography of reported biological responses and clinical manifestations attributed to microwave and radio frequency radiation [AD-734391] N72-21071
- BINOCULAR VISION**
- Response latencies and correlation in single units and visual evoked potentials in cat striate cortex following monocular and binocular stimulations A72-26771
- BIOASSAY**
- BIOMOD - computer graphic system for interactive biochemical modeling and analysis [P-4704] N72-20068
- Sensitivity of Ge(Li) detectors in biological and environmental counting [UCRL-73505] N72-20079
- BIOASTRONAUTICS**
- Space flight ecology and physiology, discussing atmospheric temperatures and radiation, biological effects of acceleration, deceleration and weightlessness and physiological stresses A72-26018
- Criteria for determining permissible doses of ionizing radiation for astronauts N72-20045
- BIOCHEMISTRY**
- Human body biochemical energy conversion processes during muscular activity, discussing nutrition, circulation and respiration roles A72-26075
- Physiological and biochemical responses of Paramecium caudatum to hypo- and hyperbaric stresses, discussing protoplasmic inactivation by high oxygen pressure A72-28299
- Physiological effects on anesthetized and conscious dogs during exposure at 80,000 ft for different decompression rates, discussing cardiovascular, biochemical and pathological effects A72-28322
- Effect of weightlessness on biochemical response of monocot seedlings [EXPT-P-1138] N72-20057
- Biochemical analyses of wheat seedling endosperms under weightless conditions of Biosatellite 2 [EXPT-P-1138] N72-20058
- BIOMOD - computer graphic system for interactive biochemical modeling and analysis [P-4704] N72-20068
- Radiation damage in mammals and humans indicated by biochemical changes in blood and urine [S2S-7/71-PT-11] N72-20083
- BIOCONTROL SYSTEMS**
- Myocardium biopulse-controlled cardiosynchronizer as key component of biocontrol systems for cardiological studies A72-26455
- Thermoregulation changes during simulated weightlessness of prolonged bed rest, noting lower sweating threshold and decreased vasodilation /autonomic dysfunction/ A72-28301
- BIODYNAMICS**
- Computer program for analyzing impact damage to skull-brain system models [AD-733986] N72-20087
- Effects of exposure to blast induced winds and pressure variations on biophysical parameters [AD-734208] N72-21054
- BIOELECTRIC POTENTIAL**
- Lenticular conditioning-shock stimulation effect on cat visual cortex response to light stimuli, noting lateral gyrus photically evoked potential amplitude increase A72-25801
- Transistorized amplifier input elements design for biopotentials recording, providing minimum noise at high input impedance A72-26468
- Response latencies and correlation in single units and visual evoked potentials in cat striate cortex following monocular and binocular stimulations A72-26771
- Cat auditory cortex neurons response to auditory and medial geniculate body electrical stimulation A72-27651
- Neuron networks dynamic behavior in terms of linear differential equations for membrane potential changes and neuron threshold A72-27925
- BIOELECTRICITY**
- Intraelectroretinographic analysis of light signal spatial summation at different retinal nerve levels in frogs A72-26454
- Cortico-subcortical connections transection effect on cat lateral geniculate body and visual cortex neurons spontaneous activity A72-27652
- Mathematical models for determining nature of electrosensing mechanism and its sensitivity in fish [AD-734027] N72-20093
- BIOENGINEERING**
- Electrode system for ventricular defibrillation, noting current density role and rounded edge effectiveness A72-26628
- Lumped parameter nonlinear RC circuit lung model for positive pressure respirator design A72-26631
- Operators reference manual for BIOMOD computer graphics system [R-746-NIH] N72-20104
- Optimal control algorithms for on-line closed loop blood pressure regulation [AD-735900] N72-21088
- BIOINSTRUMENTATION**
- Electronic and hematocrit devices to investigate cardiovascular system functions including blood coagulation process, pressure and flow A72-26464
- Pneumatic thermistor transducer to measure steep ejection time interval between cardiac volume pulse upstroke start and maximum rise rate occurrence A72-26633
- Nose installed thermistor device for in-flight monitoring of pilot respiration and pulse rate A72-27417
- Pressure ramp programmer for automatic blood pressure measurements [NASA-CR-115508] N72-21074
- BIOLOGICAL EFFECTS**
- Lungs fibrosis and cancer caused by asbestos fibers inhalation, noting environment control for protection against workers health hazards A72-25518
- Industrial safety rules recommendations for lasers based on radiation biological effects and eye optical and physiological properties A72-27615
- Geomagnetic field perturbation biological effects, studying geomagnetic storm field energy levels and magnetic flux variables relation to human sensitivity thresholds A72-28210
- Solar activity effects on biospheric processes for biological and physicochemical systems in unsteady state, considering maximum effects on man at certain electromagnetic wave frequencies A72-28211
- Solar activity effects on biosphere processes, discussing radiation-induced molecular activation mechanisms in water and biological plasma calcium ion concentration changes A72-28213
- Biomedical effects on air crews of chemical fire suppression agent Halon 1301 /bromotrifluoromethane/ during simulated aircraft cabin fires A72-28308
- Problems concerned with biological effects of space radiation [NASA-TT-P-604] N72-20039
- Biological effect of cosmic radiation under flight conditions as analyzed from data collected in experiments conducted during past 40 years N72-20046

- Effects of space flight conditions on biological systems
N72-20066
- KWIC index and bibliography on biological effects related technology of lasers and light [PB-2:5:91]
N72-21070
- BIOLOGICAL EVOLUTION**
Evolutionary significance of primary amino acid or nucleotide base sequences of DNAs within various phylogenetic groups
A72-27160
- Liver and muscle type isozymes of DPN-linked glycerol-3-P dehydrogenase in chickens in terms of tissue distribution, ontogeny and avian evolution
A72-27161
- BIOLOGY**
Biologist view of behavioristic approach to psychoacoustics, criticizing mechanical concept of living organism as inadequate for understanding human sensory system
A72-25732
- BIOMEDICAL DATA**
Digital computer technique for computation of pulmonary mechanics parameters, using phasor method and Fourier series analysis of respiratory flow signals
A72-26620
- Left ventricular volume time course from computer processing of video angiocardio graphic data based on X ray densitometry measurements
A72-26627
- Random sample comparison of computer program for ECG diagnoses and physicians readings
A72-26975
- Arterial pressure data recording technique using magnetic tape recorder and automatic conversion to digital form
A72-27649
- Equipment specifications for general purpose bioamplifier for use in Integrated Medical, Behavioral, and Laboratory Measurement System [NASA-CR-115506]
N72-20110
- BIOMETRICS**
TV microscopic system for on-line measurement of cat omentum microvessels diameter relative to heart action
A72-26621
- Electrolyte hydrostatic pressure measurement in limited volume biological compartments by fluid filled glass micropipette used in microtransducer capacity
A72-26623
- Arterial pressure data recording technique using magnetic tape recorder and automatic conversion to digital form
A72-27649
- Piezoelectric transducer for indirect on-wrist blood pressure measurements for clinical environment
A72-27961
- Human acceleration stress tolerance monitoring techniques for temporal, brachial and radial arterial blood flow and indirect systolic and diastolic blood pressure measurements
A72-28328
- BIONICS**
Russian book on visual sensor signal dynamics covering nerve signal transformation, light stimuli responses, afferent flow, bionics, neurocybernetics and communication theory
A72-26049
- Olfactory receptor models sensitivity, discussing threshold dependence on adsorbed odoriferous agent amount and exposure time
A72-26453
- Lumped parameter nonlinear RC circuit lung model for positive pressure respirator design
A72-26631
- Fluid mechanics of left ventricle model with mitral and aortic valves, showing ring vortex relation to diastole and closure
A72-26775
- Impact tests on anthropomorphic dummies for protection effectiveness evaluation of lap belt, Air Force shoulder harness-lap belt and airbag-lap belt restraints
A72-27471
- Receptor membrane pulse generation electronic model with tunnel diode negative resistance circuit
A72-27578
- BIOHOD** - interactive computer graphic system for modeling continuous biological systems
[R-747-NIH]
N72-20067
- BIOHOD** - computer graphic system for interactive biochemical modeling and analysis
[P-4704]
N72-20068
- Operators reference manual for BIOMOD computer graphics system
[R-746-NIH]
N72-20104
- Medical research abstracts on limulus visual system, electronic neuron model development, and auditory adaptation in horseshoe crab
[AD-734017]
N72-21073
- BIOPHYSICS**
Biophysical and cytological studies with laser microbeams
[AD-734181]
N72-20090
- BIOSATELLITE 2**
Experiments with invertebrates, plants, and cellular systems on Biosatellite 2 flight
[NASA-SP-204]
N72-20048
- Experiments involving parasitic wasp *Habrobracon*, yeast, and *Artemia salina* on Biosatellite 2
[EXPT-P-1079]
N72-20050
- Biochemical analyses of wheat seedling endosperms under weightless conditions of Biosatellite 2
[EXPT-P-1138]
N72-20058
- BIOTECHNOLOGY**
Status of Swedish research in biotechnology and applied psychology relating to man machine systems
[RAE-LIB-TRANS-1597]
N72-20073
- BIOTELEMETRY**
Common collector micropower monolithic transmitter for single or multichannel biomedical telemetry
A72-26563
- Monolithic micropower command receiver to extend lifetime of implanted biotelemetry system
A72-26564
- Cotton wick probe-transducer assembly for pneumograph recording of rabbit respiratory rate
A72-26619
- Biotelemetry system for EEG monitoring of free swimming diver at 15 meter depth, discussing power requirements, antenna design and signal attenuation
A72-27478
- Biotelemetric equipment for measuring physiological responses of freely moving human beings
N72-20147
- Biotelemetric measurements of physiological responses during labor and sports activities
N72-20148
- BISMUTH COMPOUNDS**
Solar activity effects on bismuth chloride hydrolysis tests from statistical results following solar flares
A72-28212
- BLACKOUT PREVENTION**
Bed rest and positive radial acceleration effect on peripheral visual response time, considering blackout or grayout prediction possibilities
A72-28297
- BLAST LOADS**
Effects of exposure to blast induced winds and pressure variations on biophysical parameters
[AD-734208]
N72-21054
- BLEEDING**
Suppression effects of hyperoxic breathing gases on red blood cell and erythropoietin hormone production following blood loss
A72-28298
- BLOOD**
Light absorption and scattering factors in whole blood related to hemoglobin concentration, discussing oxygen saturation, cardiac output and pathological conditions
A72-26630
- Human centrifuge studies of high positive acceleration effects on blood oxygenation and arterial oxygen and carbon dioxide tension
A72-28287
- Serum cholesterol, phospholipid and lipoprotein levels relation to atherosclerotic heart disease occurrence in USAF personnel
A72-28292
- Radiation damage in mammals and humans indicated by biochemical changes in blood and urine
[SZS-7/71-PT-1]
N72-20083

- Improved hemodialyzer for removing selected substances from blood by process of dialysis [NASA-CASE-HQN-10741] N72-20114
- Glycolytic metabolism effects from responses of blood lactate-pyruvate and redox state to chronic exposure to 3 percent CO₂ [AD-734122] N72-21059
- BLOOD CIRCULATION**
- Electrocorticograph monitoring of central nervous system state in dogs reanimated by artificial blood circulation after prolonged clinical death by drowning A72-28215
- Whole body plethysmograph system for use in measuring airway resistance under ambient hyperbaric conditions for normal breathing patterns [AD-735462] N72-21081
- BLOOD COAGULATION**
- Ascorbic acid influence on blood coagulation and anticoagulation systems in dogs with acute hypoxia, discussing plasma recalcification time and heparin tolerance A72-28217
- Effects of prolonged exposure to hyperoxia environment on coagulating processes of blood [JPRS-55553] N72-21044
- BLOOD FLOW**
- Electronic and hematocrit devices to investigate cardiovascular system functions including blood coagulation process, pressure and flow A72-26464
- Forearm skin and muscle blood flow change measurements during whole body heating, using plethysmography, isotopic labeling and blood sampling techniques A72-26617
- Hemodynamic variables relation to coronary blood flow and myocardial oxygen consumption during upright bicycle exercise A72-26618
- Water filled volume and strain gage phethysmography for forearm blood flow measurement during isometric exercise A72-26622
- Vascular-capillary study of age related angioarchitectonic features of human brain optic lobe A72-26675
- Sheet flow theory for pulmonary alveolar blood flow, discussing blood pressure effects, membrane tension, blood volume and transit time distribution A72-26702
- Left ventricular dynamic function in terms of internal diameter, pressure and flow in dogs at rest and during isoproterenol and metaraminol infusions A72-26773
- Hemodynamic assessment of arterial blood flow from radiograph measurements of aorta branching points A72-26774
- Fluid mechanics of left ventricle model with mitral and aortic valves, showing ring vortex relation to diastole and closure A72-26775
- Instantaneous and continuous blood flow velocity measurement by Doppler ultrasonic flowmeter using transcutaneous and implanted probes A72-26778
- Isotopic labeled microspheres for cat uveal and retinal blood flow and oxygen consumption determination, studying increased intraocular pressure and carbon dioxide tension effects A72-27841
- Acceleration stress effects on splanchnic blood flow due to organ displacement and neurogenic vasoconstriction in vascular beds A72-28285
- Tilt table test for gravitational stress effects on human pulmonary capillary blood flow A72-28286
- Autonomic nervous system role in controlling coronary and cardiac responses to hypoxic hypoxia, measuring blood flow with Doppler ultrasonic flow transducer A72-28313
- Human acceleration stress tolerance monitoring techniques for temporal, brachial and radial arterial blood flow and indirect systolic and diastolic blood pressure measurements A72-28328
- BLOOD PLASMA**
- Serum petidase activity determination as enzymatic diagnostic test for myocardial infarction A72-25851
- Myocardial infarction stress effect on serum cortisol, plasma free fatty acid and urinary catecholamine levels A72-26787
- Bed rest and centrifuging effects on human plasma thyroid hormone level, discussing total protein, albumin and thyroxin binding globulin concentrations A72-27477
- Multihour immersion effects on blood plasma protein and electrolyte concentration in trained and untrained subjects A72-27480
- Red cell mass plasma volume decrease in Apollo mission crews, indicating erythropoiesis inhibition A72-28266
- Plasma protein concentration, volume and hematocrit changes during exercise, bed rest and high forward acceleration A72-28296
- BLOOD PRESSURE**
- Electronic and hematocrit devices to investigate cardiovascular system functions including blood coagulation process, pressure and flow A72-26464
- Sheet flow theory for pulmonary alveolar blood flow, discussing blood pressure effects, membrane tension, blood volume and transit time distribution A72-26702
- Left ventricular dynamic function in terms of internal diameter, pressure and flow in dogs at rest and during isoproterenol and metaraminol infusions A72-26773
- Arterial pressure data recording technique using magnetic tape recorder and automatic conversion to digital form A72-27649
- Single linear measure of systolic pressure gradient for calculation of aortic valve area in stenosis severity assessment A72-27734
- Piezoelectric transducer for indirect on-wrist blood pressure measurements for clinical environment A72-27961
- Arterial blood gas tensions, using sequential phased dilution for pilot oxygen delivery A72-28255
- Human acceleration stress tolerance monitoring techniques for temporal, brachial and radial arterial blood flow and indirect systolic and diastolic blood pressure measurements A72-28328
- Pressure ramp programmer for automatic blood pressure measurements [NASA-CR-115508] N72-21074
- Optimal control algorithms for on-line closed loop blood pressure regulation [AD-735900] N72-21088
- BLOOD VESSELS**
- TV microscopic system for on-line measurement of cat omentum microvessels diameter relative to heart action A72-26621
- Irreversibility mechanism in postpartum ductus arteriosus closure in guinea pigs, studying vessel cellular changes and smooth muscle response to oxygen pressure A72-27826
- Elastic thin shell theories for explaining dynamic behavior of prestressed blood vessels [NASA-CR-125827] N72-20070
- BODY KINEMATICS**
- Effectiveness of restraint equipment in controlling head impact forces and body kinematics in enclosed aircraft areas [FAA-AM-72-6] N72-21078
- BODY MEASUREMENT (BIOLOGY)**
- Single linear measure of systolic pressure gradient for calculation of aortic valve area in stenosis

- severity assessment A72-27734
- Biomedical system for measuring volume and volume variations of human body under zero gravity conditions [NASA-CASE-MSC-13972-1] A72-20105
- BODY SIZE (BIOLOGY)**
- Dimensional analysis and similarity theories application to biological organisms relationships between body size and metabolism A72-26074
- BODY TEMPERATURE**
- German papers on human body energy balance and temperature control covering energy conversion processes, chemical secretions, muscle activity, etc A72-26071
- Human body thermoregulatory processes under varying environmental conditions and metabolic rates, discussing role of blood circulation, sweating, nervous stimuli, hormones, etc A72-26073
- Thermodynamic analysis of heat of evaporation of sweat, considering ambient temperature and humidity effects, body heat storage and presence of solutes A72-26610
- Forearm skin and muscle blood flow change measurements during whole body heating, using plethysmography, isotopic labeling and blood sampling techniques A72-26617
- Cumulative sleep deficit, preceding sleep or wakefulness period duration and body temperature effects on reaction time in multiple choice visual task A72-26690
- Biothermal response of increased core temperature in rhesus monkey to mechanical vibration, noting implications for pilot performance during prolonged buffeting A72-28268
- Ear site body temperature measurement relation to radiant heating of scalp and upper face A72-28333
- Relationship between steady sweat flow and temperature regulation mechanism during exposure to heat [REPT-877] A72-20069
- Response of ventilation parameters, pulse rate, oxygen uptake, and body temperature in man under acute and severe hypoxia [DLR-FB-71-65] A72-21053
- BODY VOLUME (BIOLOGY)**
- Biomedical system for measuring volume and volume variations of human body under zero gravity conditions [NASA-CASE-MSC-13972-1] A72-20105
- BODY WEIGHT**
- Weight loss due to respiratory tract evaporative water loss during exercise, from humidity change, ventilatory exchange and oxygen uptake data A72-26613
- Triglyceridemia relation to age, relative weight and ischemic cardiopathy probability from ECG, anthropometry and lipid and glucid metabolism studies A72-27238
- Sham-exposed controls and body weight variation in primates exposed to 55 MeV protons [AD-734779] A72-21066
- BONE MARROW**
- Effectiveness of lead screens in protecting bone marrow quantity necessary for survival of pigs gamma irradiated with Co-60 [PRMC-TH-97] A72-20078
- BONES**
- Calcium and phosphorus excretion relation to bone density changes in immobilized Macaca nemestrina monkeys A72-27473
- BRADYCARDIA**
- Case report of pilot near-syncopal episode with bradycardia due to hyperactive right carotid sinus reflex A72-27487
- BRAIN**
- Mathematical model of extracellular pH in brain tissue from blood and cerebrospinal fluid acid-base parameters for respiration central chemosensitive mechanism study A72-26660
- Respiration control by extracellular pH in medullary tissue, studying chemoreceptor response to hydrogen ion concentration in cat cerebrospinal fluid A72-26661
- Vascular-capillary study of age related angioarchitectonic features of human brain optic lobe A72-26675
- Thyroid and adrenocortical hormonal state effect on cell number and functional maturation of brain, discussing neurogenesis in infants A72-27298
- Thermoregulation in deeply hibernating rodents during separate chilling and steady hibernation temperature maintenance of skin and brain A72-27827
- BRAIN CIRCULATION**
- Objective evaluation of main rheoencephalogram parameter for disturbed brain blood circulation A72-28218
- BRAIN DAMAGE**
- Hydrogen peroxide formation relationship to lipid peroxidation and seizures in brain during high pressure oxygen exposure A72-28300
- Computer program for analyzing impact damage to skull-brain system models [AD-733986] A72-20087
- BRIGHTNESS DISCRIMINATION**
- Automated visual sensitivity tester for determining visual field sensitivity and blind spot size [NASA-CASE-ARC-10329-1] A72-21079
- BRITTLENESS**
- Pure biocarbons for skeletal fixation of limb prosthetic devices, noting load bearing applications dependence on brittle characteristics A72-28095
- BROMINE COMPOUNDS**
- Biomedical effects on air crews of chemical fire suppression agent Halon 1301 /bromotrifluoromethane/ during simulated aircraft cabin fires A72-28308
- BUBBLES**
- Bubble growth during decompression and allowable gas tension in human body [DLR-FB-71-48] A72-20075
- BUFFETING**
- Biothermal response of increased core temperature in rhesus monkey to mechanical vibration, noting implications for pilot performance during prolonged buffeting A72-28268
- C**
- CABIN ATMOSPHERES**
- Sealed cabin air regeneration by means of potassium superoxide, noting weight and space savings A72-26594
- CALCIUM METABOLISM**
- Calcium and phosphorus excretion relation to bone density changes in immobilized Macaca nemestrina monkeys A72-27473
- CANCER**
- Lungs fibrosis and cancer caused by asbestos fibers inhalation, noting environment control for protection against workers health hazards A72-25548
- CAPILLARIES (ANATOMY)**
- Vascular-capillary study of age related angioarchitectonic features of human brain optic lobe A72-26675
- Albino rats spinal cord capillaries ultrastructure upon hypothermy, noting endothelial cells sinking to lower levels from microscopic observation A72-27304
- CAPILLARY FLOW**
- Tilt table test for gravitational stress effects on human pulmonary capillary blood flow A72-28286
- CARBON**
- Pure biocarbons for skeletal fixation of limb

- prosthetic devices, noting load bearing applications dependence on brittle characteristics A72-28095
- CARBON DIOXIDE**
Lactate-pyruvate and redox state responses of blood and tissue in chronic hypercapnia [AD-734120] N72-21057
Plasma creatine phosphokinase response to hypercapnia [AD-734126] N72-21058
Glycolytic metabolism effects from responses of blood lactate-pyruvate and redox state to chronic exposure to 3 percent CO₂ [AD-734122] N72-21059
- CARBON DIOXIDE CONCENTRATION**
Added elastic load tests for thoracic elastance change effects on human response to carbon dioxide inhalation, using rebreathing technique A72-27726
Exercise role in ventilatory acclimatization to graded hypoxia in goats from carbon dioxide response curve measurements A72-27727
Native highlander and lowlander chemoreflex ventilatory response to transient carbon dioxide inhalation at low and high altitudes A72-27728
- CARBON DIOXIDE TENSION**
Isotopic labeled microspheres for cat uveal and retinal blood flow and oxygen consumption determination, studying increased intraocular pressure and carbon dioxide tension effects A72-27841
Human centrifuge studies of high positive acceleration effects on blood oxygenation and arterial oxygen and carbon dioxide tension A72-28287
Physiological and subjective responses of physically fit young men to combined exercise-carbon dioxide stress tests A72-28311
- CARDIAC VENTRICLES**
Left ventricular volume time course from computer processing of video angiocardiographic data based on X ray densitometry measurements A72-26627
Electrode system for ventricular defibrillation, noting current density role and rounded edge effectiveness A72-26628
Left ventricular dynamic function in terms of internal diameter, pressure and flow in dogs at rest and during isoproterenol and metaraminol infusions A72-26773
Fluid mechanics of left ventricle model with mitral and aortic valves, showing ring vortex relation to diastole and closure A72-26775
High altitude hypoxia preadaptation effects on left ventricle myocardium noradrenaline concentration in rats with experimental vitium cordis A72-27648
Dynamic electrocardiography with analog computer program to detect, count and classify atypical ventricular depolarization complexes A72-28281
- CARDIOGRAPHY**
Ear densitograph for noninvasive cardiac performance measurements during physical activities, exercise tests, flight conditions and for critical patients long-term monitoring A72-25500
Left ventricular volume time course from computer processing of video angiocardiographic data based on X ray densitometry measurements A72-26627
Human cardiovascular function change as indication of hypoxic circulatory stress, using noninvasive cardiographic measurements of cardiac electromechanical time intervals A72-27470
- CARDIOLOGY**
Myocardium biopulse-controlled cardiosynchronizer as key component of biocontrol systems for cardiological studies A72-26455
- CARDIOVASCULAR SYSTEM**
Positive acceleration effects on human cardiovascular system during centrifuge tests, studying ECG changes in terms of cardiac rhythm, heart rate and wave parameters A72-26015
Cardiovascular responses to positive pressure oxygen breathing from blood pressure and heart and respiratory rate measurements A72-26017
Human cardiovascular function change as indication of hypoxic circulatory stress, using noninvasive cardiographic measurements of cardiac electromechanical time intervals A72-27470
Cat and rat cardiac and cardiovascular reflexes response to electric pulse stimulation of sensorimotor cerebral cortex A72-27647
Multivariate algorithms of optimum content and form for cardiovascular risk assessment in pilots and air transport personnel A72-28264
Clofibrate treatment for atherosclerotic cardiovascular disease prevention among Sabena flying personnel A72-28293
Physiological effects on anesthetized and conscious dogs during exposure at 80,000 ft for different decompression rates, discussing cardiovascular, biochemical and pathological effects A72-28322
Design of specialized analog computer for on-line monitoring of cardiac stroke volume by means of modified version of pressure pulse contour method [NASA-TN-D-6658] N72-20108
Characteristics of heart rate information during sleep, and extracting sleep information from heart rate data [AD-734283] N72-21061
Portable equipment for detecting myocardial activity [AD-735882] N72-21084
- CAROTID SINUS REFLEX**
Case report of pilot near-syncope episode with bradycardia due to hyperactive right carotid sinus reflex A72-27487
- CASE HISTORIES**
Case report of fighter pilot disorientation episode during night flying exercise, suggesting psychological stress factor A72-26019
Case report of pilot near-syncope episode with bradycardia due to hyperactive right carotid sinus reflex A72-27487
- CATECHOLAMINE**
Sleep deprivation effect on circadian rhythms in human performance, psychological fatigue ratings, catecholamine excretion and urine flow A72-26692
Myocardial infarction stress effect on serum cortisol, plasma free fatty acid and urinary catecholamine levels A72-26787
Parachutist biomedical responses in aerial tow at 110-175 knots, determining heart and respiration rates and urinary catecholamines A72-28272
- CATS**
Gain control of cat retina rapid light adaptation process to attenuate signals reaching retinal ganglion cells from photoreceptors A72-27299
- CELLS (BIOLOGY)**
Thyroid and adrenocortical hormonal state effect on cell number and functional maturation of brain, discussing neurogenesis in infants A72-27298
Albino rats spinal cord capillaries ultrastructure upon hypothermy, noting endothelial cells sinking to lower levels from microscopic observation A72-27304
Irreversibility mechanism in postpartum ductus arteriosus closure in guinea pigs, studying vessel cellular changes and smooth muscle response to oxygen pressure A72-27826
Experiments with invertebrates, plants, and cellular systems on Biosatellite 2 flight [NASA-SP-204] N72-20048

- Effect of weightlessness and spacecraft environment on spontaneous and radiation induced somatic mutation rates and cytologic changes in *Tridascantia* [EXPT-P-1123] N72-20954
- Weightlessness effects on single cell, amoeba *Pelomyxa carolinensis* [EXPT-P-1135] N72-20061
- Effects of high altitude on cellular and energy metabolism in rats [AD-734933] N72-21064
- CENTER OF GRAVITY**
Simulated gravity environment tests of vertical jump features, recording work performed, body center of gravity upward velocity, potential and kinetic energy changes A72-27479
- CENTRAL NERVOUS SYSTEM**
Electrocorticograph monitoring of central nervous system state in dogs reanimated by artificial blood circulation after prolonged clinical death by drowning A72-28215
- Central nervous system symptoms and simple bends in gas decompression sickness cases during USAF operational flying A72-28283
- CENTRIFUGING**
Valsalva and M-1 maneuvers acceleration tolerance protective effects during high-g centrifuging with and without anti-g suits A72-28318
- CENTRIFUGING STRESS**
Positive acceleration effects on human cardiovascular system during centrifuge tests, studying ECG changes in terms of cardiac rhythm, heart rate and wave parameters A72-26015
- Pulmonary atelectasis and arterial-venous shunting and heart displacement prevention during centrifuging of dogs breathing oxygenated liquid fluorocarbon in water immersion respirator A72-26609
- Bed rest and centrifuging effects on human plasma thyroid hormone level, discussing total protein, albumin and thyroxin binding globulin concentrations A72-27477
- Centrifugation tolerance reduction after 14 days bed rest with moderate exercise, determining rehydration effects A72-28295
- Neck proprioception effects and otolith organ activity in perceived visual target elevation under centrifuging stress A72-28305
- CEREBELLUM**
Amygdala projection to accessory olfactory bulb in rats, discussing main bulb, olfactory tubercle, pyriform cortex accessory bulb and amygdala relationships A72-26770
- CEREBRAL CORTEX**
Visual evoked cortical responses in objective refraction related to retinal image clarity for clinical applications A72-25349
- Lenticular conditioning-shock stimulation effect on cat visual cortex response to light stimuli, noting lateral gyrus photically evoked potential amplitude increase A72-25801
- Response latencies and correlation in single units and visual evoked potentials in cat striate cortex following monocular and binocular stimulations A72-26771
- Extrageniculo-striate vision in monkey, discussing circle vs triangle and red vs green discrimination A72-26772
- Interhemispheric effects on choice reaction times to single and multiple letter displays, analyzing cerebral dominance and visual information transmission compared with verbal response A72-27075
- Visual cortex neuronal background activity in unanesthetized rabbits under stimulation and depression of lateral geniculate body and mesencephalic reticular formation, considering synaptic organization A72-27646
- Cat and rat cardiac and cardiovascular reflexes response to electric pulse stimulation of sensorimotor cerebral cortex A72-27647
- Cat auditory cortex neurons response to auditory and medial geniculate body electrical stimulation A72-27651
- Cortico-subcortical connections transection effect on cat lateral geniculate body and visual cortex neurons spontaneous activity A72-27652
- CEREBROSPINAL FLUID**
Respiration control by extracellular pH in medullary tissue, studying chemoreceptor response to hydrogen ion concentration in cat cerebrospinal fluid A72-26661
- Cerebrospinal fluid pH change effects on cat respiratory response before and after vagotomy, showing vagal activity relation to central chemical control of respiration A72-27825
- CHARACTER RECOGNITION**
Character recognition experiments to determine attention control and temporal-spatial capacity limitation during visual information processing A72-27074
- CHEMICAL ELEMENTS**
Compilation of raw data on elemental concentrations in normal and diseased human organs [UCRL-51C13-PT-1-REV-1] N72-20081
- CHEMICAL TESTS**
Solar activity effects on bismuth chloride hydrolysis tests from statistical results following solar flares A72-28212
- CHEMORECEPTORS**
Olfactory receptor models sensitivity, discussing threshold dependence on adsorbed odoriferous agent amount and exposure time A72-26453
- Mathematical model of extracellular pH in brain tissue from blood and cerebrospinal fluid acid-base parameters for respiration central chemosensitive mechanism study A72-26660
- Respiration control by extracellular pH in medullary tissue, studying chemoreceptor response to hydrogen ion concentration in cat cerebrospinal fluid A72-26661
- Mountain sickness relation to ventilation response to hypoxia, noting response intensity dependence on peripheral chemoreceptor sensitivity A72-27481
- Acute hypoxia effects on dog coronary blood flow and cardiac function from cardiac beta-adrenergic and hemodynamics study A72-27482
- Native highlander and lowlander chemoreflex ventilatory response to transient carbon dioxide inhalation at low and high altitudes A72-27728
- Cerebrospinal fluid pH change effects on cat respiratory response before and after vagotomy, showing vagal activity relation to central chemical control of respiration A72-27825
- CHEMOTHERAPY**
Left ventricular dynamic function in terms of internal diameter, pressure and flow in dogs at rest and during isoproterenol and metaraminol infusions A72-26773
- Clofibrate treatment for atherosclerotic cardiovascular disease prevention among Sabena flying personnel A72-28293
- CHLORINE FLUORIDES**
Suit for personnel handling liquid rocket propellants for protection from chlorine trifluoride and elemental fluorine [AD-731556] N72-20115
- CHRONIC CONDITIONS**
Two stage description of middle germ layer chronic polyarthritis, noting heart muscle and vascular wall tissues necrosis A72-27822

CIRCADIAN RHYTHMS

Diurnal rhythm and loss of sleep effects on human efficiency - Conference, Strasbourg, July 1970
A72-26676

Human performance dependence on time of day, discussing circadian and physiological rhythms relation and environmental change effects
A72-26677

Sleep deprivation effects relation to work duration, time of day, circadian rhythm, memory function, task performance, environmental factors, drug use and age
A72-26678

EEG measurement of sleep behavior patterns, discussing sleep stages, temporal patterns, circadian rhythm, intrasleep process stability and age factor
A72-26679

Time displacement effects on human physiological and psychological functions, discussing circadian rhythm phase shift and performance deficits
A72-26681

Cumulative partial sleep deprivation effects on human performance in auditory vigilance, routine addition and running digit span tests, observing circadian rhythms
A72-26683

Sleep, lack of sleep and circadian rhythm effects on psychometric test performance
A72-26684

Sleep interruption, sleep deprivation and continuous darkness effects on circadian rhythms in human performance
A72-26685

Sleep-wakefulness cycle variations effect on reaction time and spontaneous tempo during time isolation experiment, showing tendency toward circadian rhythm
A72-26687

Human functional level performance characteristics, noting relationship between spontaneous rhythm diurnal variations in psychic and physical performance
A72-26691

Sleep deprivation effect on circadian rhythms in human performance, psychological fatigue ratings, catecholamine excretion and urine flow
A72-26692

Circadian rhythm effects on introverts and extroverts biochemistry, physiology and performance, suggesting arousal mechanism differences
A72-26693

Transzonal air travel as cause of psychological and physiological rhythm change effects on pilot performance
A72-26694

Project Pegasus vigilance tasks for mental performance aspects of time zone change effects on human circadian rhythms
A72-26695

Time zone transition induced circadian rhythm disturbance effect on military personnel mental and physiological performance
A72-26696

Metabolic and hormonal response adaptation to prolonged hypodynamics in water immersion/head out/, noting diurnal and nocturnal differences in circadian rhythms
A72-28267

Circadian rhythms of visual accommodation responses and physiological correlations during target tracking, recording monocular focus state by IR optometer
A72-28366

CIRCULATORY SYSTEM
Heart and circulatory system functional diagnostics, discussing ECG, blood pressure, X ray, phonocardiographical and pulmonary examinations
A72-27271

Human cardiovascular function change as indication of hypoxic circulatory stress, using noninvasive cardiographic measurements of cardiac electromechanical time intervals
A72-27470

CITRATES
Experimental and clinical studies in treating digitalis caused cardiac arrhythmias with sodium citrate using heart patients and dogs

[NASA-TT-F-14194] N72-21045

CIVIL AVIATION
LOX supply systems installation for civil transport aircraft crew and/or passenger breathing oxygen [SAE AIR 1223] A72-26630

Physiological effects of high altitude flight and development of life support systems for civil aircraft environmental control [JPRS-55454] N72-20107

CLIMATE
Bicycle ergometer measurements of thermoregulation input and output under wide range of work load and climatic conditions, deriving correlation equation
A72-25874

CLIMBING FLIGHT
USAF V-51R noise protector earplugs modification to allow for pressure equalization during aircraft climb and descent
A72-28276

CLINICAL MEDICINE
Physiological and clinical effects of long distance flight in pressurized commercial planes with simulated altitudes over 1500 meters
A72-27486

Clinical diagnosis of ST/T depression in resting ECG, noting coronary heart disease and left ventricular hypertrophy
A72-27733

Frontal sinus hematoma incidence in flying personnel and scuba divers, discussing diagnosis and clinical treatment
A72-28275

Production and use of aerosols in treating respiratory tract disorders [UR-349C-3] N72-20685

Experimental and clinical studies in treating digitalis caused cardiac arrhythmias with sodium citrate using heart patients and dogs [NASA-TT-F-14194] N72-21045

Clinical analysis of hypokinesia caused changes in nervous system and effects of pharmacological preparations on hypokinesia disorders [NASA-TT-F-14225] N72-21046

Clinical treatment of vibration induced disorders in construction workers [RAB-LIB-TRANS-1611] N72-21051

CLOTHING
Computer analysis of clothing and human acclimatization to Antarctic Region [AD-734671] N72-21055

COAGULATION
Electronic and hematocrit devices to investigate cardiovascular system functions including blood coagulation process, pressure and flow
A72-26464

COBALT 60
Effectiveness of lead screens in protecting bone marrow quantity necessary for survival of pigs gamma irradiated with Co-60 [FRNC-TH-97] N72-20078

COCKPITS
Anthropometric data utilization for military pilot/aircraft compatibility evaluation, discussing cockpit exclusion code development and implementation
A72-28324

CODERS
Data processing in isolated crab biological strain receptor formed by muscle, transducer and encoder, noting pulse frequency modulation in encoding process
A72-27577

COLD ACCLIMATIZATION
Computer analysis of clothing and human acclimatization to Antarctic Region [AD-734671] N72-21055

COLLAGENS
Pathological significance of high oxygen tension exposure effects on acid soluble collagen extracted from mouse skin
A72-27483

COLLISION AVOIDANCE
Pilot warning systems for visual midair collision avoidance, noting reaction to imminent threats, scanning patterns and display sector size effects [SAE PAPER 720312] A72-25576

Physiological effects of intense anticollision flash light backscatter pulses on instrument rated pilots

- A72-28303
 - Detection range, color, brightness and flash subjective response tests to evaluate light signals for nighttime sea navigation and visual collision avoidance
 - A72-28326
 - Head-up omnidirectional two dimensional auditory display device for visual detection facilitation in aircraft collision avoidance systems
- COLLOIDING**

 - A72-28327
 - Living organisms defense and preservation via refrigeration and vacuum combined use in lyophilization technique
- COLLOIDS**

 - A72-27293
 - Abiogenic formation of nucleic acid bases and nucleosides in photochemically synthesized self sustaining coacervates
 - A72-27657
- COLOR VISION**

 - A72-26772
 - Extrageniculostriate vision in monkey, discussing circle vs triangle and red vs green discrimination
 - A72-20095
 - Time variation in human processing of movement directions and Stroop color words [AD-734299]
 - N72-20095
 - Human visual acuity measured by chromatic square wave gratings under luminance conditions [AD-734931]
 - N72-21063
- COMBAT**

 - A72-26688
 - Sleep loss and work-rest cycle effects on combat efficiency, considering psychomotor reactivity, vigilance and decision making capacity
 - A72-28317
 - Pilot and back-seat man physiological responses during high-g aerial combat maneuvers in F-4E aircraft, discussing ECG, respiratory rate and minute volume
- COMMUNICATION THEORY**

 - A72-26049
 - Russian book on visual sensor signal dynamics covering nerve signal transformation, light stimuli responses, afferent flow, bionics, neurocybernetics and communication theory
- COMPATIBILITY**

 - A72-28324
 - Anthropometric data utilization for military pilot/aircraft compatibility evaluation, discussing cockpit exclusion code development and implementation
- COMPUTER DESIGN**

 - A72-20108
 - Design of specialized analog computer for on-line monitoring of cardiac stroke volume by means of modified version of pressure pulse contour method [NASA-TN-D-6658]
- COMPUTER GRAPHICS**

 - A72-20067
 - BIOMOD - interactive computer graphic system for modeling continuous biological systems [R-747-NIH]
 - A72-20068
 - BIOMOD - computer graphic system for interactive biochemical modeling and analysis [P-4704]
 - A72-20104
 - Operators reference manual for BIOMOD computer graphics system [R-746-NIH]
- COMPUTER PROGRAMS**

 - A72-28281
 - Dynamic electrocardiography with analog computer program to detect, count and classify atypical ventricular depolarization complexes
 - A72-20082
 - Two Monte Carlo codes for calculation of dose distribution in human phantoms irradiated by external photon sources [KFKI-71-12]
 - A72-20087
 - Computer program for analyzing impact damage to skull-brain system models [AD-733986]
 - A72-21055
 - Computer analysis of clothing and human acclimatization to Antarctic Region [AD-734071]
- COMPUTER TECHNIQUES**

 - A72-26620
 - Digital computer technique for computation of pulmonary mechanics parameters, using phasor method and Fourier series analysis of respiratory flow signals
- A72-26626
 - Computer assisted monitoring of ECG waveforms and heart sounds frequency spectra to detect bubble laden blood during decompression sickness
 - A72-26627
 - Left ventricular volume time course from computer processing of video angiocardio-graphic data based on X ray densitometry measurements
 - A72-26975
 - Random sample comparison of computer program for ECG diagnoses and physicians readings
 - A72-27442
 - Menu selection for SKYLAB astronauts by computer technique based on mixed integer programming code, using measure of pleasure lists
 - A72-27475
 - Computer analysis of helicopter pilots eye movement patterns dependence on visual task skill and performance time
 - A72-27821
 - Automatic ECG recording and analysis by electronic data processing equipment, discussing methods of data acquisition and transmission for routine diagnosis and prophylactic mass examinations
 - A72-28277
 - Low cost real time computerized C 14 radiorespirometry telemetering system for monitoring human metabolism data during space missions
- CONCENTRATION (COMPOSITION)**

 - A72-20081
 - Compilation of raw data on elemental concentrations in normal and diseased human organs [UCRL-51013-PT-1-REV-1]
- CONFERENCES**

 - A72-26676
 - Diurnal rhythm and loss of sleep effects on human efficiency - Conference, Strasbourg, July 1970
 - A72-28251
 - Aerospace medicine - Conference, Bal Harbour, Florida, May 1972
- CONTAMINANTS**

 - A72-27042
 - Spacecraft critical surfaces protection from molecular and particulate contamination sources including gloves, tissues, and covering or packaging materials
 - A72-28253
 - Aviator breathing oxygen contaminant detector using gas chromatography and portable IR analyzer
- CONTROLLED ATMOSPHERES**

 - A72-28310
 - Hypoxia effect on aircraft pilot performance, using Link GAT 1 trainer and controlled composition atmosphere under varied altitude conditions for simulated ILS landing approaches
- CORDAGE**

 - A72-20098
 - Fabrication of root cord restrained fabric suit sections from sheets of fabric [NASA-CASE-HSC-12398]
- CORNEA**

 - A72-28331
 - Keratoconus /noninflammatory conic protrusion of cornea/ diagnosis and rehabilitation in USAF flying personnel
- CORONARY CIRCULATION**

 - A72-25802
 - Beta-adrenergic blocking effect on canine coronary and systemic hemodynamic adaptation during treadmill exercise
 - A72-26618
 - Hemodynamic variables relation to coronary blood flow and myocardial oxygen consumption during upright bicycle exercise
 - A72-26773
 - Left ventricular dynamic function in terms of internal diameter, pressure and flow in dogs at rest and during isoproterenol and metaraminol infusions
 - A72-27482
 - Acute hypoxia effects on dog coronary blood flow and cardiac function from cardiac beta-adrenergic and hemodynamics study
 - A72-27733
 - Clinical diagnosis of ST/T depression in resting ECG, noting coronary heart disease and left ventricular hypertrophy
 - A72-27733
 - Autonomic nervous system role in controlling coronary and cardiac responses to hypoxic hypoxia, measuring blood flow with Doppler ultrasonic flow

- Objective evaluation of main rheoencephalogram parameter for disturbed brain blood circulation A72-28218
- Frontal sinus hematoma incidence in flying personnel and scuba divers, discussing diagnosis and clinical treatment A72-28275
- ECG diagnostics for arrhythmia assessment in flying personnel flight fitness examination A72-28294
- Keratoconus /noninflammatory conic protrusion of cornea/ diagnosis and rehabilitation in USAF flying personnel A72-28331
- DIALYSIS**
Improved hemodialyzer for removing selected substances from blood by process of dialysis [NASA-CASE-HQN-10741] N72-20114
- DIASTOLE**
Fluid mechanics of left ventricle model with mitral and aortic valves, showing ring vortex relation to diastole and closure A72-26775
- DIETS**
Menu selection for SKYLAB astronauts by computer technique based on mixed integer programming code, using measure of pleasure lists A72-27442
- DIFFERENTIAL EQUATIONS -**
Neuron networks dynamic behavior in terms of linear differential equations for membrane potential changes and neuron threshold A72-27925
- DIFFRACTION PATTERNS**
Retina visual acuity testing by zero and first order moire fringes, using square-wave amplitude gratings A72-27953
- DIGITAL DATA**
Digital thermometer with interchangeable temperature sensors [AD-735662] N72-21087
- DIGITAL TECHNIQUES**
Digital computer technique for computation of pulmonary mechanics parameters, using phasor method and Fourier series analysis of respiratory flow signals A72-26620
- DIGITALIS**
Experimental and clinical studies in treating digitalis caused cardiac arrhythmias with sodium citrate using heart patients and dogs [NASA-TT-P-14194] N72-21045
- DIMENSIONAL ANALYSIS**
Dimensional analysis and similarity theories application to biological organisms relationships between body size and metabolism A72-26074
- DIMENSIONAL MEASUREMENT**
TV microscopic system for on-line measurement of cat omentum microvessels diameter relative to heart action A72-26621
- DISORDERS**
Clinical analysis of hypokinesia caused changes in nervous system and effects of pharmacological preparations on hypokinesia disorders [NASA-TT-P-14225] N72-21046
Clinical treatment of vibration induced disorders in construction workers [RAE-LIB-TRANS-1611] N72-21051
- DISORIENTATION**
Case report of fighter pilot disorientation episode during night flying exercise, suggesting psychological stress factor A72-26019
Brief vestibular disorientation test technique for assessment of potential nonpilot airborne specialists or naval flight officers A72-28256
- DISPLACEMENT MEASUREMENT**
Involuntary head movement and helmet motion displacements during human centrifuge runs to 6 Gz from photographic recordings A72-28288
Positive acceleration force-produced displacements of helmet-attached reticle in front of left eye A72-28330
- DISPLAY DEVICES**
Pilot warning systems for visual midair collision avoidance, noting reaction to imminent threats, scanning patterns and display sector size effects [SAE PAPER 720312] A72-25576
Data display techniques in man operated automatic control system, assessing information volume versatility and operability A72-26451
- DIURESIS**
Renal clearance studies of left atrial distention effect in dog, indicating antidiuretic hormone inhibition mechanism of diuresis A72-27828
- DIURNAL VARIATIONS**
Human performance dependence on time of day, discussing circadian and physiological rhythms relation and environmental change effects A72-26677
Sleep deprivation effects relation to work duration, time of day, circadian rhythms, memory function, task performance, environmental factors, drug use and age A72-26678
Human functional level performance characteristics, noting relationship between spontaneous rhythms diurnal variations in psychic and physical performance A72-26691
- DIVING (UNDERWATER)**
Diving operations medical aspects significance for manned planetary surface exploration in high density atmospheres, considering protective clothing, breathing apparatus and gas mixtures, etc A72-27415
Biotelemetry system for EEG monitoring of free swimming diver at 15 meter depth, discussing power requirements, antenna design and signal attenuation A72-27478
Frontal sinus hematoma incidence in flying personnel and scuba divers, discussing diagnosis and clinical treatment A72-28275
Estimating absolute distance underwater, and improvement of visual judgement accuracy by training [AD-734125] N72-20089
Optimum underwater work measurement techniques [AD-734014] N72-20092
Lactate-pyruvate and redox state responses of blood and tissue in chronic hypercapnia [AD-734120] N72-21057
Plasma creatine phosphokinase response to hypercapnia [AD-734126] N72-21058
Development and tests of sensitive methodologies for measuring sensory and motor impairment in hyperbaric environments [AD-735117] N72-21062
- DOGS**
Experimental and clinical studies in treating digitalis caused cardiac arrhythmias with sodium citrate using heart patients and dogs [NASA-TT-P-14194] N72-21045
- DOPPLER EFFECT**
Instantaneous and continuous blood flow velocity measurement by Doppler ultrasonic flowmeter using transcutaneous and implanted probes A72-26778
Doppler discrimination in high background noise of rotary winged aircraft [AD-734118] N72-21056
- DROSOPHILA**
Radiation effects in Drosophila due to space environment [EXPT-P-1160] N72-20051
Teratogenic and genetic effects in Drosophila caused by space environment [EXPT-P-1159] N72-20052
- DUMMIES**
Impact tests on anthropomorphic dummies for protection effectiveness evaluation of lap belt, Air Force shoulder harness-lap belt and airbag-lap belt restraints A72-27471
- DYNAMIC RESPONSE**
Modified Van der Pol wave motion oscillator model

- for prediction of aortic dynamic response to negative g impact accelerations
A72-28271
- Elastic thin shell theories for explaining dynamic behavior of prestressed blood vessels [NASA-CR-125827] N72-20070
- Indirect measurement of primate vestibular system function through analysis of vestibulo-ocular reflex response to various input stimuli [AD-734545L] N72-21065
- DYNAMIC TESTS**
- Dynamic deceleration anthropomorphic dummy tests of general aviation occupant lap belt/shoulder harness restraint systems [SAE PAPER 72-325] A72-25588
- E**
- EAR**
- Ear site body temperature measurement relation to radiant heating of scalp and upper face A72-28333
- EAR PROTECTORS**
- USAF V-51R noise protector earplugs modification to allow for pressure equalization during aircraft climb and descent A72-28276
- EARTH ATMOSPHERE**
- Russian papers on solar activity effects on earth atmosphere and biosphere covering climate, vegetation, animals and man A72-28206
- EARTH HYDROSPHERE**
- Russian papers on solar activity effects on earth atmosphere and biosphere covering climate, vegetation, animals and man A72-28206
- Solar activity effects on biospheric processes for biological and physicochemical systems in unsteady state, considering maximum effects on man at certain electromagnetic wave frequencies A72-28211
- Solar activity effects on biosphere processes, discussing radiation-induced molecular activation mechanisms in water and biological plasma calcium ion concentration changes A72-28213
- ECOLOGY**
- Space flight ecology and physiology, discussing atmospheric temperatures and radiation, biological effects of acceleration, deceleration and weightlessness and physiological stresses A72-26018
- ECONOMIC FACTORS**
- Flight crew training programs cost and quality, emphasizing safety and flight simulator application A72-26998
- EDUCATION**
- Training in identification of sound characteristics in sonar classification task [AD-733451] N72-20117
- EFFERENT NERVOUS SYSTEMS**
- Electromyogram and myogram responses in phasic stretch reflex under prestrain conditions as index of fusimotor activity level in normal humans A72-26632
- Development and tests of sensitive methodologies for measuring sensory and motor impairment in hyperbaric environments [AD-735117] N72-21062
- EGGS**
- Effect of weightlessness on fertilized eggs of grass frog, *Rana pipiens* [EXPT-P-1047] N72-20060
- EJECTION INJURIES**
- Ejection injuries from U.S. Navy aircraft, discussing statistical distribution of vertebral, shoulder, arm/hand, knee, leg, head and face injuries A72-28273
- ELASTIC PROPERTIES**
- Speed and mechanical work measurements during knee bending and immediate or delayed leg extension exercise, showing muscle elastic potential energy utilization A72-26615
- Added elastic load tests for thoracic elastance change effects on human response to carbon dioxide inhalation, using rebreathing technique A72-27726
- Elastic thin shell theories for explaining dynamic behavior of prestressed blood vessels [NASA-CR-125827] N72-20070
- ELECTRIC STIMULI**
- Lenticular conditioning-shock stimulation effect on cat visual cortex response to light stimuli, noting lateral gyrus photically evoked potential amplitude increase A72-25801
- Electrode system for ventricular defibrillation, noting current density role and rounded edge effectiveness A72-26628
- Cat and rat cardiac and cardiovascular reflexes response to electric pulse stimulation of sensorimotor cerebral cortex A72-27647
- Cat auditory cortex neurons response to auditory and medial geniculate body electrical stimulation A72-27651
- ELECTRICAL IMPEDANCE**
- Transistorized amplifier input elements design for biopotentials recording, providing minimum noise at high input impedance A72-26468
- ELECTROCARDIOGRAPHY**
- QRS wave detectors for arrhythmia and hemodynamic data analysis, using standardized PM magnetic tape containing various artifacts for evaluation A72-25499
- Positive acceleration effects on human cardiovascular system during centrifuge tests, studying ECG changes in terms of cardiac rhythm, heart rate and wave parameters A72-26015
- Computer assisted monitoring of ECG waveforms and heart sounds frequency spectra to detect bubble laden blood during decompression sickness A72-26626
- Gabor-Nelson myocardium electrical activity model for mathematical construction of vectorcardiograph from ECG for comparison of various lead systems A72-26629
- Random sample comparison of computer program for ECG diagnoses and physicians readings A72-26975
- Triglyceridemia relation to age, relative weight and ischemic cardiopathy probability from ECG, anthropometry and lipid and glucid metabolism studies A72-27238
- Heart and circulatory system functional diagnostics, discussing ECG, blood pressure, X ray, phonocardiographical and pulmonary examinations A72-27271
- Clinical diagnosis of ST/T depression in resting ECG, noting coronary heart disease and left ventricular hypertrophy A72-27733
- Automatic ECG recording and analysis by electronic data processing equipment, discussing methods of data acquisition and transmission for routine diagnosis and prophylactic mass examinations A72-27821
- Dynamic electrocardiography with analog computer program to detect, count and classify atypical ventricular depolarization complexes A72-28281
- Stress vectorcardiography quantitative analysis of ECG response to treadmill exercise test to establish diagnosis criteria for coronary heart disease A72-28282
- ECG diagnostics for arrhythmia assessment in flying personnel flight fitness examination A72-28294
- Portable equipment for detecting myocardial activity [AD-735882] N72-21084
- ELECTRODES**
- Electrode system for ventricular defibrillation, noting current density role and rounded edge effectiveness A72-26628
- ELECTROENCEPHALOGRAPHY**
- Orienting response indication by EEG alpha rhythm desynchronization in relation to visual stimulation intensity

- A72-26238
EEG measurement of sleep behavior patterns, discussing sleep stages, temporal patterns, circadian rhythm, intrasleep process stability and age factor
- A72-26679
Jet aircraft noise effect on sleeping EEG and subsequent waking performance, showing presence of carry-over effects
- A72-27474
Biotelemetry system for EEG monitoring of free swimming diver at 15 meter depth, discussing power requirements, antenna design and signal attenuation
- A72-27478
Human electrophysiological changes during perceptual isolation from EEG, EMG, vertical eye movements and electrodermal measurements
- A72-27484
Electrocorticograph monitoring of central nervous system state in dogs reanimated by artificial blood circulation after prolonged clinical death by drowning
- A72-28215
EEG recording and analysis by analog technique as means of studying human responses to hyperventilation
- A72-28312
ELECTROLYTE METABOLISM
Multihour immersion effects on blood plasma protein and electrolyte concentration in trained and untrained subjects
- A72-27480
ELECTROLYTES
Electrolyte hydrostatic pressure measurement in limited volume biological compartments by fluid filled glass micropipette used in microtransducer capacity
- A72-26623
ELECTROMAGNETIC ABSORPTION
Light absorption and scattering factors in whole blood related to hemoglobin concentration, discussing oxygen saturation, cardiac output and pathological conditions
- A72-26630
ELECTROMAGNETIC FIELDS
Magnetic storm strength ELF electromagnetic field effects on rabbits, dogs and bacteria, discussing changes in EEG, ECG and blood characteristics
- A72-28214
ELECTROMYOGRAPHY
Electromyogram and myogram responses in phasic stretch reflex under prestrain conditions as index of fusimotor activity level in normal humans
- A72-26632
Electromyographic activity of biceps muscle during submaximum isometric contraction determined from auditory feedback
- N72-20094
[AD-734300]
Electromyographic measurement of maximum voluntary muscle contraction endurance in chronic hyperventilators
- N72-21072
[AD-734298]
- ELECTRON MICROSCOPES**
Electron microscope study of hyperoxia-induced pathogenetic ultrastructural changes in rat lung
- A72-27531
- ELECTRONIC EQUIPMENT**
Training devices for training operators in use characteristics and maintenance of Naval electronic equipment
- N72-20116
[AD-733471]
- ELECTRONIC TRANSDUCERS**
Pneumatic thermistor transducer to measure steep ejection time interval between cardiac volume pulse upstroke start and maximum rise rate occurrence
- A72-26633
- ELECTROPHYSIOLOGY**
Human electrophysiological changes during perceptual isolation from EEG, EMG, vertical eye movements and electrodermal measurements
- A72-27484
Mathematical models for determining nature of electrosensing mechanism and its sensitivity in fish
- N72-20093
[AD-734027]
- ELECTRORETINOGRAPHY**
Intraelectroretinographic analysis of light signal
- spatial summation at different retinal nerve levels in frogs
- A72-26454
Landolt ring radioactive plaque night vision tester comparison with electroretinography and Goldmann-Weekers dark adaptometry apparatus from special tests of night blind patients
- A72-28332
ENDOCRINE SYSTEMS
Neuroendocrine responses in microwave radiation exposed rats, correlating thyroid and thyrotropic activity
- A72-27485
ENDOLYMPH
Vestibular, auditory, acceleration and altitude decompression testing of pilot following endolymphatic shunt surgery for Menieres disease
- A72-27485
ENDOTHELIUM
Albino rats spinal cord capillaries ultrastructure upon hypothermy, noting endothelial cells sinking to lower levels from microscopic observation
- A72-27304
ENERGY ABSORPTION
Energy absorbing seat design for light aircraft, describing development and static and dynamic testing
- A72-25585
[SAE PAPER 720322]
- ENERGY BUDGETS**
German papers on human body energy balance and temperature control covering energy conversion processes, chemical secretions, muscle activity, etc
- A72-26071
ENERGY CONVERSION
German papers on human body energy balance and temperature control covering energy conversion processes, chemical secretions, muscle activity, etc
- A72-26071
Thermodynamics of human body metabolism, discussing energy conversion calorimetric measurements, body size, food intake, age, sex, endocrine and nervous effects
- A72-26072
Human body biochemical energy conversion processes during muscular activity, discussing nutrition, circulation and respiration roles
- A72-26075
ENERGY REQUIREMENTS
Speed and mechanical work measurements during knee bending and immediate or delayed leg extension exercise, showing muscle elastic potential energy utilization
- A72-26615
Analysis of body temperature control and thermal economy during work by unclothed subjects on erometer
- N72-20072
[RAE-LIB-TRANS-1610]
Effects of high altitude on cellular and energy metabolism in rats
- N72-21064
[AD-734933]
- ENVIRONMENT MODELS**
Mathematical expression for pilot incapacitation applied to data from high stress/short duration encounters with environmental problems
- A72-28284
ENVIRONMENT POLLUTION
Sensitivity of Ge(Li) detectors in biological and environmental counting
- N72-20079
[UCRL-73505]
- ENVIRONMENT SIMULATION**
Simulated gravity environment tests of vertical jump features, recording work performed, body center of gravity upward velocity, potential and kinetic energy changes
- A72-27479
ENVIRONMENTAL CONTROL
Lungs fibrosis and cancer caused by asbestos fibers inhalation, noting environment control for protection against workers health hazards
- A72-25548
Air conditioned undergarment for use in environmentally controlled suit in sterile chamber
- N72-20106
[NASA-CASE-LAR-1C076-1]
Physiological effects of high altitude flight and development of life support systems for civil aircraft environmental control
- N72-20107
[JPRS-55454]

ENVIRONMENTAL ENGINEERING

Aircraft pilot seating protection from dynamic environment by active vibration isolation, discussing human frequency response characteristics A72-26391

ENVIRONMENTAL TESTS
Parotid fluid 17-hydroxycortico steroid level relation to hyperthermia stress at various heat levels during thermal environmental testing A72-28335

ENZYME ACTIVITY
Serum petidase activity determination as enzymatic diagnostic test for myocardial infarction A72-25851

ENZYMES
Plasma creatine phosphokinase response to hypercapnia [AD-734126] N72-21058

ENZYMOLGY
Liver and muscle type isozymes of DPN-linked glycerol-3-P dehydrogenase in chickens in terms of tissue distribution, ontogeny and avian evolution A72-27161

EQUIPMENT SPECIFICATIONS
Specifications and engineering model of urine sampling and collection system for manned space flights [NASA-CR-115507] N72-20109
Equipment specifications for general purpose bioamplifier for use in Integrated Medical, Behavioral, and Laboratory Measurement System [NASA-CR-115506] N72-20110

ERGOMETERS
Bicycle ergometer measurements of thermoregulation input and output under wide range of work load and climatic conditions, deriving correlation equation A72-25874
Physical work capacity comparison during bicycle ergometry and treadmill walking tests, measuring oxygen uptake, ventilatory parameters and excess carbon dioxide production A72-26095
Maximal oxygen uptake and heart rate during laddermill climbing, inclined treadmill running and cycling ergometer tests A72-26612
Analysis of body temperature control and thermal economy during work by unclothed subjects on erometer [RAE-LIB-TRANS-1610] N72-20072
Physiological stressing and conditioning ergometer system [NASA-CASE-MFS-21109] N72-20112

ERYTHROCYTES
Erythrocyte life span in mice under normal atmospheric pressure and various degrees of hypoxia acclimatization, using radioactive labeled diisopropyl phosphorofluoridate A72-26608
Red cell mass plasma volume decrease in Apollo mission crews, indicating erythropoiesis inhibition A72-28266
Suppression effects of hyperoxic breathing gases on red blood cell and erythropoietin hormone production following blood loss A72-28298

ETHYLENE OXIDE
Using ethylene oxide as decontaminating agent for planetary quarantine [NASA-CR-126034] N72-21048

EUROPE
European research and atomic energy applications to agricultural crops and insect sterilization [NP-19016] N72-20077

EVAPORATION
Thermodynamic analysis of heat of evaporation of sweat, considering ambient temperature and humidity effects, body heat storage and presence of solutes A72-26610
Weight loss due to respiratory tract evaporative water loss during exercise, from humidity change, ventilatory exchange and oxygen uptake data A72-26613

EXCRETION
Calcium and phosphorus excretion relation to bone density changes in immobilized Macaca nemestrina

monkeys

A72-27473

EXERCISE (PHYSIOLOGY)

Physiological and subjective responses of physically fit young men to combined exercise-carbon dioxide stress tests

A72-28311

Gastric motility in normal people at rest and during physical exercise [NASA-TT-F-14207] N72-20074

EXOBIOLOGY

Biological experiments on plants, animals and bacteria aboard Zond 5, 6 and 7 space probes, noting flight conditions effect on physiological functions and hereditary structures

A72-25941

Problems concerned with biological effects of space radiation [NASA-TT-F-604] N72-20039

Quantitative evaluation of effects of radiation sickness as applicable to problems of space radiobiology

N72-20041

Modifying influence of various flight factors on radiobiological effects of ionizing radiation on organisms in space flight

N72-20042

Relative biological effectiveness of various types of cosmic radiation

N72-20043

Abstracts on space biology and medicine involved in cosmonaut training [JPRS-55687] N72-21043

EXPIRATION

Plethysmographic and laryngoscopic investigation of glottis opening and airway resistance relation to lung volume during panting and continuous slow expiration

A72-26611

Inspiration, expiration and hand muscle control comparison in psychophysical category production method for human voluntary breathing regulation investigation

A72-27843

EXPLOSIVE DECOMPRESSION

Medical and physiological hazards for SST passengers and crews, discussing cumulative cosmic radiation and high altitude decompression risks

A72-25816

Case report of rapid decompression in supersonic trainer aircraft pressurized cabin, discussing physical and blast effects, pressurization safety, decompression sickness and hypoxia

A72-26020

EXTRACTION

Improved hemodialyzer for removing selected substances from blood by process of dialysis [NASA-CASE-HQN-10741] N72-20114

EXTRATERRESTRIAL LIFE

Life on Mars, investigating ground based and probe observations of atmospheric composition and pressure, surface temperature and features and UV radiation

A72-27624

EXTRATERRESTRIAL RADIATION

Problems concerned with biological effects of space radiation [NASA-TT-F-604] N72-20039

Analysis of ionizing radiation sources in space N72-20040

EXTRAVEHICULAR ACTIVITY

Open loop life support subsystem using breathing bag as reservoir for EVA [NASA-CASE-MSC-12411-1] N72-20096

EXTREMELY LOW FREQUENCIES

Magnetic storm strength ELF electromagnetic field effects on rabbits, dogs and bacteria, discussing changes in EEG, ECG and blood characteristics

A72-28214

EXTROVERSION

Circadian rhythm effects on introverts and extroverts biochemistry, physiology and performance, suggesting arousal mechanism differences

A72-26693

EYE DISEASES

Keratoconus /noninflammatory conic protrusion of cornea/ diagnosis and rehabilitation in USAF flying personnel

- EYE DOMINANCE** A72-28331
Interhemispheric effects on choice reaction times to single and multiple letter displays, analyzing cerebral dominance and visual information transmission compared with verbal response
A72-27775
- EYE EXAMINATIONS**
Retina visual acuity testing by zero and first order moire fringes, using square-wave amplitude gratings
A72-27953
Landolt ring radioactive plaque night vision tester comparison with electroretinography and Goldmann-Weekers dark adaptometry apparatus from special tests of night blind patients
A72-28332
Automated visual sensitivity tester for determining visual field sensitivity and blind spot size
[NASA-CASE-ARC-1329-1] N72-21079
- EYE MOVEMENTS**
Image visual recognition during voluntary saccadic eye movements, noting stimuli visible luminance change effect
A72-27310
Computer analysis of helicopter pilots eye movement patterns dependence on visual task skill and performance time
A72-27475
Human electrophysiological changes during perceptual isolation from EEG, EMG, vertical eye movements and electrodermal measurements
A72-27484
Nystagmus eye movements relationship to ocular illusion from test involving vestibular stimulation and visual stimuli velocity estimates
A72-28304
- EYE PROTECTION**
Industrial safety rules recommendations for lasers based on radiation biological effects and eye optical and physiological properties
A72-27615
Ocular laser protective filter with narrowband absorption, luminous transmission, and optical density of 3.5
[AD-735799] N72-21083
- F**
- F-104 AIRCRAFT**
Human, technical and environmental factors in accidents of naval F-104 squadron, considering temporal distribution of accidents and pilot physical condition
A72-27820
- F-4 AIRCRAFT**
Pilot and back-seat man physiological responses during high-g aerial combat maneuvers in F-4E aircraft, discussing ECG, respiratory rate and minute volume
A72-28317
- FABRICATION**
Fabrication of root cord restrained fabric suit sections from sheets of fabric
[NASA-CASE-MSC-12398] N72-20098
- FABRICS**
Fabrication of root cord restrained fabric suit sections from sheets of fabric
[NASA-CASE-MSC-12398] N72-20098
- FATIGUE (BIOLOGY)**
IR pupillography for screening narcoleptics and fatigue prone individuals from driver and pilot training applicants
A72-28323
- FATTY ACIDS**
Myocardial infarction stress effect on serum cortisol, plasma free fatty acid and urinary catecholamine levels
A72-26787
- FEEDBACK CONTROL**
Optimal control algorithms for on-line closed loop blood pressure regulation
[AD-735900] N72-21088
- FEEDING (SUPPLYING)**
Automatic pair feeding device for controlled feeding of test animals
[NASA-CASE-ARC-10302-1] N72-21052
- FETUSES**
Irreversibility mechanism in postpartum ductus arteriosus closure in guinea pigs, studying vessel cellular changes and smooth muscle response to oxygen pressure
A72-27826
- FIBRILLATION**
Electrode system for ventricular defibrillation, noting current density role and rounded edge effectiveness
A72-26628
- FIBROSIS**
Lungs fibrosis and cancer caused by asbestos fibers inhalation, noting environment control for protection against workers health hazards
A72-25548
- FIRE EXTINGUISHERS**
Biomedical effects on air crews of chemical fire suppression agent Halon 1301 /bromotrifluoromethane/ during simulated aircraft cabin fires
A72-28308
- FISHES**
Mathematical models for determining nature of electrosensing mechanism and its sensitivity in fish
[AD-734027] N72-20093
- FLASH BLINDNESS**
Physiological effects of intense anticollision flash light backscatter pulses on instrument rated pilots
A72-28303
- FLIGHT CREWS**
Hemodynamic criteria for physical fitness in airmen, discussing age dependent variations in heart beat, arterial pressure and body temperature
A72-26987
Flight crew training programs cost and quality, emphasizing safety and flight simulator application
A72-26998
Life support equipment and pressure suit operational requirements from viewpoint of flight crews and test pilots
A72-27516
Pilot selection criterion for replacement air group /RAG/, using scored maneuver itea correlations for flight crew and pilot training
A72-28262
Multivariate algorithms of optimum content and form for cardiovascular risk assessment in pilots and air transport personnel
A72-28264
Biomedical effects on air crews of chemical fire suppression agent Halon 1301 /bromotrifluoromethane/ during simulated aircraft cabin fires
A72-28308
USAF aircraft accidents/incidents involving aircrewmembers with medical waiver on various visual, cardiopulmonary and other chronic pathological and psychiatric conditions
A72-28315
Listening levels preferred by flying personnel
[AD-734778] N72-20088
Semi-automatic methods for airlines crew scheduling
[TR-320-3006] N72-20100
Anthropometric requirements for entrance into naval flight training program
[AD-735101] N72-21067
- FLIGHT FITNESS**
ECG diagnostics for arrhythmia assessment in flying personnel flight fitness examination
A72-28294
- FLIGHT HAZARDS**
Medical and physiological hazards for SST passengers and crews, discussing cumulative cosmic radiation and high altitude decompression risks
A72-25816
- FLIGHT SIMULATION**
Pilot glide slope and localizer tracking performance during successive in-flight simulated ILS approaches
A72-28260
Pilot pursuit tracking performance under acceleration stress, simulating high performance aircraft dynamics via human centrifuge equipped with simulated head-up predictive gunsight
A72-28320
- FLIGHT SIMULATORS**
Flight crew training programs cost and quality,

- emphasizing safety and flight simulator application
A72-26998
- FLIGHT STRESS (BIOLOGY)**
Case report of fighter pilot disorientation episode during night flying exercise, suggesting psychological stress factor
A72-26019
- Flight stress and performance of training in general aviation simulator compared with actual flight
A72-28261
- Anxiety relation to success or failure in naval flight training program
A72-28263
- Mathematical expression for pilot incapacitation applied to data from high stress/short duration encounters with environmental problems
A72-28284
- FLIGHT TRAINING**
Flight crew training programs cost and quality, emphasizing safety and flight simulator application
A72-26998
- Factor analysis of grades for successful performance skill identification during undergraduate and graduate jet pilot training
A72-27472
- Flight stress and performance of training in general aviation simulator compared with actual flight
A72-28261
- Anxiety relation to success or failure in naval flight training program
A72-28263
- FLOATING**
Inflatability and flotation of one man life raft after puncture to main wall
[NASA-CASE-LAR-10241-1]
N72-21076
- FLOW RESISTANCE**
Plethysmographic and laryngoscopic investigation of glottis opening and airway resistance relation to lung volume during panting and continuous slow expiration
A72-26611
- Hyperoxia effect on human airways resistance during high pressure oxygen breathing
A72-26614
- FLOW THEORY**
Sheet flow theory for pulmonary alveolar blood flow, discussing blood pressure effects, membrane tension, blood volume and transit time distribution
A72-26702
- FLOW VELOCITY**
Instantaneous and continuous blood flow velocity measurement by Doppler ultrasonic flowmeter using transcutaneous and implanted probes
A72-26778
- FLOWMETERS**
Instantaneous and continuous blood flow velocity measurement by Doppler ultrasonic flowmeter using transcutaneous and implanted probes
A72-26778
- FLUID FILTERS**
Use of gas and liquid filters to sterilize spacecraft
[NASA-CR-126035]
N72-21047
- FLUID FLOW**
Improved hemodialyzer for removing selected substances from blood by process of dialysis
[NASA-CASE-HQN-10741]
N72-20114
- FLUID MECHANICS**
Fluid mechanics of left ventricle model with mitral and aortic valves, showing ring vortex relation to diastole and closure
A72-26775
- FLUORINE**
Suit for personnel handling liquid rocket propellants for protection from chlorine trifluoride and elemental fluorine
[AD-731556]
N72-20115
- FLUOROHYDROCARBONS**
Biomedical effects on air crews of chemical fire suppression agent Halon 1301 /bromotrifluoromethane/ during simulated aircraft cabin fires
A72-28308
- FLYING PERSONNEL**
Brief vestibular disorientation test technique for assessment of potential nonpilot airborne specialists or naval flight officers
A72-28256
- Statistical survey of barosinusitis incidence in U.S. Navy flying personnel during altitude chamber training, discussing diagnostic methods and clinical management
A72-28274
- Frontal sinus hematoma incidence in flying personnel and scuba divers, discussing diagnosis and clinical treatment
A72-28275
- Change in Naval Flight Officer operational role due to modern equipment design in weapons systems, sensors and navigational aids
A72-28291
- Serum cholesterol, phospholipid and lipoprotein levels relation to atherosclerotic heart disease occurrence in USAF personnel
A72-28292
- Clofibrate treatment for atherosclerotic cardiovascular disease prevention among Sabena flying personnel
A72-28293
- ECG diagnostics for arrhythmia assessment in flying personnel flight fitness examination
A72-28294
- Review of aeromedical records for grounding USAF flying personnel during 1956-1970, noting increased age factor effect
A72-28316
- Keratoconus /noninflammatory conic protrusion of cornea/ diagnosis and rehabilitation in USAF flying personnel
A72-28331
- FOOD**
Role of nitrogen metabolism in biological productivity and marine food chain in temperate seas
[CU-3826-22]
N72-20084
- FOREARM**
Forearm skin and muscle blood flow change measurements during whole body heating, using plethysmography, isotopic labeling and blood sampling techniques
A72-26617
- Water filled volume and strain gage phethysmography for forearm blood flow measurement during isometric exercise
A72-26622
- FREQUENCY RESPONSE**
Aircraft pilot seating protection from dynamic environment by active vibration isolation, discussing human frequency response characteristics
A72-26391
- Auditory flutter fusion frequency changes in humans during prolonged visual deprivation
A72-27418
- FROGS**
Effect of weightlessness on fertilized eggs of grass frog, *Rana pipiens*
[EXPT-P-1047]
N72-20060
- FUEL CONTAMINATION**
Fungicidal potency of antiicing additive for jet fuel
[AD-735451]
N72-21068
- FUNGICIDES**
Fungicidal potency of antiicing additive for jet fuel
[AD-735451]
N72-21068

G

- GALVANIC SKIN RESPONSE**
Human electrophysiological changes during perceptual isolation from EEG, EMG, vertical eye movements and electrodermal measurements
A72-27484
- GAMMA RAYS**
Effects of gamma radiation and weightlessness on cell growth of *Salmonella typhimurium* or induction of bacterial prophage
[EXPT-P-1135]
N72-20063
- Genetic effects of space flight and gamma radiation on *Neurospora crassa*
[EXPT-P-1037]
N72-20064
- GAS DETECTORS**
Aviator breathing oxygen contaminant detector using gas chromatography and portable IR analyzer

- GAS FLOW** A72-28253
 Method and apparatus for analyzing respiratory gas flow rate and inspiration-expiration frequencies in real time
 [NASA-CASE-MSC-13436-1] N72-20113
- GAS LASERS**
 Rhesus monkey retinal image diameter estimation during exposure to Ar and He-Ne laser irradiation, using microphotometer scans A72-25314
- GAS MIXTURES**
 Cardiorespiratory response to breathing dense sulfur fluoride-oxygen mixture under physical exercise conditions A72-28314
- GAS PRESSURE**
 Bubble growth during decompression and allowable gas tension in human body
 [DLR-PB-71-48] N72-20075
- GASTROINTESTINAL SYSTEM**
 Gastric motility in normal people at rest and during physical exercise
 [NASA-TT-F-14207] N72-20074
- GENERAL AVIATION AIRCRAFT**
 Dynamic deceleration anthropomorphic dummy tests of general aviation occupant lap belt/shoulder harness restraint systems
 [SAE PAPER 720325] A72-25588
 Flight stress and performance of training in general aviation simulator compared with actual flight A72-28261
 FAA program for revision of aviation aircraft maximum allowable control forces specifications, taking into account female pilots capabilities A72-28325
 Use of shoulder harness in general aviation aircraft to prevent or minimize injury during crashes
 [FAA-AM-72-3] N72-21077
- GENETICS**
 Evolutionary significance of primary amino acid or nucleotide base sequences of DNAs within various phylogenetic groups A72-27160
 Teratogenic and genetic effects in Drosophila caused by space environment
 [EXPT-P-1159] N72-20052
 Genetic effects of space flight and gamma radiation on Neurospora crassa
 [EXPT-P-1037] N72-20064
- GEOMAGNETIC PULSATIONS**
 Geomagnetic field perturbation biological effects, studying geomagnetic storm field energy levels and magnetic flux variables relation to human sensitivity thresholds A72-28210
- GERMINATION**
 Physiology of wheat seed germination and seedling growth during orbital flight
 [EXPT-P-1096] N72-20056
- GLIDE LANDINGS**
 Pilot glide slope and localizer tracking performance during successive in-flight simulated ILS approaches A72-28260
- GLOTTIS**
 Plethysmographic and laryngoscopic investigation of glottis opening and airway resistance relation to lung volume during panting and continuous slow expiration A72-26611
- GLYCOLYSIS**
 Lactate-pyruvate and redox state responses of blood and tissue in chronic hypercapnia
 [AD-734120] N72-21057
 Glycolytic metabolism effects from responses of blood lactate-pyruvate and redox state to chronic exposure to 3 percent CO₂
 [AD-734122] N72-21059
- GOGGLES**
 Goggle device for measuring visually perceptive direction of space
 [NASA-CR-125859] N72-20102
- GRAINS (FOOD)**
 Effect of weightlessness on growth and orientation of roots and shoots of wheat seedlings
 [EXPT-P-1020] N72-20055
 Physiology of wheat seed germination and seedling growth during orbital flight A72-27238
- [EXPT-P-1096] N72-20056
 Biochemical analyses of wheat seedling endosperms under weightless conditions of Biosatellite 2
 [EXPT-P-1138] N72-20058
- GRATINGS (SPECTRA)**
 Human visual acuity measured by chromatic square wave gratings under luminance conditions
 [AD-734931] N72-21063
- GRAVITATIONAL EFFECTS**
 Simulated gravity environment tests of vertical jump features, recording work performed, body center of gravity upward velocity, potential and kinetic energy changes A72-27479
 Ear oximeter design for human subject blood oxygen saturation estimation during increased g-loads A72-28278
 Tilt table test for gravitational stress effects on human pulmonary capillary blood flow A72-28286
- GROUND CREWS**
 Ground and flight crews coordinated effort in Apollo mission operations, noting experts on ground and spacecrew spot judgments capability
 [AIAA PAPER 72-236] A72-26557
- GROWTH**
 Effect of weightlessness on growth and orientation of roots and shoots of wheat seedlings
 [EXPT-P-1020] N72-20055
 Effects of gamma radiation and weightlessness on cell growth of Salmonella typhimurium or induction of bacterial prophage
 [EXPT-P-1135] N72-20063
- ## H
- HARNESSES**
 Dynamic deceleration anthropomorphic dummy tests of general aviation occupant lap belt/shoulder harness restraint systems
 [SAE PAPER 720325] A72-25588
 Impact tests on anthropomorphic dummies for protection effectiveness evaluation of lap belt, Air Force shoulder harness-lap belt and airbag-lap belt restraints A72-27471
 Use of shoulder harness in general aviation aircraft to prevent or minimize injury during crashes
 [FAA-AM-72-3] N72-21077
 Effectiveness of restraint equipment in controlling head impact forces and body kinematics in enclosed aircraft areas
 [FAA-AM-72-6] N72-21078
- HEAD (ANATOMY)**
 Ear site body temperature measurement relation to radiant heating of scalp and upper face A72-28333
 Effectiveness of restraint equipment in controlling head impact forces and body kinematics in enclosed aircraft areas
 [FAA-AM-72-6] N72-21078
- HEAD MOVEMENT**
 Involuntary head movement and helmet motion displacements during human centrifuge runs to 6 Gz from photographic recordings A72-28288
- HEAD-UP DISPLAYS**
 Pilot pursuit tracking performance under acceleration stress, simulating high performance aircraft dynamics via human centrifuge equipped with simulated head-up predictive gunsight A72-28320
 Head-up omnidirectional two dimensional auditory display device for visual detection facilitation in aircraft collision avoidance systems A72-28327
- HEARING**
 Listening levels preferred by flying personnel
 [AD-734778] N72-20088
- HEART DISEASES**
 Serum petidase activity determination as enzymatic diagnostic test for myocardial infarction A72-25851
 Triglyceridemia relation to age, relative weight and ischemic cardiopathy probability from ECG, anthropometry and lipid and glucid metabolism studies A72-27238

- High altitude hypoxia preadaptation effects on left ventricle myocardium noradrenaline concentration in rats with experimental vitium cordis
A72-27648
- Hemodynamic effects of angiographic contrast medium in patients with and without heart disease, discussing myocardial performance during first ten beats
A72-27732
- Clinical diagnosis of ST/T depression in resting ECG, noting coronary heart disease and left ventricular hypertrophy
A72-27733
- Two stage description of middle germ layer chronic polyarthritis, noting heart muscle and vascular wall tissues necrosis
A72-27822
- Multivariate algorithms of optimum content and form for cardiovascular risk assessment in pilots and air transport personnel
A72-28264
- Potential coronary heart disease susceptibility indicators in ATC population, using Framingham age/obesity parameters
A72-28265
- Stress vectorcardiography quantitative analysis of ECG response to treadmill exercise test to establish diagnosis criteria for coronary heart disease
A72-28282
- Serum cholesterol, phospholipid and lipoprotein levels relation to atherosclerotic heart disease occurrence in USAF personnel
A72-28292
- Clofibrate treatment for atherosclerotic cardiovascular disease prevention among Sabena flying personnel
A72-28293
- Portable equipment for detecting myocardial activity [AD-735882]
N72-21084
- HEART FUNCTION**
- Ear densitograph for noninvasive cardiac performance measurements during physical activities, exercise tests, flight conditions and for critical patients long-term monitoring
A72-25500
- Electronic and hematocrit devices to investigate cardiovascular system functions including blood coagulation process, pressure and flow
A72-26464
- TV microscopic system for on-line measurement of cat omentum microvessels diameter relative to heart action
A72-26621
- Physical training effect on rat cardiac function and metabolic response to hypoxia
A72-26701
- Heart and circulatory system functional diagnostics, discussing ECG, blood pressure, X ray, phonocardiographical and pulmonary examinations
A72-27271
- Human cardiovascular function change as indication of hypoxic circulatory stress, using noninvasive cardiographic measurements of cardiac electromechanical time intervals
A72-27470
- Acute hypoxia effects on dog coronary blood flow and cardiac function from cardiac beta-adrenergic and hemodynamics study
A72-27482
- Case report of pilot near-syncope episode with bradycardia due to hyperactive right carotid sinus reflex
A72-27487
- Cat and rat cardiac and cardiovascular reflexes response to electric pulse stimulation of sensorimotor cerebral cortex
A72-27647
- Renal clearance studies of left atrial distention effect in dog, indicating antidiuretic hormone inhibition mechanism of diuresis
A72-27828
- Autonomic nervous system role in controlling coronary and cardiac responses to hypoxic hypoxia, measuring blood flow with Doppler ultrasonic flow transducer
A72-28313
- Cardiorespiratory response to breathing dense sulfur fluoride-oxygen mixture under physical exercise conditions
A72-28314
- HEART MINUTE VOLUME**
- Design of specialized analog computer for on-line monitoring of cardiac stroke volume by means of modified version of pressure pulse contour method [NASA-TN-D-6658]
N72-20108
- HEART RATE**
- Positive acceleration effects on human cardiovascular system during centrifuge tests, studying ECG changes in terms of cardiac rhythm, heart rate and wave parameters
A72-26015
- Maximal oxygen uptake and heart rate during laddermill climbing, inclined treadmill running and cycling ergometer tests
A72-26612
- Computer assisted monitoring of ECG waveforms and heart sounds frequency spectra to detect bubble laden blood during decompression sickness
A72-26626
- Nose installed thermistor device for in-flight monitoring of pilot respiration and pulse rate
A72-27417
- Parachutist biomedical responses in aerial tow at 110-175 knots, determining heart and respiration rates and urinary catecholamines
A72-28272
- Characteristics of heart rate information during sleep, and extracting sleep information from heart rate data [AD-734283]
N72-21061
- HEAT FLUX**
- Underwater tests of instrument system for combined skin temperature and direct heat flow measurement in thermally stressful environments
A72-28334
- HEAT MEASUREMENT**
- Thermodynamics of human body metabolism, discussing energy conversion calorimetric measurements, body size, food intake, age, sex, endocrine and nervous effects
A72-26072
- HEAT OF VAPORIZATION**
- Thermodynamic analysis of heat of evaporation of sweat, considering ambient temperature and humidity effects, body heat storage and presence of solutes
A72-26610
- HEAT TOLERANCE**
- Relationship between steady sweat flow and temperature regulation mechanism during exposure to heat [REPT-377]
N72-20069
- HELMETS**
- Vertical drop rig test equipment for measuring shock attenuation of crash helmets, discussing shock absorption criteria for impact protection
A72-26016
- Involuntary head movement and helmet motion displacements during human centrifuge runs to 6 Gz from photographic recordings
A72-28288
- Positive acceleration force-produced displacements of helmet-attached reticle in front of left eye
A72-28330
- HEMATOCRIT**
- Electronic and hematocrit devices to investigate cardiovascular system functions including blood coagulation process, pressure and flow
A72-26464
- Plasma protein concentration, volume and hematocrit changes during exercise, bed rest and high forward acceleration
A72-28296
- HEMATOPOIESIS**
- Suppression effects of hyperoxic breathing gases on red blood cell and erythropoietin hormone production following blood loss
A72-28298
- HEMODYNAMIC RESPONSES**
- Beta-adrenergic blocking effect on canine coronary and systemic hemodynamic adaptation during treadmill exercise
A72-25802
- Hemodynamic criteria for physical fitness in airmen, discussing age dependent variations in heart beat, arterial pressure and body temperature
A72-26987

- Physiological index changes in parachutists of various ages, considering plasma recalcification, blood prothrombin, heparin time, fibrinolytic activity, pressure and heart beat
A72-26988
- Hemodynamic effects of angiographic contrast medium in patients with and without heart disease, discussing myocardial performance during first ten beats
A72-27732
- Hemodynamic response to physical exercise stress in dogs with angiotensin-induced acute arterial hypertension
A72-28216
- Autonomic nervous system role in controlling coronary and cardiac responses to hypoxic hypoxia, measuring blood flow with Doppler ultrasonic flow transducer
A72-28313
- Effects of prolonged exposure to hyperoxia environment on coagulating processes of blood [JPRS-55553]
N72-21044
- HEMODYNAMICS**
- QRS wave detectors for arrhythmia and hemodynamic data analysis, using standardized FM magnetic tape containing various artifacts for evaluation
A72-25499
- Hemodynamic variables relation to coronary blood flow and myocardial oxygen consumption during upright bicycle exercise
A72-26618
- Left ventricular dynamic function in terms of internal diameter, pressure and flow in dogs at rest and during isoproterenol and metaraminol infusions
A72-26773
- Hemodynamic assessment of arterial blood flow from radiograph measurements of aorta branching points
A72-26774
- Acute hypoxia effects on dog coronary blood flow and cardiac function from cardiac beta-adrenergic and hemodynamics study
A72-27482
- HEMOGLOBIN**
- Light absorption and scattering factors in whole blood related to hemoglobin concentration, discussing oxygen saturation, cardiac output and pathological conditions
A72-26630
- HEREDITY**
- Biological experiments on plants, animals and bacteria aboard Zond 5, 6 and 7 space probes, noting flight conditions effect on physiological functions and hereditary structures
A72-25941
- HIBERNATION**
- Thermoregulation in deeply hibernating rodents during separate chilling and steady hibernation temperature maintenance of skin and brain
A72-27827
- HIGH ACCELERATION**
- Plasma protein concentration, volume and hematocrit changes during exercise, bed rest and high forward acceleration
A72-28296
- HIGH ALTITUDE ENVIRONMENTS**
- Physiological and clinical effects of long distance flight in pressurized commercial planes with simulated altitudes over 15000 meters
A72-27486
- Native highlander and lowlander chemoreflex ventilatory response to transient carbon dioxide inhalation at low and high altitudes
A72-27728
- Physiological effects of high altitude flight and development of life support systems for civil aircraft environmental control [JPRS-55454]
N72-20107
- HIGH ALTITUDE TESTS**
- Physiological effects on anesthetized and conscious dogs during exposure at 80,000 ft for different decompression rates, discussing cardiovascular, biochemical and pathological effects
A72-28322
- Effects of high altitude on cellular and energy metabolism in rats [AD-734933]
N72-21064
- HIGH GRAVITY ENVIRONMENTS**
- Pilot and back-seat man physiological responses during high-g aerial combat maneuvers in P-4E aircraft, discussing ECG, respiratory rate and minute volume
A72-28317
- HIGH PRESSURE OXYGEN**
- Cardiovascular responses to positive pressure oxygen breathing from blood pressure and heart and respiratory rate measurements
A72-26017
- Physiological and biochemical responses of *Paramecium caudatum* to hypo- and hyperbaric stresses, discussing protoplasmic inactivation by high oxygen pressure
A72-28299
- Hydrogen peroxide formation relationship to lipid peroxidation and seizures in brain during high pressure oxygen exposure
A72-28300
- Effects of prolonged exposure to hyperoxia environment on coagulating processes of blood [JPRS-55553]
N72-21044
- HIGH TEMPERATURE ENVIRONMENTS**
- Parotid fluid 17-hydroxycorticoid steroid level relation to hyperthermia stress at various heat levels during thermal environmental testing
A72-28335
- HORMONE METABOLISMS**
- Thyroid and adrenocortical hormonal state effect on cell number and functional maturation of brain, discussing neurogenesis in infants
A72-27298
- Bed rest and centrifuging effects on human plasma thyroid hormone level, discussing total protein, albumin and thyroxin binding globulin concentrations
A72-27477
- Renal clearance studies of left atrial distention effect in dog, indicating antidiuretic hormone inhibition mechanism of diuresis
A72-27828
- Metabolic and hormonal response adaptation to prolonged hypodynamics in water immersion /head out/, noting diurnal and nocturnal differences in circadian rhythms
A72-28267
- Suppression effects of hyperoxic breathing gases on red blood cell and erythropoietin hormone production following blood loss
A72-28298
- HUMAN BEHAVIOR**
- EEG measurement of sleep behavior patterns, discussing sleep stages, temporal patterns, circadian rhythm, intrasleep process stability and age factor
A72-26679
- HUMAN BEINGS**
- Radiation effects of total and partial body irradiation in human beings [AD-734209]
N72-20091
- HUMAN BODY**
- German papers on human body energy balance and temperature control covering energy conversion processes, chemical secretions, muscle activity, etc
A72-26071
- Thermodynamics of human body metabolism, discussing energy conversion calorimetric measurements, body size, food intake, age, sex, endocrine and nervous effects
A72-26072
- Human body thermoregulatory processes under varying environmental conditions and metabolic rates, discussing role of blood circulation, sweating, nervous stimuli, hormones, etc
A72-26073
- Human body biochemical energy conversion processes during muscular activity, discussing nutrition, circulation and respiration roles
A72-26075
- Geomagnetic field perturbation biological effects, studying geomagnetic storm field energy levels and magnetic flux variables relation to human sensitivity thresholds
A72-28210
- Supine human body mechanical impedance under combined stress of vibration and sustained acceleration
A72-28270

- Bubble growth during decompression and allowable gas tension in human body [DLR-PB-71-48] N72-20075
- Compilation of raw data on elemental concentrations in normal and diseased human organs [UCRL-51013-PT-1-REV-1] N72-20081
- Clinical treatment of vibration induced disorders in construction workers [RAE-LIB-TRANS-1611] N72-21051
- HUMAN CENTRIFUGES**
- Positive acceleration effects on human cardiovascular system during centrifuge tests, studying ECG changes in terms of cardiac rhythm, heart rate and wave parameters A72-26015
- Human centrifuge studies of high positive acceleration effects on blood oxygenation and arterial oxygen and carbon dioxide tension A72-28287
- Involuntary head movement and helmet motion displacements during human centrifuge runs to 6 Gz from photographic recordings A72-28288
- Acceleration protection properties of modified partial pressure suit, determining tolerance limits by vision impairment criteria during centrifuge tests A72-28319
- Pilot pursuit tracking performance under acceleration stress, simulating high performance aircraft dynamics via human centrifuge equipped with simulated head-up predictive gunsight A72-28320
- HUMAN FACTORS ENGINEERING**
- Medical evaluation of manned space flight physiological effects, considering Mercury, Gemini and Apollo programs A72-26100
- Aircraft pilot seating protection from dynamic environment by active vibration isolation, discussing human frequency response characteristics A72-26391
- Weightlessness effects on human organism, discussing physiological changes, artificial gravity by spacecraft rotation and exercise to counter adverse reactions A72-26891
- Human, technical and environmental factors in accidents of naval F-104 squadron, considering temporal distribution of accidents and pilot physical condition A72-27820
- Change in Naval Flight Officer operational role due to modern equipment design in weapons systems, sensors and navigational aids A72-28291
- FAA program for revision of aviation aircraft maximum allowable control forces specifications, taking into account female pilots capabilities A72-28325
- Human Resources Research Organization bibliography of publications as of 30 June, 1971 N72-20101
- Analysis of pedal operation by seated operator with application to design of foot controls for automobiles and other equipment [AD-735315] N72-21089
- HUMAN PERFORMANCE**
- Human performance under intense noise, measuring effects on muscle tension, metabolism, respiration rate, visual accommodation, saccadic eye movement and dark adaptation A72-25728
- Diurnal rhythm and loss of sleep effects on human efficiency - Conference, Strasbourg, July 1970 A72-26676
- Human performance dependence on time of day, discussing circadian and physiological rhythms relation and environmental change effects A72-26677
- Sleep deprivation effects relation to work duration, time of day, circadian rhythm, memory function, task performance, environmental factors, drug use and age A72-26678
- Sleep loss effect on reaction and movement times during information processing in step tracking task A72-26680
- Time displacement effects on human physiological and psychological functions, discussing circadian rhythm phase shift and performance deficits A72-26681
- Mental performance tests in sleep deprived subjects for indication of recuperative function of slow wave and REM sleep stages A72-26682
- Cumulative partial sleep deprivation effects on human performance in auditory vigilance, routine addition and running digit span tests, observing circadian rhythms A72-26683
- Sleep, lack of sleep and circadian rhythm effects on psychometric test performance A72-26684
- Sleep interruption, sleep deprivation and continuous darkness effects on circadian rhythms in human performance A72-26685
- Sleep loss and work-rest cycle effects on combat efficiency, considering psychomotor reactivity, vigilance and decision making capacity A72-26688
- Cumulative sleep deficit, preceding sleep or wakefulness period duration and body temperature effects on reaction time in multiple choice visual task A72-26690
- Human functional level performance characteristics, noting relationship between spontaneous rhythm diurnal variations in psychic and physical performance A72-26691
- Sleep deprivation effect on circadian rhythms in human performance, psychological fatigue ratings, catecholamine excretion and urine flow A72-26692
- Circadian rhythm effects on introverts and extroverts biochemistry, physiology and performance, suggesting arousal mechanism differences A72-26693
- Project Pegasus vigilance tasks for mental performance aspects of time zone change effects on human circadian rhythms A72-26695
- Time zone transition induced circadian rhythm disturbance effect on military personnel mental and physiological performance A72-26696
- Auditory flutter fusion frequency changes in humans during prolonged visual deprivation A72-27418
- Jet aircraft noise effect on sleeping EEG and subsequent waking performance, showing presence of carry-over effects A72-27474
- Parachutist biomedical responses in aerial tow at 110-175 knots, determining heart and respiration rates and urinary catecholamines A72-28272
- Periodic, continuous and aperiodic white noise effects on human serial decoding performance, relating subjective and autonomic responses A72-28289
- Self estimated distractibility in subjects related to attention lapses during perceptual motor performance, indicating psychophysiological changes A72-28307
- Noise effects on human performance and reactions [NASA-TN-D-6675] N72-20071
- Optimum underwater work measurement techniques [AD-734014] N72-20092
- Electromyographic activity of biceps muscle during submaximum isometric contraction determined from auditory feedback [AD-734300] N72-20094
- Human Resources Research Organization bibliography of publications as of 30 June, 1971 N72-20101
- Biotelemetric equipment for measuring physiological responses of freely moving human beings N72-20147
- Parametric analysis of intravehicular manned cargo transfer in simulated weightlessness [NASA-TN-D-6774] N72-21075

- Automated instructional monitors for diagnosing student difficulties in acquiring complex concepts and skills
[AD-736212] N72-21090
- HUMAN REACTIONS**
Pilot warning systems for visual midair collision avoidance, noting reaction to imminent threats, scanning patterns and display sector size effects [SAE PAPER 720312] A72-25576
Audiometric determination of human temporary threshold shifts due to steady state and impulsive noise A72-25873
Ear oximeter design for human subject blood oxygen saturation estimation during increased g-loads A72-28278
EEG recording and analysis by analog technique as means of studying human responses to hyperventilation A72-28312
Noise effects on human performance and reactions [NASA-TN-D-6675] N72-20071
Human Resources Research Organization bibliography of publications as of 30 June, 1971 N72-20101
Human reactions to long term space flight [NASA-CR-125826] N72-20103
Mathematical models for analyzing sequential and continuous motor behavior in humans [AD-734681] N72-21060
- HUMAN TOLERANCES**
Pathophysiology of exposure to UV, IR, coherent, microwave and RF radiations, discussing potential hazards, damage, human tolerance threshold, protection guides and safety standards A72-27963
Centrifugation tolerance reduction after 14 days bed rest with moderate exercise, determining rehydration effects A72-28295
Physiological and subjective responses of physically fit young men to combined exercise-carbon dioxide stress tests A72-28311
Pilot and back-seat man physiological responses during high-g aerial combat maneuvers in F-4E aircraft, discussing ECG, respiratory rate and minute volume A72-28317
Valsalva and M-1 maneuvers acceleration tolerance protective effects during high-g centrifuging with and without anti-g suits A72-28318
Human acceleration stress tolerance monitoring techniques for temporal, brachial and radial arterial blood flow and indirect systolic and diastolic blood pressure measurements A72-28328
Miniature swine as human analog to investigate physiological response to high positive acceleration, comparing human and animal tolerances A72-28329
Human Resources Research Organization bibliography of publications as of 30 June, 1971 N72-20101
- HYDRATION**
Centrifugation tolerance reduction after 14 days bed rest with moderate exercise, determining rehydration effects A72-28295
- HYDROGEN PEROXIDE**
Hydrogen peroxide formation relationship to lipid peroxidation and seizures in brain during high pressure oxygen exposure A72-28300
- HYDROLYSIS**
Solar activity effects on bismuth chloride hydrolysis tests from statistical results following solar flares A72-28212
- HYDROSTATIC PRESSURE**
Electrolyte hydrostatic pressure measurement in limited volume biological compartments by fluid filled glass micropipette used in microtransducer capacity A72-26623
- HYDROXYCORTICOSTEROID**
Parotid fluid 17-hydroxycortico steroid level
- relation to hyperthermia stress at various heat levels during thermal environmental testing A72-28335
- HYPERBARIC CHAMBERS**
Physiological and biochemical responses of Paramecium caudatum to hypo- and hyperbaric stresses, discussing protoplasmic inactivation by high oxygen pressure A72-28299
Development and tests of sensitive methodologies for measuring sensory and motor impairment in hyperbaric environments [AD-735117] N72-21062
Whole body plethysmograph system for use in measuring airway resistance under ambient hyperbaric conditions for normal breathing patterns [AD-735462] N72-21081
- HYPERCAPNIA**
Chronic hypoxia adapted rat myocardial tissue sensitivity to increased carbon dioxide tension A72-26616
Lactate-pyruvate and redox state responses of blood and tissue in chronic hypercapnia [AD-734120] N72-21057
Plasma creatine phosphokinase response to hypercapnia [AD-734126] N72-21058
- HYPEROXIA**
Hyperoxia effect on human airways resistance during high pressure oxygen breathing A72-26614
Electron microscope study of hyperoxia-induced pathogenetic ultrastructural changes in rat lung A72-27531
Suppression effects of hyperoxic breathing gases on red blood cell and erythropoietin hormone production following blood loss A72-28298
Effects of prolonged exposure to hyperoxia environment on coagulating processes of blood [JPRS-55553] N72-21044
- HYPERTENSION**
Hemodynamic response to physical exercise stress in dogs with angiotensin-induced acute arterial hypertension A72-28216
- HYPERTHERMIA**
Parotid fluid 17-hydroxycortico steroid level - relation to hyperthermia stress at various heat levels during thermal environmental testing A72-28335
- HYPERVENTILATION**
EEG recording and analysis by analog technique as means of studying human responses to hyperventilation A72-28312
Electromyographic measurement of maximum voluntary muscle contraction endurance in chronic hyperventilators [AD-734298] N72-21072
- HYPOBARIC ATMOSPHERES**
Physiological and biochemical responses of Paramecium caudatum to hypo- and hyperbaric stresses, discussing protoplasmic inactivation by high oxygen pressure A72-28299
- HYPODYNAMIA**
Metabolic and hormonal response adaptation to prolonged hypodynamics in water immersion /head out/, noting diurnal and nocturnal differences in circadian rhythms A72-28267
- HYPOKINESIA**
Clinical analysis of hypokinesia caused changes in nervous system and effects of pharmacological preparations on hypokinesia disorders [NASA-TT-F-14225] N72-21046
- HYPOTHALAMUS**
Adrenocortical response to prolonged high altitude hypoxia in hypothalamic deafferented rats, showing rapid neural stimulation with delayed humoral activation A72-27829
- HYPOTHERMIA**
Albino rats spinal cord capillaries ultrastructure upon hypothermy, noting endothelial cells sinking to lower levels from microscopic observation A72-27304

HYPOXIA

Erythrocyte life span in mice under normal atmospheric pressure and various degrees of hypoxia acclimatization, using radioactive labeled diisopropyl phosphorofluoridate A72-26608

Chronic hypoxia adapted rat myocardial tissue sensitivity to increased carbon dioxide tension A72-26616

Physical training effect on rat cardiac function and metabolic response to hypoxia A72-26701

Human cardiovascular function change as indication of hypoxic circulatory stress, using noninvasive cardiographic measurements of cardiac electromechanical time intervals A72-27470

Mountain sickness relation to ventilation response to hypoxia, noting response intensity dependence on peripheral chemoreceptor sensitivity A72-27481

Acute hypoxia effects on dog coronary blood flow and cardiac function from cardiac beta-adrenergic and hemodynamics study A72-27482

High altitude hypoxia preadaptation effects on left ventricle myocardium noradrenaline concentration in rats with experimental vitium cordis A72-27648

Exercise role in ventilatory acclimatization to graded hypoxia in goats from carbon dioxide response curve measurements A72-27727

Adrenocortical response to prolonged high altitude hypoxia in hypothalamic deafferented rats, showing rapid neural stimulation with delayed humoral activation A72-27829

Ascorbic acid influence on blood coagulation and anticoagulation systems in dogs with acute hypoxia, discussing plasma recalcification time and heparin tolerance A72-28217

Hypoxia effect on aircraft pilot performance, using Link GAT 1 trainer and controlled composition atmosphere under varied altitude conditions for simulated ILS landing approaches A72-28310

Autonomic nervous system role in controlling coronary and cardiac responses to hypoxic hypoxia, measuring blood flow with Doppler ultrasonic flow transducer A72-28313

Response of ventilation parameters, pulse rate, oxygen uptake, and body temperature in man under acute and severe hypoxia [DLR-FB-71-65] N72-21053

IMAGE CONTRAST
Spatial characteristics of equal energy visual stimuli in metacontrast design for targets and masks of constant separation and varying width, deriving weighting functions A72-27680

IMMOBILIZATION
Calcium and phosphorus excretion relation to bone density changes in immobilized Macaca nemestrina monkeys A72-27473

IMPACT ACCELERATION
Modified Van der Pol wave motion oscillator model for prediction of aortic dynamic response to negative g impact accelerations A72-28271

IMPACT DAMAGE
Computer program for analyzing impact damage to skull-brain system models [AD-733986] N72-20087

IMPACT LOADS
Effects of exposure to blast induced winds and pressure variations on biophysical parameters [AD-734208] N72-21054

IMPACT TESTING MACHINES
Vertical drop rig test equipment for measuring shock attenuation of crash helmets, discussing shock absorption criteria for impact protection A72-26616

IMPACT TESTS

Impact tests on anthropomorphic dummies for protection effectiveness evaluation of lap belt, Air Force shoulder harness-lap belt and airbag-lap belt restraints A72-27471

IMPLANTATION

Vapor cycle engine for driving Pu 238 fueled heart assist system [PB-205474] N72-21086

IN-FLIGHT MONITORING

Nose installed thermistor device for in-flight monitoring of pilot respiration and pulse rate A72-27417

INDUSTRIAL SAFETY

Lungs fibrosis and cancer caused by asbestos fibers inhalation, noting environment control for protection against workers health hazards A72-25548

Asbestos reinforced plastics safe handling and manipulation ensured by regulations provided precautions A72-25549

Russian book on powdered metals toxicity covering industrial dust, physiological effects, safety standards, electron configurations and crystalline structure A72-26067

Industrial safety rules recommendations for lasers based on radiation biological effects and eye optical and physiological properties A72-27615

Pathophysiology of exposure to UV, IR, coherent, microwave and RF radiations, discussing potential hazards, damage, human tolerance threshold, protection guides and safety standards A72-27963

INFARCTION

Serum peptidase activity determination as enzymatic diagnostic test for myocardial infarction A72-25851

Myocardial infarction stress effect on serum cortisol, plasma free fatty acid and urinary catecholamine levels A72-26787

INFLATING

Inflatability and flotation of one man life raft after puncture to main wall [NASA-CASE-LAR-10241-1] N72-21076

INFRARED DETECTORS

IR pupillography for screening narcoleptics and fatigue prone individuals from driver and pilot training applicants A72-28323

INSECTS

Experiments involving parasitic wasp Habrobracon, yeast, and Artemia salina on Biosatellite 2 [EXPT-P-1079] N72-20050

European research and atomic energy applications to agricultural crops and insect sterilization [NP-19016] N72-20077

INSTRUMENT LANDING SYSTEMS

Pilot glide slope and localizer tracking performance during successive in-flight simulated ILS approaches A72-28260

INTEGRATED CIRCUITS

Common collector micropower monolithic transmitter for single or multichannel biomedical telemetry A72-26563

INTERFERENCE GRATING

Retina visual acuity testing by zero and first order moire fringes, using square-wave amplitude gratings A72-27953

INTRAOCULAR PRESSURE

Isotopic labeled microspheres for cat uveal and retinal blood flow and oxygen consumption determination, studying increased intraocular pressure and carbon dioxide tension effects A72-27841

INTRAVEHICULAR ACTIVITY

Parametric analysis of intravehicular manned cargo transfer in simulated weightlessness [NASA-TN-D-6774] N72-21075

INTROVERSION

Circadian rhythm effects on introverts and extroverts biochemistry, physiology and performance, suggesting arousal mechanism

- differences A72-26693
- INVERTEBRATES**
Experiments with invertebrates, plants, and cellular systems on Biosatellite 2 flight [NASA-SP-204] N72-20048
- INVOLUNTARY ACTIONS**
Involuntary head movement and helmet motion displacements during human centrifuge runs to 6 Gz from photographic recordings A72-28288
- IONIZING RADIATION**
Analysis of ionizing radiation sources in space N72-20040
Modifying influence of various flight factors on radiobiological effects of ionizing radiation on organisms in space flight N72-20042
Criteria for determining permissible doses of ionizing radiation for astronauts N72-20045
- IRRADIATION**
Radiation effects of total and partial body irradiation in human beings [AD-734209] N72-20091
- IRREVERSIBLE PROCESSES**
Irreversibility mechanism in postpartum ductus arteriosus closure in guinea pigs, studying vessel cellular changes and smooth muscle response to oxygen pressure A72-27826
- ISCHEMIA**
Triacylglyceridemia relation to age, relative weight and ischemic cardiopathy probability from ECG, anthropometry and lipid and glucid metabolism studies A72-27238
- ISOLATION**
Human electrophysiological changes during perceptual isolation from EEG, EMG, vertical eye movements and electrodermal measurements A72-27484
- ISOTOPIC LABELING**
Isotopic labeled microspheres for cat uveal and retinal blood flow and oxygen consumption determination, studying increased intraocular pressure and carbon dioxide tension effects A72-27841
- J**
- JET AIRCRAFT**
Factor analysis of grades for successful performance skill identification during undergraduate and graduate jet pilot training A72-27472
- JET AIRCRAFT NOISE**
Jet aircraft noise effect on sleeping EEG and subsequent waking performance, showing presence of carry-over effects A72-27474
- JET ENGINE FUELS**
Fungicidal potency of antiicing additive for jet fuel [AD-735451] N72-21068
- JOSEPHSON JUNCTIONS**
Cryogenic Josephson junction magnetometer in magnetocardiography, discussing high ambient noise levels in unshielded environment A72-27288
- K**
- KWIC INDEXES**
KWIC index and bibliography on biological effects related technology of lasers and light [PB-205091] N72-21070
- L**
- LABOR**
Biotelemetric measurements of physiological responses during labor and sports activities N72-20148
- LABORATORY EQUIPMENT**
Modular microbiology laboratory design considerations and zero gravity experiments to investigate microbial culture systems behavior A72-28280
- LACTATES**
Glycolytic metabolism effects from responses of blood lactate-pyruvate and redox state to chronic exposure to 3 percent CO2 [AD-734122] N72-21059
- LASER OUTPUTS**
Rhesus monkey retinal image diameter estimation during exposure to Ar and He-Ne laser irradiation, using microphotometer scans A72-25314
Industrial safety rules recommendations for lasers based on radiation biological effects and eye optical and physiological properties A72-27615
- LASERS**
Biophysical and cytological studies with laser microbeams [AD-734181] N72-20090
KWIC index and bibliography on biological effects related technology of lasers and light [PB-205091] N72-21070
Ocular laser protective filter with narrowband absorption, luminous transmission, and optical density of 3.5 [AD-735799] N72-21083
- LEUKOCYTES**
Crowding phenomenon effect on blood cell oxygen consumption, using Cartesian diver technique for polymorphonuclear leukocyte, lymphocyte and platelet measurements A72-27842
- LIFE RAFTS**
Inflatability and flotation of one man life raft after puncture to main wall [NASA-CASE-LAR-10241-1] N72-21076
- LIFE SCIENCES**
Living organisms defense and preservation via refrigeration and vacuum combined use in lyophilization technique A72-27293
- LIFE SPAN**
Erythrocyte life span in mice under normal atmospheric pressure and various degrees of hypoxia acclimatization, using radioactive labeled diisopropyl phosphorofluoridate A72-26608
- LIFE SUPPORT SYSTEMS**
Life support equipment and pressure suit operational requirements from viewpoint of flight crews and test pilots A72-27516
Open loop life support subsystem using breathing bag as reservoir for EVA [NASA-CASE-NSC-12411-1] N72-20096
Physiological effects of high altitude flight and development of life support systems for civil aircraft environmental control [JPRS-55454] N72-20107
- LIGHT (VISIBLE RADIATION)**
KWIC index and bibliography on biological effects related technology of lasers and light [PB-205091] N72-21070
- LIGHT ADAPTATION**
Gain control of cat retina rapid light adaptation process to attenuate signals reaching retinal ganglion cells from photoreceptors A72-27299
Physiological effects of intense anticollision flash light backscatter pulses on instrument rated pilots A72-28303
- LIGHT AIRCRAFT**
Energy absorbing seat design for light aircraft, describing development and static and dynamic testing [SAE PAPER 720322] A72-25585
- LIGHT SCATTERING**
Light absorption and scattering factors in whole blood related to hemoglobin concentration, discussing oxygen saturation, cardiac output and pathological conditions A72-26630
Physiological effects of intense anticollision flash light backscatter pulses on instrument rated pilots A72-28303
- LIMBS (ANATOMY)**
Pure biocarbons for skeletal fixation of limb prosthetic devices, noting load bearing

- applications dependence on brittle characteristics
A72-28C95
- LIPID METABOLISM**
Triglyceridemia relation to age, relative weight and ischemic cardiopathy probability from ECG, anthropometry and lipid and glucid metabolism studies
A72-27238
Serum cholesterol, phospholipid and lipoprotein levels relation to atherosclerotic heart disease occurrence in USAF personnel
A72-28292
Hydrogen peroxide formation relationship to lipid peroxidation and seizures in brain during high pressure oxygen exposure
A72-28300
- LIPOPROTEINS**
Serum cholesterol, phospholipid and lipoprotein levels relation to atherosclerotic heart disease occurrence in USAF personnel
A72-28292
- LIQUID BREATHING**
Pulmonary atelectasis and arterial-venous shunting and heart displacement prevention during centrifuging of dogs breathing oxygenated liquid fluorocarbon in water immersion respirator
A72-26609
- LIQUID OXYGEN**
LOX supply systems installation for civil transport aircraft crew and/or passenger breathing oxygen [SAE AIR 1223]
A72-26C3C
- LIQUID ROCKET PROPELLANTS**
Suit for personnel handling liquid rocket propellants for protection from chlorine trifluoride and elemental fluorine [AD-731556]
N72-20115
- LIVER**
Liver and muscle type isozymes of DPN-linked glycerol-3-P dehydrogenase in chickens in terms of tissue distribution, ontogeny and avian evolution
A72-27161
- LOAD TESTS**
Added elastic load tests for thoracic elastance change effects on human response to carbon dioxide inhalation, using rebreathing technique
A72-27726
- LOCOMOTION**
Gastric motility in normal people at rest and during physical exercise [NASA-TT-P-142C7]
N72-20074
- LONG TERM EFFECTS**
Human reactions to long term space flight [NASA-CR-125826]
N72-20103
- LOW TEMPERATURE ENVIRONMENTS**
Thermoregulation in deeply hibernating rodents during separate chilling and steady hibernation temperature maintenance of skin and brain
A72-27827
- LOWER ATMOSPHERE**
Russian papers on solar activity effects on earth atmosphere and biosphere covering climate, vegetation, animals and man
A72-28206
Solar activity effects on biospheric processes for biological and physicochemical systems in unsteady state, considering maximum effects on man at certain electromagnetic wave frequencies
A72-28211
- LUMINANCE**
Human visual acuity measured by chromatic square wave gratings under luminance conditions [AD-734931]
N72-21063
- LUNG MORPHOLOGY**
Electron microscope study of hyperoxia-induced pathogenetic ultrastructural changes in rat lung
A72-27531
- LUNGS**
Lumped parameter nonlinear RC circuit lung model for positive pressure respirator design
A72-26631
- LYMPHOCYTES**
Crowding phenomenon effect on blood cell oxygen consumption, using Cartesian diver technique for polymorphonuclear leukocyte, lymphocyte and platelet measurements
A72-27842
- M**
- MAGNETIC EFFECTS**
Geomagnetic field perturbation biological effects, studying geomagnetic storm field energy levels and magnetic flux variables relation to human sensitivity thresholds
A72-28210
Magnetic storm strength ELF electromagnetic field effects on rabbits, dogs and bacteria, discussing changes in EEG, ECG and blood characteristics
A72-28214
- MAGNETIC STORMS**
Geomagnetic field perturbation biological effects, studying geomagnetic storm field energy levels and magnetic flux variables relation to human sensitivity thresholds
A72-28210
- MAGNETOCARDIOGRAPHY**
Cryogenic Josephson junction magnetometer in magnetocardiography, discussing high ambient noise levels in unshielded environment
A72-27288
- MAGNETOMETERS**
Cryogenic Josephson junction magnetometer in magnetocardiography, discussing high ambient noise levels in unshielded environment
A72-27288
- MAINTENANCE**
Training devices for training operators in use characteristics and maintenance of Naval electronic equipment [AD-733471]
N72-20116
- MAN MACHINE SYSTEMS**
Data display techniques in man operated automatic control system, assessing information volume versatility and operability
A72-26451
Pilot-aircraft system model for relationship between weapons delivery accuracy and manual flight control system design, noting display, computation and control aids to pilot
A72-28121
Status of Swedish research in biotechnology and applied psychology relating to man machine systems [RAE-LIB-TRANS-1597]
N72-20073
- MANNED SPACE FLIGHT**
Medical evaluation of manned space flight physiological effects, considering Mercury, Gemini and Apollo programs
A72-26100
Diving operations medical aspects significance for manned planetary surface exploration in high density atmospheres, considering protective clothing, breathing apparatus and gas mixtures, etc
A72-27415
Specifications and engineering model of urine sampling and collection system for manned space flights [NASA-CR-115507]
N72-20109
- MANUAL CONTROL**
Data display techniques in man operated automatic control system, assessing information volume versatility and operability
A72-26451
Pilot-aircraft system model for relationship between weapons delivery accuracy and manual flight control system design, noting display, computation and control aids to pilot
A72-28121
Analysis of pedal operation by seated operator with application to design of foot controls for automobiles and other equipment [AD-735315]
N72-21089
- MANUALS**
Operators reference manual for BIOMOD computer graphics system [R-746-NIB]
N72-20104
- MARINE BIOLOGY**
Role of nitrogen metabolism in biological productivity and marine food chain in temperate seas [CU-3826-22]
N72-20084
- MARS ENVIRONMENT**
Life on Mars, investigating ground based and probe observations of atmospheric composition and pressure, surface temperature and features and UV

- radiation A72-27624
- MARS SURFACE**
- Life on Mars, investigating ground based and probe observations of atmospheric composition and pressure, surface temperature and features and UV radiation A72-27624
- MATERIALS HANDLING**
- Asbestos reinforced plastics safe handling and manipulation ensured by regulations provided precautions A72-25549
- Parametric analysis of intravehicular manned cargo transfer in simulated weightlessness [NASA-TN-D-6774] N72-21075
- MATHEMATICAL MODELS**
- Gabor-Nelson myocardium electrical activity model for mathematical construction of vectorcardiograph from ECG for comparison of various lead systems A72-26629
- Mathematical model of extracellular pH in brain tissue from blood and cerebrospinal fluid acid-base parameters for respiration central chemosensitive mechanism study A72-26660
- Pilot-aircraft system model for relationship between weapons delivery accuracy and manual flight control system design, noting display, computation and control aids to pilot A72-28121
- Modified Van der Pol wave motion oscillator model for prediction of aortic dynamic response to negative g impact accelerations A72-28271
- Mathematical models for determining nature of electrosensing mechanism and its sensitivity in fish [AD-734027] N72-20093
- Mathematical models for predicting safety margins in planetary quarantine [NASA-CR-126032] N72-21050
- Mathematical models for analyzing sequential and continuous motor behavior in humans [AD-734681] N72-21060
- MEASURING INSTRUMENTS**
- Goggle device for measuring visually perceptive direction of space [NASA-CR-125859] N72-20102
- MECHANICAL IMPEDANCE**
- Supine human body mechanical impedance under combined stress of vibration and sustained acceleration A72-28270
- MEDICAL EQUIPMENT**
- Biomedical system for measuring volume and volume variations of human body under zero gravity conditions [NASA-CASE-MSC-13972-1] N72-20105
- Prosthetic device with sensing means for detecting tactile stimuli [NASA-CASE-MFS-16570] N72-20111
- Pressure ramp programmer for automatic blood pressure measurements [NASA-CR-115508] N72-21074
- Portable equipment for detecting myocardial activity [AD-735882] N72-21084
- MEDICAL PHENOMENA**
- Diving operations medical aspects significance for manned planetary surface exploration in high density atmospheres, considering protective clothing, breathing apparatus and gas mixtures, etc A72-27415
- Statistical survey of barosinusitis incidence in U.S. Navy flying personnel during altitude chamber training, discussing diagnostic methods and clinical management A72-28274
- USAF aircraft accidents/incidents involving aircrewmembers with medical waiver on various visual, cardiopulmonary and other chronic pathological and psychiatric conditions A72-28315
- Review of aeromedical records for grounding USAF flying personnel during 1956-1970, noting increased age factor effect A72-28316
- MEMBRANES**
- Neuron networks dynamic behavior in terms of linear differential equations for membrane potential changes and neuron threshold A72-27925
- MEMORY**
- Sleep deprivation effects relation to work duration, time of day, circadian rhythm, memory function, task performance, environmental factors, drug use and age A72-26678
- MENTAL PERFORMANCE**
- Mental performance tests in sleep deprived subjects for indication of recuperative function of slow wave and REM sleep stages A72-26682
- Cumulative partial sleep deprivation effects on human performance in auditory vigilance, routine addition and running digit span tests, observing circadian rhythms A72-26683
- Project Pegasus vigilance tasks for mental performance aspects of time zone change effects on human circadian rhythms A72-26695
- Time zone transition induced circadian rhythm disturbance effect on military personnel mental and physiological performance A72-26696
- METABOLISM**
- Thermodynamics of human body metabolism, discussing energy conversion calorimetric measurements, body size, food intake, age, sex, endocrine and nervous effects A72-26072
- Human body thermoregulatory processes under varying environmental conditions and metabolic rates, discussing role of blood circulation, sweating, nervous stimuli, hormones, etc A72-26073
- Dimensional analysis and similarity theories application to biological organisms relationships between body size and metabolism A72-26074
- Physical training effect on rat cardiac function and metabolic response to hypoxia A72-26701
- Mechanism by which inert gases influence metabolism [NASA-CR-62079] N72-21041
- Effects of high altitude on cellular and energy metabolism in rats [AD-734933] N72-21064
- METAL POWDER**
- Russian book on powdered metals toxicity covering industrial dust, physiological effects, safety standards, electron configurations and crystalline structure A72-26067
- MICROBIOLOGY**
- Modular microbiology laboratory design considerations and zero gravity experiments to investigate microbial culture systems behavior A72-28280
- MICROELECTRONICS**
- Common collector micropower monolithic transmitter for single or multichannel biomedical telemetry A72-26563
- Monolithic micropower command receiver to extend lifetime of implanted biotelemetry system A72-26564
- MICROINSTRUMENTATION**
- Electrolyte hydrostatic pressure measurement in limited volume biological compartments by fluid filled glass micropipette used in microtransducer capacity A72-26623
- MICROORGANISMS**
- Series analyses method for determining protein content of intact microorganisms [NASA-TT-F-14253] N72-21042
- MICROSCOPY**
- TV microscopic system for on-line measurement of cat omentum microvessels diameter relative to heart action A72-26621
- MICROWAVES**
- Neuroendocrine responses in microwave radiation exposed rats, correlating thyroid and thyrotropic activity

- A72-28321
- Bibliography of reported biological responses and clinical manifestations attributed to microwave and radio frequency radiation
[AD-734391] N72-21071
- MIDAIR COLLISIONS**
Pilot warning systems for visual midair collision avoidance, noting reaction to imminent threats, scanning patterns and display sector size effects [SAE PAPER 720312] A72-25576
- MILITARY AIRCRAFT**
Anthropometric data utilization for military pilot/aircraft compatibility evaluation, discussing cockpit exclusion code development and implementation A72-28324
- MILITARY AVIATION**
Ejection injuries from U.S. Navy aircraft, discussing statistical distribution of vertebral, shoulder, arm/hand, knee, leg, head and face injuries A72-28273
- Statistical survey of barosinusitis incidence in U.S. Navy flying personnel during altitude chamber training, discussing diagnostic methods and clinical management A72-28274
- USAF V-51R noise protector earplugs modification to allow for pressure equalization during aircraft climb and descent A72-28276
- Central nervous system symptoms and simple bends in gas decompression sickness cases during USAF operational flying A72-28283
- Change in Naval Flight Officer operational role due to modern equipment design in weapons systems, sensors and navigational aids A72-28291
- USAF aircraft accidents/incidents involving aircrewmembers with medical waiver on various visual, cardiopulmonary and other chronic pathological and psychiatric conditions A72-28315
- Review of aeromedical records for grounding USAF flying personnel during 1956-1970, noting increased age factor effect A72-28316
- MOIRE EFFECTS**
Retina visual acuity testing by zero and first order moire fringes, using square-wave amplitude gratings A72-27953
- MOLECULAR BIOLOGY**
Evolutionary significance of primary amino acid or nucleotide base sequences of DNAs within various phylogenetic groups A72-27160
- Liver and muscle type isozymes of DPN-linked glycerol-3-P dehydrogenase in chickens in terms of tissue distribution, ontogeny and avian evolution A72-27161
- MOLECULAR INTERACTIONS**
Solar activity effects on biosphere processes, discussing radiation-induced molecular activation mechanisms in water and biological plasma calcium ion concentration changes A72-28213
- MONITORS**
Low cost real time computerized C 14 radiorespirometry telemetering system for monitoring human metabolism data during space missions A72-28277
- MONOCULAR VISION**
Response latencies and correlation in single units and visual evoked potentials in cat striate cortex following monocular and binocular stimulations A72-26771
- MONTE CARLO METHOD**
Two Monte Carlo codes for calculation of dose distribution in human phantoms irradiated by external photon sources [KFKI-71-12] N72-20082
- MORTALITY**
Combined effects of radiation and weightlessness on mortality and mutagenesis of living systems A72-20065
- MOTION PICTURES**
Motion picture test for air traffic control aptitude for use in personnel selection and evaluation [AD-735942] N72-21085
- MOTION SICKNESS**
Motion sickness experience correlations to vestibular tests in pilots and nonpilots A72-28257
- Vision influence on acute motion sickness elicitation in slow rotation room, comparing with vestibular factors A72-28258
- Environmental temperature effect on motion sickness sweating, discussing nausea and discomforting symptomology prediction A72-28302
- MOUNTAIN INHABITANTS**
Native highlander and lowlander chemoreflex ventilatory response to transient carbon dioxide inhalation at low and high altitudes A72-27728
- MULTIVARIATE STATISTICAL ANALYSIS**
Multivariate algorithms of optimum content and form for cardiovascular risk assessment in pilots and air transport personnel A72-28264
- MUSCLES**
Forearm skin and muscle blood flow change measurements during whole body heating, using plethysmography, isotopic labeling and blood sampling techniques A72-26617
- Liver and muscle type isozymes of DPN-linked glycerol-3-P dehydrogenase in chickens in terms of tissue distribution, ontogeny and avian evolution A72-27161
- MUSCULAR FATIGUE**
Electromyographic activity of biceps muscle during submaximum isometric contraction determined from auditory feedback [AD-734300] N72-20094
- Electromyographic measurement of maximum voluntary muscle contraction endurance in chronic hyperventilators [AD-734298] N72-21072
- MUSCULAR FUNCTION**
Human body biochemical energy conversion processes during muscular activity, discussing nutrition, circulation and respiration roles A72-26075
- Speed and mechanical work measurements during knee bending and immediate or delayed leg extension exercise, showing muscle elastic potential energy utilization A72-26615
- Electromyogram and myogram responses in phasic stretch reflex under prestrain conditions as index of fusimotor activity level in normal humans A72-26632
- Human motoneuron discharge time relations during isometric muscle contraction, measuring adjacent action potential and mean interspike intervals A72-27653
- Irreversibility mechanism in postpartum ductus arteriosus closure in guinea pigs, studying vessel cellular changes and smooth muscle response to oxygen pressure A72-27826
- Inspiration, expiration and hand muscle control comparison in psychophysical category production method for human voluntary breathing regulation investigation A72-27843
- MUSCULOSKELETAL SYSTEM**
Pure biocarbons for skeletal fixation of limb prosthetic devices, noting load bearing applications dependence on brittle characteristics A72-28095
- MUTATIONS**
Effect of weightlessness and spacecraft environment on spontaneous and radiation induced somatic mutation rates and cytologic changes in Tradescantia [EXPT-P-1123] N72-20054
- Combined effects of radiation and weightlessness on mortality and mutagenesis of living systems N72-20065
- MYOCARDIUM**
Serum peptidase activity determination as enzymatic

- diagnostic test for myocardial infarction
A72-25851
- Myocardium biopulse-controlled cardiosynchronizer as key component of biocontrol systems for cardiological studies
A72-26455
- Chronic hypoxia adapted rat myocardial tissue sensitivity to increased carbon dioxide tension
A72-26616
- Hemodynamic variables relation to coronary blood flow and myocardial oxygen consumption during upright bicycle exercise
A72-26618
- Gabor-Nelson myocardium electrical activity model for mathematical construction of vectorcardiograph from ECG for comparison of various lead systems
A72-26629
- Myocardial infarction stress effect on serum cortisol, plasma free fatty acid and urinary catecholamine levels
A72-26787
- High altitude hypoxia preadaptation effects on left ventricle myocardium noradrenaline concentration in rats with experimental vitium cordis
A72-27648
- Hemodynamic effects of angiographic contrast medium in patients with and without heart disease, discussing myocardial performance during first ten beats
A72-27732
- MYOELECTRIC POTENTIALS**
Human motoneuron discharge time relations during isometric muscle contraction, measuring adjacent action potential and mean interspike intervals
A72-27653
- MYOELECTRICITY**
Myocardium biopulse-controlled cardiosynchronizer as key component of biocontrol systems for cardiological studies
A72-26455
- Gabor-Nelson myocardium electrical activity model for mathematical construction of vectorcardiograph from ECG for comparison of various lead systems
A72-26629
- N**
- NARCOLEPSY**
IR pupillography for screening narcoleptics and fatigue prone individuals from driver and pilot training applicants
A72-28323
- NAUSEA**
Environmental temperature effect on motion sickness sweating, discussing nausea and discomforting symptomology prediction
A72-28302
- NAVIGATION AIDS**
Detection range, color, brightness and flash subjective response tests to evaluate light signals for nighttime sea navigation and visual collision avoidance
A72-28326
- NAVY**
Training devices for training operators in use characteristics and maintenance of Naval electronic equipment
[AD-733471] N72-20116
- NECK (ANATOMY)**
Neck proprioception effects and otolith organ activity in perceived visual target elevation under centrifuging stress
A72-28305
- NEGATIVE RESISTANCE CIRCUITS**
Receptor membrane pulse generation electronic model with tunnel diode negative resistance circuit
A72-27578
- NERVES**
Cerebrospinal fluid pH change effects on cat respiratory response before and after vagotomy, showing vagal activity relation to central chemical control of respiration
A72-27825
- NERVOUS SYSTEM**
Clinical analysis of hypokinesia caused changes in nervous system and effects of pharmacological preparations on hypokinesia disorders
[NASA-TT-F-14225] N72-21046
- NEURAL NETS**
Visual cortex neuronal background activity in unanesthetized rabbits under stimulation and depression of lateral geniculate body and mesencephalic reticular formation, considering synaptic organization
A72-27646
- Neuron networks dynamic behavior in terms of linear differential equations for membrane potential changes and neuron threshold
A72-27925
- NEUROLOGY**
Acceleration stress effects on splanchnic blood flow due to organ displacement and neurogenic vasoconstriction in vascular beds
A72-28285
- Workload modification effects on pilot neurological changes during Boeing 707 letdown, approach and landing
A72-28290
- NEUROHUSCULAR TRANSMISSION**
Human motoneuron discharge time relations during isometric muscle contraction, measuring adjacent action potential and mean interspike intervals
A72-27653
- Electromyographic measurement of maximum voluntary muscle contraction endurance in chronic hyperventilators
[AD-734298] N72-21072
- NEURONS**
Cortico-subcortical connections transection effect on cat lateral geniculate body and visual cortex neurons spontaneous activity
A72-27652
- Human motoneuron discharge time relations during isometric muscle contraction, measuring adjacent action potential and mean interspike intervals
A72-27653
- NEUROPHYSIOLOGY**
Russian book on visual sensor signal dynamics covering nerve signal transformation, light stimuli responses, afferent flow, bionics, neurocybernetics and communication theory
A72-26049
- Intraelectroretinographic analysis of light signal spatial summation at different retinal nerve levels in frogs
A72-26454
- NEUROSPORA**
Genetic effects of space flight and gamma radiation on Neurospora crassa
[EXPT-P-1037] N72-20064
- NIGHT VISION**
Landolt ring radioactive plaque night vision tester comparison with electroretinography and Goldmann-Weekers dark adaptometry apparatus from special tests of night blind patients
A72-28332
- NITROGEN**
Role of nitrogen metabolism in biological productivity and marine food chain in temperate seas
[CU-3826-22] N72-20084
- NOISE (SOUND)**
Behavior alterations in pepper plant, Capsicum annuum, in response to weightlessness, rotation, vibration, and acoustic stress
[EXPT-P-1017] N72-20059
- Noise effects on human performance and reactions
[NASA-TN-D-6675] N72-20071
- NOISE INTENSITY**
Human performance under intense noise, measuring effects on muscle tension, metabolism, respiration rate, visual accommodation, saccadic eye movement and dark adaptation
A72-25728
- NOISE REDUCTION**
Transistorized amplifier input elements design for biopotentials recording, providing minimum noise at high input impedance
A72-26468
- USAF V-51R noise protector earplugs modification to allow for pressure equalization during aircraft climb and descent
A72-28276
- NOISE THRESHOLD**
Audiometric determination of human temporary threshold shifts due to steady state and impulsive noise

- NOISE TOLERANCE A72-25873
Human performance under intense noise, measuring effects on muscle tension, metabolism, respiration rate, visual accommodation, saccadic eye movement and dark adaptation
- NORADRENALINE A72-25728
High altitude hypoxia preadaptation effects on left ventricle myocardium noradrenaline concentration in rats with experimental vitium cordis
- NUCLEAR ENERGY A72-27648
European research and atomic energy applications to agricultural crops and insect sterilization [NP-19016] N72-20077
- NUCLEIC ACIDS A72-27657
Abiogenic formation of nucleic acid bases and nucleosides in photochemically synthesized self sustaining coacervates
- NUCLEOSIDES A72-27657
Abiogenic formation of nucleic acid bases and nucleosides in photochemically synthesized self sustaining coacervates
- NUCLEOTIDES A72-2716C
Evolutionary significance of primary amino acid or nucleotide base sequences of DNAs within various phylogenetic groups
- NYSTAGMUS A72-28304
Nystagmus eye movements relationship to oculogyral illusion from test involving vestibular stimulation and visual stimuli velocity estimates
- OCULOGRAVIC ILLUSIONS A72-28304
Nystagmus eye movements relationship to oculogyral illusion from test involving vestibular stimulation and visual stimuli velocity estimates
- OLFACTORY PERCEPTION A72-26453
Olfactory receptor models sensitivity, discussing threshold dependence on adsorbed odoriferous agent amount and exposure time
Amygdala projection to accessory olfactory bulb in rats, discussing main bulb, olfactory tubercle, pyriform cortex accessory bulb and amygdala relationships
- OPERATOR PERFORMANCE A72-26686
Short sleep period and oxygen breathing effects on arousal level of air traffic controller during detection task performance
Work-rest scheduling and sleep loss effect on operator performance in watchkeeping and active multiple visual tasks
Change in Naval Flight Officer operational role due to modern equipment design in weapons systems, sensors and navigational aids A72-28291
- OPERATORS (PERSONNEL) A72-20116
Training devices for training operators in use characteristics and maintenance of Naval electronic equipment [AD-733471]
- OPTICAL DATA PROCESSING A72-27074
Character recognition experiments to determine attention control and temporal-spatial capacity limitation during visual information processing
- OPTICAL DENSITY A72-21083
Ocular laser protective filter with narrowband absorption, luminous transmission, and optical density of 3.5 [AD-735799]
- OPTICAL FILTERS A72-21083
Ocular laser protective filter with narrowband absorption, luminous transmission, and optical density of 3.5 [AD-735799]
- OPTICAL MEASUREMENT
Light absorption and scattering factors in whole blood related to hemoglobin concentration, discussing oxygen saturation, cardiac output and pathological conditions A72-26630
- OPTICAL TRACKING A72-28306
Circadian rhythms of visual accommodation responses and physiological correlations during target tracking, recording monocular focus state by IR optometer
- OPTIMAL CONTROL A72-21088
Optimal control algorithms for on-line closed loop blood pressure regulation [AD-735900]
- ORGANIC CHEMISTRY A72-27529
Life origin and primordial organic chemistry, considering Darwinian evolution, spontaneous generation, primitive atmospheres, interstellar matter, energy sources, macromolecular synthesis, moon and Jupiter
- ORGANS A72-20081
Compilation of raw data on elemental concentrations in normal and diseased human organs [UCRL-51013-PT-1-REV-1]
- OTOLITH ORGANS A72-28305
Neck proprioception effects and otolith organ activity in perceived visual target elevation under centrifuging stress
- OXIMETRY A72-28278
Ear oximeter design for human subject blood oxygen saturation estimation during increased g-loads
- OXYGEN A72-28278
Ear oximeter design for human subject blood oxygen saturation estimation during increased g-loads
- OXYGEN ANALYZERS A72-28253
Aviator breathing oxygen contaminant detector using gas chromatography and portable IR analyzer
Method and apparatus for analyzing respiratory gas flow rate and inspiration-expiration frequencies in real time [NASA-CASE-MSC-13436-1] N72-20113
Evaluation of oxygen-sensing warning device for use in damage control suit system [AD-735377] N72-21082
- OXYGEN BREATHING A72-26017
Cardiovascular responses to positive pressure oxygen breathing from blood pressure and heart and respiratory rate measurements
Hyperoxia effect on human airways resistance during high pressure oxygen breathing A72-26614
Short sleep period and oxygen breathing effects on arousal level of air traffic controller during detection task performance A72-26686
Arterial blood gas tensions, using sequential phased dilution for pilot oxygen delivery A72-28255
Suppression effects of hyperoxic breathing gases on red blood cell and erythropoietin hormone production following blood loss A72-28298
- OXYGEN CONSUMPTION A72-26095
Physical work capacity comparison during bicycle ergometry and treadmill walking tests, measuring oxygen uptake, ventilatory parameters and excess carbon dioxide production
Maximal oxygen uptake and heart rate during laddermill climbing, inclined treadmill running and cycling ergometer tests A72-26612
Hemodynamic variables relation to coronary blood flow and myocardial oxygen consumption during upright bicycle exercise A72-26618
Isotopic labeled microspheres for cat uveal and retinal blood flow and oxygen consumption determination, studying increased intraocular pressure and carbon dioxide tension effects A72-27841
Crowding phenomenon effect on blood cell oxygen consumption, using Cartesian diver technique for

- polymorphonuclear leukocyte, lymphocyte and platelet measurements A72-27842
- Response of ventilation parameters, pulse rate, oxygen uptake, and body temperature in man under acute and severe hypoxia [DLR-PB-71-65] N72-21053
- OXYGEN MASKS**
Method and apparatus for analyzing respiratory gas flow rate and inspiration-expiration frequencies in real time [NASA-CASE-MSC-13436-1] N72-20113
- OXYGEN SUPPLY EQUIPMENT**
LOX supply systems installation for civil transport aircraft crew and/or passenger breathing oxygen [SAE AIR 1223] A72-26030
- OXYGEN TENSION**
Pathological significance of high oxygen tension exposure effects on acid soluble collagen extracted from mouse skin A72-27483
Irreversibility mechanism in postpartum ductus arteriosus closure in guinea pigs, studying vessel cellular changes and smooth muscle response to oxygen pressure A72-27826
Arterial blood gas tensions, using sequential phased dilution for pilot oxygen delivery A72-28255
Human centrifuge studies of high positive acceleration effects on blood oxygenation and arterial oxygen and carbon dioxide tension A72-28287
- OXYGENATION**
Human centrifuge studies of high positive acceleration effects on blood oxygenation and arterial oxygen and carbon dioxide tension A72-28287
- P**
- PARACHUTE DESCENT**
Physiological index changes in parachutists of various ages, considering plasma recalcification, blood prothrombin, heparin time, fibrinolytic activity, pressure and heart beat A72-26988
- PATHOGENESIS**
Electron microscope study of hyperoxia-induced pathogenetic ultrastructural changes in rat lung A72-27531
- PATHOLOGICAL EFFECTS**
Pathological significance of high oxygen tension exposure effects on acid soluble collagen extracted from mouse skin A72-27483
Case report of pilot near-syncope episode with bradycardia due to hyperactive right carotid sinus reflex A72-27487
Physiological effects on anesthetized and conscious dogs during exposure at 80,000 ft for different decompression rates, discussing cardiovascular, biochemical and pathological effects A72-28322
- PATTERN RECOGNITION**
Image visual recognition during voluntary saccadic eye movements, noting stimuli visible luminance change effect A72-27310
- PEDALS**
Analysis of pedal operation by seated operator with application to design of foot controls for automobiles and other equipment [AD-735315] N72-21089
- PELOMYXA**
Weightlessness effects on single cell, amoeba *Pelomyxa carolinensis* [EXPT-P-1035] N72-20061
Effects of space environment, acceleration, and vibration on feeding, growth, and morphology of amoeba, *Pelomyxa carolinensis* [EXPT-P-1035] N72-20062
- PEPPERS**
Behavior alterations in pepper plant, *Capsicum annum*, in response to weightlessness, rotation, vibration, and acoustic stress [EXPT-P-1017] N72-20059
- PERCEPTUAL TIME CONSTANT**
Time variation in human processing of movement directions and Stroop color words [AD-734299] N72-20095
- PERFORMANCE**
Sensitivity of Ge(Li) detectors in biological and environmental counting [UCRL-73505] N72-20079
- PERFORMANCE PREDICTION**
Factor analysis of grades for successful performance skill identification during undergraduate and graduate jet pilot training A72-27472
- PERFORMANCE TESTS**
Detection range, color, brightness and flash subjective response tests to evaluate light signals for nighttime sea navigation and visual collision avoidance A72-28326
- PERIPHERAL CIRCULATION**
Forearm skin and muscle blood flow change measurements during whole body heating, using plethysmography, isotopic labeling and blood sampling techniques A72-26617
Water filled volume and strain gage plethysmography for forearm blood flow measurement during isometric exercise A72-26622
- PERSONNEL SELECTION**
Aptitude screening test of ATC training applicants, using directional heading determination under aural distraction A72-28252
Brief vestibular disorientation test technique for assessment of potential nonpilot airborne specialists or naval flight officers A72-28256
Potential coronary heart disease susceptibility indicators in ATC population, using Framingham age/obesity parameters A72-28265
Anthropometric requirements for entrance into naval flight training program [AD-735101] N72-21067
Motion picture test for air traffic control aptitude for use in personnel selection and evaluation [AD-735942] N72-21085
- pH**
Cerebrospinal fluid pH change effects on cat respiratory response before and after vagotomy, showing vagal activity relation to central chemical control of respiration A72-27825
- pH FACTOR**
Mathematical model of extracellular pH in brain tissue from blood and cerebrospinal fluid acid-base parameters for respiration central chemosensitive mechanism study A72-26660
Respiration control by extracellular pH in medullary tissue, studying chemoreceptor response to hydrogen ion concentration in cat cerebrospinal fluid A72-26661
- PHARMACOLOGY**
Russian book on pathophysiological principles of air and space pharmacology covering stress and fatigue reduction and pilots and astronauts performance improvement A72-27926
Problems and techniques of space pharmacology N72-20044
Clinical analysis of hypokinesia caused changes in nervous system and effects of pharmacological preparations on hypokinesia disorders [NASA-TT-P-14225] N72-21046
- PHONEMICS**
Interhemispheric effects on choice reaction times to single and multiple letter displays, analyzing cerebral dominance and visual information transmission compared with verbal response A72-27075
- PHONOCARDIOGRAPHY**
Computer assisted monitoring of ECG waveforms and heart sounds frequency spectra to detect bubble laden blood during decompression sickness A72-26626

- Heart and circulatory system functional diagnostics, discussing ECG, blood pressure, X ray, phonocardiographical and pulmonary examinations
A72-27271
- PHOSPHORUS METABOLISM**
Calcium and phosphorus excretion relation to bone density changes in immobilized *Macaca nemestrina* monkeys
A72-27473
- PHOTOCHEMICAL REACTIONS**
Abiogenic formation of nucleic acid bases and nucleosides in photochemically synthesized self sustaining coacervates
A72-27657
- PHOTOGRAPHIC RECORDING**
Involuntary head movement and helmet motion displacements during human centrifuge runs to 6 Gz from photographic recordings
A72-28288
- PHOTONS**
Two Monte Carlo codes for calculation of dose distribution in human phantoms irradiated by external photon sources [KFKI-71-12]
N72-20082
- PHYSICAL EXAMINATIONS**
Potential coronary heart disease susceptibility indicators in ATC population, using Framingham age/obesity parameters
A72-28265
- PHYSICAL EXERCISE**
Beta-adrenergic blocking effect on canine coronary and systemic hemodynamic adaptation during treadmill exercise
A72-25802
Bicycle ergometer measurements of thermoregulation input and output under wide range of work load and climatic conditions, deriving correlation equation
A72-25874
Maximal oxygen uptake and heart rate during laddermill climbing, inclined treadmill running and cycling ergometer tests
A72-26612
Weight loss due to respiratory tract evaporative water loss during exercise, from humidity change, ventilatory exchange and oxygen uptake data
A72-26613
Speed and mechanical work measurements during knee bending and immediate or delayed leg extension exercise, showing muscle elastic potential energy utilization
A72-26615
Hemodynamic variables relation to coronary blood flow and myocardial oxygen consumption during upright bicycle exercise
A72-26618
Water filled volume and strain gage phethysmography for forearm blood flow measurement during isometric exercise
A72-26622
Physical training effect on rat cardiac function and metabolic response to hypoxia
A72-26701
Exercise role in ventilatory acclimatization to graded hypoxia in goats from carbon dioxide response curve measurements
A72-27727
Hemodynamic response to physical exercise stress in dogs with angiotensin-induced acute arterial hypertension
A72-28216
Stress vectorcardiography quantitative analysis of ECG response to treadmill exercise test to establish diagnosis criteria for coronary heart disease
A72-28282
Plasma protein concentration, volume and hematocrit changes during exercise, bed rest and high forward acceleration
A72-28296
Cardiorespiratory response to breathing dense sulfur fluoride-oxygen mixture under physical exercise conditions
A72-28314
Physiological stressing and conditioning ergometer system [NASA-CASE-MPS-21109]
N72-20112
- PHYSICAL FACTORS**
Human functional level performance characteristics, noting relationship between spontaneous rhythm
- diurnal variations in psychic and physical performance
A72-26691
- PHYSICAL FITNESS**
Hemodynamic criteria for physical fitness in airmen, discussing age dependent variations in heart beat, arterial pressure and body temperature
A72-26987
Physiological and subjective responses of physically fit young men to combined exercise-carbon dioxide stress tests
A72-28311
- PHYSICAL WORK**
Physical work capacity comparison during bicycle ergometry and treadmill walking tests, measuring oxygen uptake, ventilatory parameters and excess carbon dioxide production
A72-26095
Simulated gravity environment tests of vertical jump features, recording work performed, body center of gravity upward velocity, potential and kinetic energy changes
A72-27479
Analysis of body temperature control and thermal economy during work by unclothed subjects on erometer [RAE-LIB-TRANS-1610]
N72-20072
- PHYSIOLOGICAL EFFECTS**
Medical and physiological hazards for SST passengers and crews, discussing cumulative cosmic radiation and high altitude decompression risks
A72-25816
Case report of rapid decompression in supersonic trainer aircraft pressurized cabin, discussing physical and blast effects, pressurization safety, decompression sickness and hypoxia
A72-26020
Medical evaluation of manned space flight physiological effects, considering Mercury, Gemini and Apollo programs
A72-26100
Time displacement effects on human physiological and psychological functions, discussing circadian rhythm phase shift and performance deficits
A72-26681
Time zone transition induced circadian rhythm disturbance effect on military personnel mental and physiological performance
A72-26696
Weightlessness effects on human organism, discussing physiological changes, artificial gravity by spacecraft rotation and exercise to counter adverse reactions
A72-26891
Multihour immersion effects on blood plasma protein and electrolyte concentration in trained and untrained subjects
A72-27480
Physiological and clinical effects of long distance flight in pressurized commercial planes with simulated altitudes over 1500 meters
A72-27486
Magnetic storm strength ELF electromagnetic field effects on rabbits, dogs and bacteria, discussing changes in EEG, ECG and blood characteristics
A72-28214
Ascorbic acid influence on blood coagulation and anticoagulation systems in dogs with acute hypoxia, discussing plasma recalcification time and heparin tolerance
A72-28217
Plasma protein concentration, volume and hematocrit changes during exercise, bed rest and high forward acceleration
A72-28296
Physiological effects of intense anticollision flash light backscatter pulses on instrument rated pilots
A72-28303
Physiological effects on anesthetized and conscious dogs during exposure at 80,000 ft for different decompression rates, discussing cardiovascular, biochemical and pathological effects
A72-28322
- PHYSIOLOGICAL FACTORS**
Human performance dependence on time of day, discussing circadian and physiological rhythms relation and environmental change effects
A72-26677

- Transzonal air travel as cause of psychological and physiological rhythm change effects on pilot performance
A72-26694
- PHYSIOLOGICAL RESPONSES**
- Lenticular conditioning-shock stimulation effect on cat visual cortex response to light stimuli, noting lateral gyrus photically evoked potential amplitude increase
A72-25801
- Cardiovascular responses to positive pressure oxygen breathing from blood pressure and heart and respiratory rate measurements
A72-26017
- Electromyogram and myogram responses in phasic stretch reflex under prestrain conditions as index of fusimotor activity level in normal humans
A72-26632
- Mountain sickness relation to ventilation response to hypoxia, noting response intensity dependence on peripheral chemoreceptor sensitivity
A72-27481
- Cat and rat cardiac and cardiovascular reflexes response to electric pulse stimulation of sensorimotor cerebral cortex
A72-27647
- Cat auditory cortex neurons response to auditory and medial geniculate body electrical stimulation
A72-27651
- Cerebrospinal fluid pH change effects on cat respiratory response before and after vagotomy, showing vagal activity relation to central chemical control of respiration
A72-27825
- Metabolic and hormonal response adaptation to prolonged hypodynamics in water immersion/head out/, noting diurnal and nocturnal differences in circadian rhythms
A72-28267
- Parachutist biomedical responses in aerial tow at 110-175 knots, determining heart and respiration rates and urinary catecholamines
A72-28272
- Acceleration stress effects on splanchnic blood flow due to organ displacement and neurogenic vasoconstriction in vascular beds
A72-28285
- Periodic, continuous and aperiodic white noise effects on human serial decoding performance, relating subjective and autonomic responses
A72-28289
- Physiological and biochemical responses of *Paramecium caudatum* to hypo- and hyperbaric stresses, discussing protoplasmic inactivation by high oxygen pressure
A72-28299
- Thermoregulation changes during simulated weightlessness of prolonged bed rest, noting lower sweating threshold and decreased vasodilation /autonomic dysfunction/
A72-28301
- Circadian rhythms of visual accommodation responses and physiological correlations during target tracking, recording monocular focus state by IR optometer
A72-28306
- Physiological and subjective responses of physically fit young men to combined exercise-carbon dioxide stress tests
A72-28311
- EEG recording and analysis by analog technique as means of studying human responses to hyperventilation
A72-28312
- Cardiorespiratory response to breathing dense sulfur fluoride-oxygen mixture under physical exercise conditions
A72-28314
- Pilot and back-seat man physiological responses during high-g aerial combat maneuvers in F-4E aircraft, discussing ECG, respiratory rate and minute volume
A72-28317
- Neuroendocrine responses in microwave radiation exposed rats, correlating thyroid and thyrotropic activity
A72-28321
- Miniature swine as human analog to investigate physiological response to high positive acceleration, comparing human and animal tolerances
A72-28329
- Biotelemetric equipment for measuring physiological responses of freely moving human beings
N72-20147
- Biotelemetric measurements of physiological responses during labor and sports activities
N72-20148
- PHYSIOLOGICAL TESTS**
- Physiological index changes in parachutists of various ages, considering plasma recalcification, blood prothrombin, heparin time, fibrinolytic activity, pressure and heart beat
A72-26988
- PHYSIOLOGY**
- Physiology of wheat seed germination and seedling growth during orbital flight
[EXPT-P-1096] N72-20056
- Physiological stressing and conditioning ergometer system
[NASA-CASE-MFS-21109] N72-20112
- PIERCING**
- Inflatability and flotation of one man life raft after puncture to main wall
[NASA-CASE-LAR-10241-1] N72-21076
- PIEZOELECTRIC TRANSDUCERS**
- Piezoelectric transducer for indirect on-wrist blood pressure measurements for clinical environment
A72-27961
- PIGMENTS**
- Apollo 12 material effect on tobacco tissue cultures, noting pigment increase
A72-27626
- PILOT PERFORMANCE**
- Pilot warning systems for visual midair collision avoidance, noting reaction to imminent threats, scanning patterns and display sector size effects [SAE PAPER 720312] A72-25576
- Case report of fighter pilot disorientation episode during night flying exercise, suggesting psychological stress factor
A72-26019
- Transzonal air travel as cause of psychological and physiological rhythm change effects on pilot performance
A72-26694
- Factor analysis of grades for successful performance skill identification during undergraduate and graduate jet pilot training
A72-27472
- Computer analysis of helicopter pilots eye movement patterns dependence on visual task skill and performance time
A72-27475
- Vestibular, auditory, acceleration and altitude decompression testing of pilot following endolymphatic shunt surgery for Menieres disease
A72-27485
- Russian book on pathophysiological principles of air and space pharmacology covering stress and fatigue reduction and pilots and astronauts performance improvement
A72-27926
- Pilot-aircraft system model for relationship between weapons delivery accuracy and manual flight control system design, noting display, computation and control aids to pilot
A72-28121
- Arterial blood gas tensions, using sequential phased dilution for pilot oxygen delivery
A72-28255
- Motion sickness experience correlations to vestibular tests in pilots and nonpilots
A72-28257
- Semicircular canal function correlation to thresholds, aftereffects and power functions in pilot vestibular tests
A72-28259
- Pilot glide slope and localizer tracking performance during successive in-flight simulated ILS approaches
A72-28260
- Biothermal response of increased core temperature in rhesus monkey to mechanical vibration, noting implications for pilot performance during prolonged buffeting
A72-28268

- Angular oscillation in yaw effect of pilot visual performance, showing vestibulo-ocular compensation and frequency response
A72-28269
- Mathematical expression for pilot incapacitation applied to data from high stress/short duration encounters with environmental problems
A72-28284
- Workload modification effects on pilot neurological changes during Boeing 707 letdown, approach and landing
A72-28290
- Physiological effects of intense anticollision flash light backscatter pulses on instrument rated pilots
A72-28303
- Hypoxia effect on aircraft pilot performance, using Link GAT 1 trainer and controlled composition atmosphere under varied altitude conditions for simulated ILS landing approaches
A72-28310
- Pilot pursuit tracking performance under acceleration stress, simulating high performance aircraft dynamics via human centrifuge equipped with simulated head-up predictive gunsight
A72-28320
- FAA program for revision of aviation aircraft maximum allowable control forces specifications, taking into account female pilots capabilities
A72-28325
- PILOT SELECTION**
- Pilot selection criterion for replacement air group /RAG/, using scored maneuver item correlations for flight crew and pilot training
A72-28262
- IR pupillography for screening narcoleptics and fatigue prone individuals from driver and pilot training applicants
A72-28323
- Anthropometric data utilization for military pilot/aircraft compatibility evaluation, discussing cockpit exclusion code development and implementation
A72-28324
- PILOT TRAINING**
- Factor analysis of grades for successful performance skill identification during undergraduate and graduate jet pilot training
A72-27472
- Flight stress and performance of training in general aviation simulator compared with actual flight
A72-28261
- Pilot selection criterion for replacement air group /RAG/, using scored maneuver item correlations for flight crew and pilot training
A72-28262
- Anxiety relation to success or failure in naval flight training program
A72-28263
- Application of systems engineering concept to US Coast Guard aviator training programs
[AD-735651] N72-21080
- PLANETARY ATMOSPHERES**
- Diving operations medical aspects significance for manned planetary surface exploration in high density atmospheres, considering protective clothing, breathing apparatus and gas mixtures, etc
A72-27415
- PLANETARY QUARANTINE**
- Requirements for effective planetary quarantine and spacecraft sterilization
[NASA-CR-126033] N72-21049
- Mathematical models for predicting safety margins in planetary quarantine
[NASA-CR-126032] N72-21050
- PLANETARY SURFACES**
- Diving operations medical aspects significance for manned planetary surface exploration in high density atmospheres, considering protective clothing, breathing apparatus and gas mixtures, etc
A72-27415
- PLANTS (BOTANY)**
- Biological experiments on plants, animals and bacteria aboard Zond 5, 6 and 7 space probes, noting flight conditions effect on physiological functions and hereditary structures
A72-25941
- Experiments with invertebrates, plants, and cellular systems on Biosatellite 2 flight
[NASA-SP-204] N72-20048
- Effect of weightlessness and spacecraft environment on spontaneous and radiation induced somatic mutation rates and cytologic changes in *Tradescantia*
[EXPT-P-1123] N72-20054
- Effect of weightlessness on biochemical response of monocot seedlings
[EXPT-P-1138] N72-20057
- PLATELETS**
- Crowding phenomenon effect on blood cell oxygen consumption, using Cartesian diver technique for polymorphonuclear leukocyte, lymphocyte and platelet measurements
A72-27842
- PLETHYSMOGRAPHY**
- Plethysmographic and laryngoscopic investigation of glottis opening and airway resistance relation to lung volume during panting and continuous slow expiration
A72-26611
- Water filled volume and strain gage plethysmography for forearm blood flow measurement during isometric exercise
A72-26622
- Whole body plethysmograph system for use in measuring airway resistance under ambient hyperbaric conditions for normal breathing patterns
[AD-735462] N72-21081
- PLUTONIUM 238**
- Vapor cycle engine for driving Pu 238 fueled heart assist system
[PB-205474] N72-21086
- PNEUMATIC PROBES**
- Pneumatic thermistor transducer to measure steep ejection time interval between cardiac volume pulse upstroke start and maximum rise rate occurrence
A72-26633
- PNEUMOGRAPHY**
- Cotton wick probe-transducer assembly for pneumograph recording of rabbit respiratory rate
A72-26619
- PORTABLE EQUIPMENT**
- Portable equipment for detecting myocardial activity
[AD-735882] N72-21084
- POTASSIUM OXIDES**
- Sealed cabin air regeneration by means of potassium superoxide, noting weight and space savings
A72-26594
- POWDER METALLURGY**
- Russian book on powdered metals toxicity covering industrial dust, physiological effects, safety standards, electron configurations and crystalline structure
A72-26067
- PRESSURE BREATHING**
- Development and tests of sensitive methodologies for measuring sensory and motor impairment in hyperbaric environments
[AD-735117] N72-21062
- PRESSURE DISTRIBUTION**
- Effects of exposure to blast induced winds and pressure variations on biophysical parameters
[AD-734208] N72-21054
- PRESSURE EFFECTS**
- Cardiovascular responses to positive pressure oxygen breathing from blood pressure and heart and respiratory rate measurements
A72-26017
- Pathological significance of high oxygen tension exposure effects on acid soluble collagen extracted from mouse skin
A72-27483
- USAF V-51R noise protector earplugs modification to allow for pressure equalization during aircraft climb and descent
A72-28276
- PRESSURE GRADIENTS**
- Single linear measure of systolic pressure gradient for calculation of aortic valve area in stenosis severity assessment
A72-27734
- PRESSURE MEASUREMENTS**
- Electrolyte hydrostatic pressure measurement in limited volume biological compartments by fluid

- filled glass micropipette used in microtransducer capacity
A72-26623
- PRESSURE REDUCTION**
Vestibular, auditory, acceleration and altitude decompression testing of pilot following endolymphatic shunt surgery for Menieres disease
A72-27485
- Physiological effects on anesthetized and conscious dogs during exposure at 80,000 ft for different decompression rates, discussing cardiovascular, biochemical and pathological effects
A72-28322
- Bubble growth during decompression and allowable gas tension in human body
[DLR-FB-71-48]
N72-20075
- PRESSURE REGULATORS**
Pressure regulator for space suit worn underwater to simulate space environment for testing and experimentation
[NASA-CASE-MFS-20332]
N72-20097
- PRESSURE SENSORS**
Piezoelectric transducer for indirect on-wrist blood pressure measurements for clinical environment
A72-27961
- PRESSURE SUITS**
Life support equipment and pressure suit operational requirements from viewpoint of flight crews and test pilots
A72-27516
- Valsalva and M-1 maneuvers acceleration tolerance protective effects during high-g centrifuging with and without anti-g suits
A72-28318
- Acceleration protection properties of modified partial pressure suit, determining tolerance limits by vision impairment criteria during centrifuge tests
A72-28319
- Fabrication of root cord restrained fabric suit sections from sheets of fabric
[NASA-CASE-MSC-12398]
N72-20098
- Evaluation of oxygen-sensing warning device for use in damage control suit system
[AD-735377]
N72-21082
- PRESSURIZED CABINS**
Case report of rapid decompression in supersonic trainer aircraft pressurized cabin, discussing physical and blast effects, pressurization safety, decompression sickness and hypoxia
A72-26020
- Physiological and clinical effects of long distance flight in pressurized commercial planes with simulated altitudes over 15000 meters
A72-27486
- PRIMATES**
Indirect measurement of primate vestibular system function through analysis of vestibulo-ocular reflex response to various input stimuli
[AD-734545L]
N72-21065
- Sham-exposed controls and body weight variation in primates exposed to 55 MeV protons
[AD-734779]
N72-21066
- PROGRAMMED INSTRUCTION**
Automated instructional monitors for diagnosing student difficulties in acquiring complex concepts and skills
[AD-736212]
N72-21090
- PROPHYLAXIS**
Automatic ECG recording and analysis by electronic data processing equipment, discussing methods of data acquisition and transmission for routine diagnosis and prophylactic mass examinations
A72-27821
- PROPRIOCEPTION**
Neck proprioception effects and otolith organ activity in perceived visual target elevation under centrifuging stress
A72-28305
- PROSTHETIC DEVICES**
Pure biocarbons for skeletal fixation of limb prosthetic devices, noting load bearing applications dependence on brittle characteristics
A72-28095
- Prosthetic device with sensing means for detecting tactile stimuli
[NASA-CASE-MFS-1657C]
N72-20111
- PROTECTION**
Impact tests on anthropomorphic dummies for protection effectiveness evaluation of lap belt, Air Force shoulder harness-lap belt and airbag-lap belt restraints
A72-27471
- PROTECTIVE CLOTHING**
Air conditioned undergarment for use in environmentally controlled suit in sterile chamber
[NASA-CASE-LAR-10076-1]
N72-20106
- Suit for personnel handling liquid rocket propellants for protection from chlorine trifluoride and elemental fluorine
[AD-731556]
N72-20115
- PROTEIN METABOLISM**
Multihour immersion effects on blood plasma protein and electrolyte concentration in trained and untrained subjects
A72-27480
- Plasma protein concentration, volume and hematocrit changes during exercise, bed rest and high forward acceleration
A72-28296
- PROTEINS**
Series analyses method for determining protein content of intact microorganisms
[NASA-TT-F-14253]
N72-21042
- PROTON IRRADIATION**
Sham-exposed controls and body weight variation in primates exposed to 55 MeV protons
[AD-734779]
N72-21066
- PROTOPLASM**
Physiological and biochemical responses of Paramecium caudatum to hypo- and hyperbaric stresses, discussing protoplasmic inactivation by high oxygen pressure
A72-28299
- PROTOZOA**
Physiological and biochemical responses of Paramecium caudatum to hypo- and hyperbaric stresses, discussing protoplasmic inactivation by high oxygen pressure
A72-28299
- PSYCHOACOUSTICS**
Biologist view of behavioristic approach to psychoacoustics, criticizing mechanical concept of living organism as inadequate for understanding human sensory system
A72-25732
- PSYCHOLOGICAL EFFECTS**
Menu selection for SKYLAB astronauts by computer technique based on mixed integer programming code, using measure of pleasure lists
A72-27442
- PSYCHOLOGICAL FACTORS**
Case report of fighter pilot disorientation episode during night flying exercise, suggesting psychological stress factor
A72-26019
- Time displacement effects on human physiological and psychological functions, discussing circadian rhythm phase shift and performance deficits
A72-26681
- Human functional level performance characteristics, noting relationship between spontaneous rhythm diurnal variations in psychic and physical performance
A72-26691
- Sleep deprivation effect on circadian rhythms in human performance, psychological fatigue ratings, catecholamine excretion and urine flow
A72-26692
- Transzonal air travel as cause of psychological and physiological rhythm change effects on pilot performance
A72-26694
- Periodic, continuous and aperiodic white noise effects on human serial decoding performance, relating subjective and autonomic responses
A72-28289
- Workload modification effects on pilot neurological changes during Boeing 707 letdown, approach and landing
A72-28290
- PSYCHOLOGICAL TESTS**
Aptitude screening test of ATC training applicants, using directional heading determination under aural distraction
A72-28252
- PSYCHOMETRICS**
Sleep, lack of sleep and circadian rhythm effects on

psychometric test performance
A72-26684

PSYCHOMOTOR PERFORMANCE
Sleep loss and work-rest cycle effects on combat efficiency, considering psychomotor reactivity, vigilance and decision making capacity
A72-26688

Inspiration, expiration and hand muscle control comparison in psychophysical category production method for human voluntary breathing regulation investigation
A72-27843

PSYCHOPHYSICS
Inspiration, expiration and hand muscle control comparison in psychophysical category production method for human voluntary breathing regulation investigation
A72-27843

PSYCHOPHYSIOLOGY
Self estimated distractibility in subjects related to attention lapses during perceptual motor performance, indicating psychophysiological changes
A72-28307

PULMONARY CIRCULATION
Sheet flow theory for pulmonary alveolar blood flow, discussing blood pressure effects, membrane tension, blood volume and transit time distribution
A72-26702

Tilt table test for gravitational stress effects on human pulmonary capillary blood flow
A72-28286

PULMONARY FUNCTIONS
Pulmonary atelectasis and arterial-venous shunting and heart displacement prevention during centrifuging of dogs breathing oxygenated liquid fluorocarbon in water immersion respirator
A72-26609

Plethysmographic and laryngoscopic investigation of glottis opening and airway resistance relation to lung volume during panting and continuous slow expiration
A72-26611

Digital computer technique for computation of pulmonary mechanics parameters, using phasor method and Fourier series analysis of respiratory flow signals
A72-26620

Native highlander and lowlander chemoreflex ventilatory response to transient carbon dioxide inhalation at low and high altitudes
A72-27728

PULSE FREQUENCY MODULATION
Data processing in isolated crab biological strain receptor formed by muscle, transducer and encoder, noting pulse frequency modulation in encoding process
A72-27577

PULSE GENERATORS
Receptor membrane pulse generation electronic model with tunnel diode negative resistance circuit
A72-27578

PULSE RATE
Pneumatic thermistor transducer to measure steep ejection time interval between cardiac volume pulse upstroke start and maximum rise rate occurrence
A72-26633

Response of ventilation parameters, pulse rate, oxygen uptake, and body temperature in man under acute and severe hypoxia
[DLR-FB-71-65]
N72-21053

PULSED RADIATION
Spectrum dose conversion method for evaluating radiation dosage
[JAERI-1209]
N72-20076

PUPILLOMETRY
IR pupillography for screening narcoleptics and fatigue prone individuals from driver and pilot training applicants
A72-28323

PURSUIT TRACKING
Pilot pursuit tracking performance under acceleration stress, simulating high performance aircraft dynamics via human centrifuge equipped with simulated head-up predictive gunsight
A72-28320

PYRUVATES

Glycolytic metabolism effects from responses of blood lactate-pyruvate and redox state to chronic exposure to 3 percent CO₂
[AD-734122]
N72-21059

R**RADIANT HEATING**

Ear site body temperature measurement relation to radiant heating of scalp and upper face
A72-28333

RADIATION DAMAGE

Industrial safety rules recommendations for lasers based on radiation biological effects and eye optical and physiological properties
A72-27615

Pathophysiology of exposure to UV, IR, coherent, microwave and RF radiations, discussing potential hazards, damage, human tolerance threshold, protection guides and safety standards
A72-27963

Radiation damage in mammals and humans indicated by biochemical changes in blood and urine
[SZS-7/71-PT-1]
N72-20083

RADIATION DETECTORS

Sensitivity of Ge(Li) detectors in biological and environmental counting
[UCRL-73505]
N72-20079

RADIATION DOSAGE

Criteria for determining permissible doses of ionizing radiation for astronauts
N72-20045

Spectrum dose conversion method for evaluating radiation dosage
[JAERI-1209]
N72-20076

Long term effects of high and low radiation dosage on human beings and animals
[A/CONF-49/P/82]
N72-20080

Two Monte Carlo codes for calculation of dose distribution in human phantoms irradiated by external photon sources
[KFKI-71-12]
N72-20082

RADIATION EFFECTS

Rhesus monkey retinal image diameter estimation during exposure to Ar and He-Ne laser irradiation, using microphotometer scans
A72-25314

Solar activity effects on biosphere processes, discussing radiation-induced molecular activation mechanisms in water and biological plasma calcium ion concentration changes
A72-28213

Neuroendocrine responses in microwave radiation exposed rats, correlating thyroid and thyrotropic activity
A72-28321

Radiation effects in Drosophila due to space environment
[EXPT-P-1160]
N72-20051

Combined effects of radiation and weightlessness on mortality and mutagenesis of living systems
N72-20065

Long term effects of high and low radiation dosage on human beings and animals
[A/CONF-49/P/82]
N72-20080

Radiation effects of total and partial body irradiation in human beings
[AD-734209]
N72-20091

RADIATION HAZARDS
Medical and physiological hazards for SST passengers and crews, discussing cumulative cosmic radiation and high altitude decompression risks
A72-25816

Pathophysiology of exposure to UV, IR, coherent, microwave and RF radiations, discussing potential hazards, damage, human tolerance threshold, protection guides and safety standards
A72-27963

RADIATION PROTECTION

Pathophysiology of exposure to UV, IR, coherent, microwave and RF radiations, discussing potential hazards, damage, human tolerance threshold, protection guides and safety standards
A72-27963

Systems used in Vostok and Voskhod spacecraft for protection of cosmonauts from radiation hazards
N72-20047

- Ocular laser protective filter with narrowband absorption, luminous transmission, and optical density of 3.5
[AD-735799] N72-21083
- RADIATION SHIELDING**
Effectiveness of lead screens in protecting bone marrow quantity necessary for survival of pigs gamma irradiated with Co-60
[FRNC-TH-97] N72-20078
- RADIATION SICKNESS**
Quantitative evaluation of effects of radiation sickness as applicable to problems of space radiobiology
N72-20041
- RADIO COMMUNICATION**
Listening levels preferred by flying personnel
[AD-734778] N72-20088
- RADIO RECEIVERS**
Monolithic micropower command receiver to extend lifetime of implanted biotelemetry system
A72-26564
- RADIO TELEMETRY**
Low cost real time computerized C 14 radiorespirometry telemetering system for monitoring human metabolism data during space missions
A72-28277
- RADIO WAVES**
Bibliography of reported biological responses and clinical manifestations attributed to microwave and radio frequency radiation
[AD-734391] N72-21071
- RADIOACTIVE ISOTOPES**
Sensitivity of Ge(Li) detectors in biological and environmental counting
[UCRL-73505] N72-20079
- RADIOBIOLOGY**
Quantitative evaluation of effects of radiation sickness as applicable to problems of space radiobiology
N72-20041
- Modifying influence of various flight factors on radiobiological effects of ionizing radiation on organisms in space flight
N72-20042
- Bibliography of reported biological responses and clinical manifestations attributed to microwave and radio frequency radiation
[AD-734391] N72-21071
- RADIOGRAPHY**
Hemodynamic assessment of arterial blood flow from radiograph measurements of aorta branching points
A72-26774
- Hemodynamic effects of angiographic contrast medium in patients with and without heart disease, discussing myocardial performance during first ten beats
A72-27732
- RAPID EYE MOVEMENT STATE**
Mental performance tests in sleep deprived subjects for indication of recuperative function of slow wave and REM sleep stages
A72-26682
- RARE GASES**
Mechanism by which inert gases influence metabolism
[NASA-CR-62079] N72-21041
- RATS**
Effects of high altitude on cellular and energy metabolism in rats
[AD-734933] N72-21064
- RC CIRCUITS**
Lumped parameter nonlinear RC circuit lung model for positive pressure respirator design
A72-26631
- REACTION TIME**
Sleep loss effect on reaction and movement times during information processing in step tracking task
A72-26680
- Sleep-wakefulness cycle variations effect on reaction time and spontaneous tempo during time isolation experiment, showing tendency toward circadian rhythm
A72-26687
- Cumulative sleep deficit, preceding sleep or wakefulness period duration and body temperature effects on reaction time in multiple choice visual task
A72-26690
- Interhemispheric effects on choice reaction times to single and multiple letter displays, analyzing cerebral dominance and visual information transmission compared with verbal response
A72-27075
- Bed rest and positive radial acceleration effect on peripheral visual response time, considering blackout or grayout prediction possibilities
A72-28297
- REAL TIME OPERATION**
Method and apparatus for analyzing respiratory gas flow rate and inspiration-expiration frequencies in real time
[NASA-CASE-MSC-13436-1] N72-20113
- REBREATHING**
Added elastic load tests for thoracic elastance change effects on human response to carbon dioxide inhalation, using rebreathing technique
A72-27726
- RECEPTORS (PHYSIOLOGY)**
Data processing in isolated crab biological strain receptor formed by muscle, transducer and encoder, noting pulse frequency modulation in encoding process
A72-27577
- Receptor membrane pulse generation electronic model with tunnel diode negative resistance circuit
A72-27578
- REFERENCE SYSTEMS**
Operators reference manual for BIOMOD computer graphics system
[R-746-NIH] N72-20104
- REFLEXES**
Electromyogram and myogram responses in phasic stretch reflex under prestrain conditions as index of fusimotor activity level in normal humans
A72-26632
- Cat and rat cardiac and cardiovascular reflexes response to electric pulse stimulation of sensorimotor cerebral cortex
A72-27647
- REFRIGERATING**
Living organisms defense and preservation via refrigeration and vacuum combined use in lyophilization technique
A72-27293
- REGENERATIVE FUEL CELLS**
Vapor cycle engine for driving Pu 238 fueled heart assist system
[PB-205474] N72-21086
- REINFORCED PLASTICS**
Asbestos reinforced plastics safe handling and manipulation ensured by regulations provided precautions
A72-25549
- RELATIVE BIOLOGICAL EFFECTIVENESS (RBE)**
Relative biological effectiveness of various types of cosmic radiation
N72-20043
- RENAL FUNCTION**
Renal clearance studies of left atrial distention effect in dog, indicating antidiuretic hormone inhibition mechanism of diuresis
A72-27828
- REPRODUCTION**
Role of nitrogen metabolism in biological productivity and marine food chain in temperate seas
[CU-3826-22] N72-20084
- RESEARCH AND DEVELOPMENT**
Major technical facilities for aerospace medical research and development
[AD-734544] N72-20119
- RESPIRATION**
Physical work capacity comparison during bicycle ergometry and treadmill walking tests, measuring oxygen uptake, ventilatory parameters and excess carbon dioxide production
A72-26095
- Plethysmographic and laryngoscopic investigation of glottis opening and airway resistance relation to lung volume during panting and continuous slow expiration
A72-26611
- Mathematical model of extracellular pH in brain tissue from blood and cerebrospinal fluid acid-base parameters for respiration central chemosensitive mechanism study
A72-26666

- Respiration control by extracellular pH in medullary tissue, studying chemoreceptor response to hydrogen ion concentration in cat cerebrospinal fluid
A72-26661
- Added elastic load tests for thoracic elastance change effects on human response to carbon dioxide inhalation, using rebreathing technique
A72-27726
- Exercise role in ventilatory acclimatization to graded hypoxia in goats from carbon dioxide response curve measurements
A72-27727
- Inspiration, expiration and hand muscle control comparison in psychophysical category production method for human voluntary breathing regulation investigation
A72-27843
- Response of ventilation parameters, pulse rate, oxygen uptake, and body temperature in man under acute and severe hypoxia
[DLR-FB-71-65] N72-21053
- Whole body plethysmograph system for use in measuring airway resistance under ambient hyperbaric conditions for normal breathing patterns
[AD-735462] N72-21081
- RESPIRATORS**
Lumped parameter nonlinear RC circuit lung model for positive pressure respirator design
A72-26631
- RESPIRATORY DISEASES**
Production and use of aerosols in treating respiratory tract disorders
[UR-3490-3] N72-20085
- Lactate-pyruvate and redox state responses of blood and tissue in chronic hypercapnia
[AD-734123] N72-21057
- Plasma creatine phosphokinase response to hypercapnia
[AD-734126] N72-21058
- Electromyographic measurement of maximum voluntary muscle contraction endurance in chronic hyperventilators
[AD-734298] N72-21072
- RESPIRATORY PHYSIOLOGY**
Digital computer technique for computation of pulmonary mechanics parameters, using phasor method and Fourier series analysis of respiratory flow signals
A72-26620
- Mountain sickness relation to ventilation response to hypoxia, noting response intensity dependence on peripheral chemoreceptor sensitivity
A72-27481
- Cerebrospinal fluid pH change effects on cat respiratory response before and after vagotomy, showing vagal activity relation to central chemical control of respiration
A72-27825
- Cardiorespiratory response to breathing dense sulfur fluoride-oxygen mixture under physical exercise conditions
A72-28314
- RESPIRATORY RATE**
Cotton wick probe-transducer assembly for pneumograph recording of rabbit respiratory rate
A72-26619
- Parachutist biomedical responses in aerial tow at 110-175 knots, determining heart and respiration rates and urinary catecholamines
A72-28272
- Method and apparatus for analyzing respiratory gas flow rate and inspiration-expiration frequencies in real time
[NASA-CASE-MSC-13436-1] N72-20113
- RESPIRATORY REFLEXES**
Native highlander and lowlander chemoreflex ventilatory response to transient carbon dioxide inhalation at low and high altitudes
A72-27728
- RESPIRATORY SYSTEM**
Weight loss due to respiratory tract evaporative water loss during exercise, from humidity change, ventilatory exchange and oxygen uptake data
A72-26613
- Hyperoxia effect on human airways resistance during high pressure oxygen breathing
A72-26614
- RESPIROMETERS**
Nose installed thermistor device for in-flight monitoring of pilot respiration and pulse rate
A72-27417
- Low cost real time computerized C 14 radiorespirometry telemetering system for monitoring human metabolism data during space missions
A72-28277
- BEST**
Gastric motility in normal people at rest and during physical exercise
[NASA-TT-F-14207] N72-20074
- BETICLES**
Positive acceleration force-produced displacements of helmet-attached reticle in front of left eye
A72-28330
- RETINA**
Intraelectroretinographic analysis of light signal spatial summation at different retinal nerve levels in frogs
A72-26454
- Isotopic labeled microspheres for cat uveal and retinal blood flow and oxygen consumption determination, studying increased intraocular pressure and carbon dioxide tension effects
A72-27841
- Retina visual acuity testing by zero and first order moire fringes, using square-wave amplitude gratings
A72-27953
- RETINAL IMAGES**
Rhesus monkey retinal image diameter estimation during exposure to Ar and He-Ne laser irradiation, using microphotometer scans
A72-25314
- Visual evoked cortical responses in objective refraction related to retinal image clarity for clinical applications
A72-25349
- Gain control of cat retina rapid light adaptation process to attenuate signals reaching retinal ganglion cells from photoreceptors
A72-27299
- RHEOENCEPHALOGRAPHY**
Objective evaluation of main rheoencephalogram parameter for disturbed brain blood circulation
A72-28218
- RHYTHM (BIOLOGY)**
Orienting response indication by EEG alpha rhythm desynchronization in relation to visual stimulation intensity
A72-26238
- ROTARY WING AIRCRAFT**
Doppler discrimination in high background noise of rotary winged aircraft
[AD-734118] N72-21056
- ROTATING ENVIRONMENTS**
Weightlessness effects on human organism, discussing physiological changes, artificial gravity by spacecraft rotation and exercise to counter adverse reactions
A72-26891
- ROTATION**
Behavior alterations in pepper plant, Capsicum annuum, in response to weightlessness, rotation, vibration, and acoustic stress
[EXPT-P-1017] N72-20059
- S**
- SAFETY MANAGEMENT**
Mathematical models for predicting safety margins in planetary quarantine
[NASA-CR-126032] N72-21050
- SALIVA**
Parotid fluid 17-hydroxycortico steroid level relation to hyperthermia stress at various heat levels during thermal environmental testing
A72-28335
- SALMONELLA**
Effects of gamma radiation and weightlessness on cell growth of Salmonella typhimurium or induction of bacterial prophage
[EXPT-P-1135] N72-20063
- SCHEDULING**
Set covering algorithm for extracted small matrices, applied to airline crew scheduling
[TR-320-3004] N72-20099

- Semi-automatic methods for airlines crew scheduling
[TR-320-3006] N72-20100
- SEAT BELTS**
Dynamic deceleration anthropomorphic dummy tests of general aviation occupant lap belt/shoulder harness restraint systems
[SAE PAPER 720325] A72-25588
Impact tests on anthropomorphic dummies for protection effectiveness evaluation of lap belt, Air Force shoulder harness-lap belt and airbag-lap belt restraints
A72-27471
- SEATS**
Energy absorbing seat design for light aircraft, describing development and static and dynamic testing
[SAE PAPER 720322] A72-25585
- SEEDS**
Physiology of wheat seed germination and seedling growth during orbital flight
[EXPT-P-1096] N72-20056
Biochemical analyses of wheat seedling endosperms under weightless conditions of Biosatellite 2
[EXPT-P-1138] N72-20058
- SEIZURES**
Hydrogen peroxide formation relationship to lipid peroxidation and seizures in brain during high pressure oxygen exposure
A72-28300
- SEMICIRCULAR CANALS**
Semicircular canal function correlation to thresholds, aftereffects and power functions in pilot vestibular tests
A72-28259
- SENSORIMOTOR PERFORMANCE**
Sleep loss effect on reaction and movement times during information processing in step tracking task
A72-26680
Self estimated distractibility in subjects related to attention lapses during perceptual motor performance, indicating psychophysiological changes
A72-28307
- SENSORY DEPRIVATION**
Auditory flutter fusion frequency changes in humans during prolonged visual deprivation
A72-27418
Human electrophysiological changes during perceptual isolation from EEG, EMG, vertical eye movements and electrodermal measurements
A72-27484
- SENSORY FEEDBACK**
Electromyographic activity of biceps muscle during submaximum isometric contraction determined from auditory feedback
[AD-734300] N72-20094
- SENSORY PERCEPTION**
Biologist view of behavioristic approach to psychoacoustics, criticizing mechanical concept of living organism as inadequate for understanding human sensory system
A72-25732
Human electrophysiological changes during perceptual isolation from EEG, EMG, vertical eye movements and electrodermal measurements
A72-27484
Mathematical models for determining nature of electrosensing mechanism and its sensitivity in fish
[AD-734027] N72-20093
Prosthetic device with sensing means for detecting tactile stimuli
[NASA-CASE-MFS-16570] N72-20111
- SEQUENTIAL ANALYSIS**
Mathematical models for analyzing sequential and continuous motor behavior in humans
[AD-734681] N72-21060
- SERVICE LIFE**
Monolithic micropower command receiver to extend lifetime of implanted biotelemetry system
A72-26564
- SET THEORY**
Set covering algorithm for extracted small matrices, applied to airline crew scheduling
[TR-320-3004] N72-20099
- SHELL THEORY**
Elastic thin shell theories for explaining dynamic behavior of prestressed blood vessels
A72-26678
- [NASA-CR-125827] N72-20070
- SHOCK ABSORBERS**
Vertical drop rig test equipment for measuring shock attenuation of crash helmets, discussing shock absorption criteria for impact protection
A72-26016
- SIGNAL DETECTORS**
QRS wave detectors for arrhythmia and hemodynamic data analysis, using standardized FM magnetic tape containing various artifacts for evaluation
A72-25499
- SIMILARITY THEOREM**
Dimensional analysis and similarity theories application to biological organisms relationships between body size and metabolism
A72-26074
- SINUSES**
Frontal sinus hematoma incidence in flying personnel and scuba divers, discussing diagnosis and clinical treatment
A72-28275
- SIZE DETERMINATION**
Rhesus monkey retinal image diameter estimation during exposure to Ar and He-Ne laser irradiation, using microphotometer scans
A72-25314
- SKIN (ANATOMY)**
Forearm skin and muscle blood flow change measurements during whole body heating, using plethysmography, isotopic labeling and blood sampling techniques
A72-26617
- SKIN TEMPERATURE (BIOLOGY)**
Thermoregulation in deeply hibernating rodents during separate chilling and steady hibernation temperature maintenance of skin and brain
A72-27827
Underwater tests of instrument system for combined skin temperature and direct heat flow measurement in thermally stressful environments
A72-28334
Assessment of human skin temperature rise suppression by edge losses during thermal irradiation
[AD-735881] N72-21069
- SKULL**
Computer program for analyzing impact damage to skull-brain system models
[AD-733986] N72-20087
- SKYLAB PROGRAM**
Menu selection for SKYLAB astronauts by computer technique based on mixed integer programming code, using measure of pleasure lists
A72-27442
- SLEEP**
EEG measurement of sleep behavior patterns, discussing sleep stages, temporal patterns, circadian rhythm, intrasleep process stability and age factor
A72-26679
Sleep, lack of sleep and circadian rhythm effects on psychometric test performance
A72-26684
Short sleep period and oxygen breathing effects on arousal level of air traffic controller during detection task performance
A72-26686
Sleep-wakefulness cycle variations effect on reaction time and spontaneous tempo during time isolation experiment, showing tendency toward circadian rhythm
A72-26687
Jet aircraft noise effect on sleeping EEG and subsequent waking performance, showing presence of carry-over effects
A72-27474
Characteristics of heart rate information during sleep, and extracting sleep information from heart rate data
[AD-734283] N72-21061
- SLEEP DEPRIVATION**
Diurnal rhythm and loss of sleep effects on human efficiency - Conference, Strasbourg, July 1970
A72-26676
Sleep deprivation effects relation to work duration, time of day, circadian rhythm, memory function, task performance, environmental factors, drug use and age
A72-26678

- Sleep loss effect on reaction and movement times during information processing in step tracking task
A72-26680
- Mental performance tests in sleep deprived subjects for indication of recuperative function of slow wave and REM sleep stages
A72-26682
- Cumulative partial sleep deprivation effects on human performance in auditory vigilance, routine addition and running digit span tests, observing circadian rhythms
A72-26683
- Sleep, lack of sleep and circadian rhythm effects on psychometric test performance
A72-26684
- Sleep interruption, sleep deprivation and continuous darkness effects on circadian rhythms in human performance
A72-26685
- Sleep loss and work-rest cycle effects on combat efficiency, considering psychomotor reactivity, vigilance and decision making capacity
A72-26688
- Work-rest scheduling and sleep loss effect on operator performance in watchkeeping and active multiple visual tasks
A72-26689
- Cumulative sleep deficit, preceding sleep or wakefulness period duration and body temperature effects on reaction time in multiple choice visual task
A72-26690
- Sleep deprivation effect on circadian rhythms in human performance, psychological fatigue ratings, catecholamine excretion and urine flow
A72-26692
- SOLAR ACTIVITY EFFECTS**
- Russian papers on solar activity effects on earth atmosphere and biosphere covering climate, vegetation, animals and man
A72-28206
- Solar activity effects on biospheric processes for biological and physicochemical systems in unsteady state, considering maximum effects on man at certain electromagnetic wave frequencies
A72-28211
- Solar activity effects on bismuth chloride hydrolysis tests from statistical results following solar flares
A72-28212
- Solar activity effects on biosphere processes, discussing radiation-induced molecular activation mechanisms in water and biological plasma calcium ion concentration changes
A72-28213
- SOLAR FLARES**
- Solar activity effects on bismuth chloride hydrolysis tests from statistical results following solar flares
A72-28212
- SONAR**
- Training in identification of sound characteristics in sonar classification task
[AD-733451] N72-20117
- Doppler discrimination in high background noise of rotary winged aircraft
[AD-734118] N72-21056
- SPACE ENVIRONMENT SIMULATION**
- Pressure regulator for space suit worn underwater to simulate space environment for testing and experimentation
[NASA-CASE-MPS-20332] N72-20097
- SPACE FLIGHT**
- Modifying influence of various flight factors on radiobiological effects of ionizing radiation on organisms in space flight
N72-20742
- Effects of space flight on flour beetle, *Tribolium confusum*
[EXPT-P-1039] N72-20753
- Physiology of wheat seed germination and seedling growth during orbital flight
[EXPT-P-1096] N72-20056
- Genetic effects of space flight and gamma radiation on *Neurospora crassa*
[EXPT-P-1037] N72-20064
- Human reactions to long term space flight
[NASA-CR-125826] N72-20103
- SPACE FLIGHT FEEDING**
- Menu selection for SKYLAB astronauts by computer technique based on mixed integer programming code, using measure of pleasure lists
A72-27442
- SPACE FLIGHT STRESS**
- Space flight ecology and physiology, discussing atmospheric temperatures and radiation, biological effects of acceleration, deceleration and weightlessness and physiological stresses
A72-26018
- Russian book on pathophysiological principles of air and space pharmacology covering stress and fatigue reduction and pilots and astronauts performance improvement
A72-27926
- Red cell mass plasma volume decrease in Apollo mission crews, indicating erythropoiesis inhibition
A72-28266
- Effects of space flight conditions on biological systems
N72-20066
- SPACE PERCEPTION**
- Character recognition experiments to determine attention control and temporal-spatial capacity limitation during visual information processing
A72-27074
- Influence of adaptation level in perception of various aspects of visual space
[AD-733918] N72-20086
- Time variation in human processing of movement directions and Stroop color words
[AD-734299] N72-20095
- Goggle device for measuring visually perceptive direction of space
[NASA-CR-125859] N72-20102
- SPACE SUITS**
- Pressure regulator for space suit worn underwater to simulate space environment for testing and experimentation
[NASA-CASE-MPS-20332] N72-20097
- SPACECRAFT CONTAMINATION**
- Spacecraft critical surfaces protection from molecular and particulate contamination sources including gloves, tissues, and covering or packaging materials
A72-27042
- SPACECRAFT ENVIRONMENTS**
- Weightlessness effects on human organism, discussing physiological changes, artificial gravity by spacecraft rotation and exercise to counter adverse reactions
A72-26891
- SPACECRAFT STERILIZATION**
- Use of gas and liquid filters to sterilize spacecraft
[NASA-CR-126035] N72-21047
- Using ethylene oxide as decontaminating agent for planetary quarantine
[NASA-CR-126034] N72-21048
- Requirements for effective planetary quarantine and spacecraft sterilization
[NASA-CR-126033] N72-21049
- SPACECREWS**
- Ground and flight crews coordinated effort in Apollo mission operations, noting experts on ground and spacecrew spot judgments capability
[ATAA PAPER 72-236] A72-26557
- Red cell mass plasma volume decrease in Apollo mission crews, indicating erythropoiesis inhibition
A72-28266
- SPATIAL DISTRIBUTION**
- Spatial characteristics of equal energy visual stimuli in metacontrast design for targets and masks of constant separation and varying width, deriving weighting functions
A72-27680
- SPECTRUM ANALYSIS**
- Spectrum dose conversion method for evaluating radiation dosage
[JABRI-1209] N72-20076
- SPEECH**
- Listening levels preferred by flying personnel
[AD-734778] N72-20088
- SPINAL CORD**
- Albino rats spinal cord capillaries ultrastructure upon hypothermy, noting endothelial cells sinking

- to lower levels from microscopic observation
A72-27304
- STANDARDS**
Pathophysiology of exposure to UV, IR, coherent, microwave and RF radiations, discussing potential hazards, damage, human tolerance threshold, protection guides and safety standards
A72-27963
Requirements for effective planetary quarantine and spacecraft sterilization
[NASA-CR-126033]
N72-21049
- STATISTICAL ANALYSIS**
Solar activity effects on bismuth chloride hydrolysis tests from statistical results following solar flares
A72-28212
- STATISTICAL DISTRIBUTIONS**
Ejection injuries from U.S. Navy aircraft, discussing statistical distribution of vertebral, shoulder, arm/hand, knee, leg, head and face injuries
A72-28273
- STERILIZATION**
European research and atomic energy applications to agricultural crops and insect sterilization
[NP-19016]
N72-20077
- STRESS (PHYSIOLOGY)**
Electromyogram and myogram responses in phasic stretch reflex under prestrain conditions as index of fusimotor activity level in normal humans
A72-26632
Physiological index changes in parachutists of various ages, considering plasma recalcification, blood prothrombin, heparin time, fibrinolytic activity, pressure and heart beat
A72-26988
Human cardiovascular function change as indication of hypoxic circulatory stress, using noninvasive cardiographic measurements of cardiac electromechanical time intervals
A72-27470
Hemodynamic response to physical exercise stress in dogs with angiotensin-induced acute arterial hypertension
A72-28216
Physiological and subjective responses of physically fit young men to combined exercise-carbon dioxide stress tests
A72-28311
Underwater tests of instrument system for combined skin temperature and direct heat flow measurement in thermally stressful environments
A72-28334
Parotid fluid 17-hydroxycortico steroid level relation to hyperthermia stress at various heat levels during thermal environmental testing
A72-28335
Elastic thin shell theories for explaining dynamic behavior of prestressed blood vessels
[NASA-CR-125827]
N72-20070
Electromyographic activity of biceps muscle during submaximum isometric contraction determined from auditory feedback
[AD-734300]
N72-20094
Physiological effects of high altitude flight and development of life support systems for civil aircraft environmental control
[JPRS-55454]
N72-20107
Physiological stressing and conditioning ergometer system
[NASA-CASE-MFS-21109]
N72-20112
Effects of exposure to blast induced winds and pressure variations on biophysical parameters
[AD-734208]
N72-21054
Lactate-pyruvate and redox state responses of blood and tissue in chronic hypercapnia
[AD-734120]
N72-21057
- SUBMERGING**
Multihour immersion effects on blood plasma protein and electrolyte concentration in trained and untrained subjects
A72-27480
- SULFUR FLUORIDES**
Cardiorespiratory response to breathing dense sulfur fluoride-oxygen mixture under physical exercise conditions
A72-28314
- SUPERSONIC AIRCRAFT**
Case report of rapid decompression in supersonic trainer aircraft pressurized cabin, discussing physical and blast effects, pressurization safety, decompression sickness and hypoxia
A72-26020
- SUPERSONIC TRANSPORTS**
Medical and physiological hazards for SST passengers and crews, discussing cumulative cosmic radiation and high altitude decompression risks
A72-25816
- SUPINE POSITION**
Supine human body mechanical impedance under combined stress of vibration and sustained acceleration
A72-28270
- SURFACE NAVIGATION**
Detection range, color, brightness and flash subjective response tests to evaluate light signals for nighttime sea navigation and visual collision avoidance
A72-28326
- SURFACE PROPERTIES**
Spacecraft critical surfaces protection from molecular and particulate contamination sources including gloves, tissues, and covering or packaging materials
A72-27042
- SURFACE TEMPERATURE**
Life on Mars, investigating ground based and probe observations of atmospheric composition and pressure, surface temperature and features and UV radiation
A72-27624
- SURVIVAL**
Effectiveness of lead screens in protecting bone marrow quantity necessary for survival of pigs gamma irradiated with Co-60
[FRNC-TH-97]
N72-20078
- SWEAT**
Thermodynamic analysis of heat of evaporation of sweat, considering ambient temperature and humidity effects, body heat storage and presence of solutes
A72-26610
Thermoregulation changes during simulated weightlessness of prolonged bed rest, noting lower sweating threshold and decreased vasodilation /autonomic dysfunction/
A72-28301
Environmental temperature effect on motion sickness sweating, discussing nausea and discomforting symptomology prediction
A72-28302
Relationship between steady sweat flow and temperature regulation mechanism during exposure to heat
[REPT-877]
N72-20069
- SWEDEN**
Status of Swedish research in biotechnology and applied psychology relating to man machine systems
[RAE-LIB-TRANS-1597]
N72-20073
- SWINE**
Effectiveness of lead screens in protecting bone marrow quantity necessary for survival of pigs gamma irradiated with Co-60
[FRNC-TH-97]
N72-20078
- SYMPTOMOLOGY**
Environmental temperature effect on motion sickness sweating, discussing nausea and discomforting symptomology prediction
A72-28302
- SYNAPSES**
Visual cortex neuronal background activity in unanesthetized rabbits under stimulation and depression of lateral geniculate body and mesencephalic reticular formation, considering synaptic organization
A72-27646
- SYNCHRONIZERS**
Myocardium biopulse-controlled cardiosynchronizer as key component of biocontrol systems for cardiological studies
A72-26455
- SYNCOPE**
Case report of pilot near-syncope episode with bradycardia due to hyperactive right carotid sinus reflex
A72-27487
- SYSTEM EFFECTIVENESS**
Training value of training materials and devices

- [AD-733962] N72-20118
- SYSTEMS ENGINEERING**
- BIOMOD - interactive computer graphic system for modeling continuous biological systems [R-747-NIH] N72-20067
- Application of systems engineering concept to US Coast Guard aviator training programs [AD-735051] N72-21080
- SYSTOLE**
- Single linear measure of systolic pressure gradient for calculation of aortic valve area in stenosis severity assessment A72-27734
- T**
- TAPE RECORDERS**
- Arterial pressure data recording technique using magnetic tape recorder and automatic conversion to digital form A72-27649
- TARGET ACQUISITION**
- Circadian rhythms of visual accommodation responses and physiological correlations during target tracking, recording monocular focus state by IR optometer A72-28306
- TASK COMPLEXITY**
- Work-rest scheduling and sleep loss effect on operator performance in watchkeeping and active multiple visual tasks A72-26689
- Workload modification effects on pilot neurological changes during Boeing 707 letdown, approach and landing A72-28290
- Automated instructional monitors for diagnosing student difficulties in acquiring complex concepts and skills [AD-736212] N72-21090
- TEACHING MACHINES**
- Training value of training materials and devices [AD-733962] N72-20118
- TELEVISION SYSTEMS**
- TV microscopic system for on-line measurement of cat omentum microvessels diameter relative to heart action A72-26621
- TEMPERATURE CONTROL**
- Human body thermoregulatory processes under varying environmental conditions and metabolic rates, discussing role of blood circulation, sweating, nervous stimuli, hormones, etc A72-26073
- TEMPERATURE EFFECTS**
- Living organisms defense and preservation via refrigeration and vacuum combined use in lyophilization technique A72-27293
- Thermoregulation in deeply hibernating rodents during separate chilling and steady hibernation temperature maintenance of skin and brain A72-27827
- Environmental temperature effect on motion sickness sweating, discussing nausea and discomforting symptomology prediction A72-28302
- Ear site body temperature measurement relation to radiant heating of scalp and upper face A72-28333
- Mechanism by which inert gases influence metabolism [NASA-CR-62C79] N72-21041
- TEMPERATURE MEASUREMENT**
- Ear site body temperature measurement relation to radiant heating of scalp and upper face A72-28333
- Underwater tests of instrument system for combined skin temperature and direct heat flow measurement in thermally stressful environments A72-28334
- Assessment of human skin temperature rise suppression by edge losses during thermal irradiation [AD-735881] N72-21069
- TEST EQUIPMENT**
- Landolt ring radioactive plaque night vision tester comparison with electroretinography and Goldmann-Weekers dark adaptometry apparatus from special tests of night blind patients
- TEST FACILITIES**
- Major technical facilities for aerospace medical research and development [AD-734544] N72-20119
- TEST PILOTS**
- Life support equipment and pressure suit operational requirements from viewpoint of flight crews and test pilots A72-27516
- THERMAL ENVIRONMENTS**
- Underwater tests of instrument system for combined skin temperature and direct heat flow measurement in thermally stressful environments A72-28334
- THERMAL RADIATION**
- Assessment of human skin temperature rise suppression by edge losses during thermal irradiation [AD-735881] N72-21069
- THERMISTORS**
- Pneumatic thermistor transducer to measure steep ejection time interval between cardiac volume pulse upstroke start and maximum rise rate occurrence A72-26633
- Nose installed thermistor device for in-flight monitoring of pilot respiration and pulse rate A72-27417
- THERMODYNAMICS**
- Thermodynamics of human body metabolism, discussing energy conversion calorimetric measurements, body size, food intake, age, sex, endocrine and nervous effects A72-26072
- Thermodynamic analysis of heat of evaporation of sweat, considering ambient temperature and humidity effects, body heat storage and presence of solutes A72-26610
- THERMOMETERS**
- Digital thermometer with interchangeable temperature sensors [AD-735662] N72-21087
- THERMOREGULATION**
- Bicycle ergometer measurements of thermoregulation input and output under wide range of work load and climatic conditions, deriving correlation equation A72-25874
- German papers on human body energy balance and temperature control covering energy conversion processes, chemical secretions, muscle activity, etc A72-26071
- Human body thermoregulatory processes under varying environmental conditions and metabolic rates, discussing role of blood circulation, sweating, nervous stimuli, hormones, etc A72-26073
- Thermoregulation in deeply hibernating rodents during separate chilling and steady hibernation temperature maintenance of skin and brain A72-27827
- Thermoregulation changes during simulated weightlessness of prolonged bed rest, noting lower sweating threshold and decreased vasodilation /autonomic dysfunction/ A72-28301
- Relationship between steady sweat flow and temperature regulation mechanism during exposure to heat [REPT-877] N72-20069
- Analysis of body temperature control and thermal economy during work by unclothed subjects on erometer [RAE-LIB-TRANS-1610] N72-20072
- THRESHOLDS (PERCEPTION)**
- Olfactory receptor models sensitivity, discussing threshold dependence on adsorbed odoriferous agent amount and exposure time A72-26453
- Geomagnetic field perturbation biological effects, studying geomagnetic storm field energy levels and magnetic flux variables relation to human sensitivity thresholds A72-28210
- Semicircular canal function correlation to thresholds, aftereffects and power functions in pilot vestibular tests

- THYROID GLAND** A72-28259
Bed rest and centrifuging effects on human plasma thyroid hormone level, discussing total protein, albumin and thyroxin binding globulin concentrations
- A72-27477
Neuroendocrine responses in microwave radiation exposed rats, correlating thyroid and thyrotropic activity
- A72-28321
TIME DEPENDENCE
Human performance dependence on time of day, discussing circadian and physiological rhythms relation and environmental change effects
- A72-26677
Computer analysis of helicopter pilots eye movement patterns dependence on visual task skill and performance time
- A72-27475
Human motoneuron discharge time relations during isometric muscle contraction, measuring adjacent action potential and mean interspike intervals
- A72-27653
TIME MEASUREMENT
Pneumatic thermistor transducer to measure steep ejection time interval between cardiac volume pulse upstroke start and maximum rise rate occurrence
- A72-26633
TISSUES (BIOLOGY)
Respiration control by extracellular pH in medullary tissue, studying chemoreceptor response to hydrogen ion concentration in cat cerebrospinal fluid
- A72-26661
Liver and muscle type isozymes of DPN-linked glycerol-3-P dehydrogenase in chickens in terms of tissue distribution, ontogeny and avian evolution
- A72-27161
Apollo 12 material effect on tobacco tissue cultures, noting pigment increase
- A72-27626
Two stage description of middle germ layer chronic polyarthritis, noting heart muscle and vascular wall tissues necrosis
- A72-27822
TOBACCO
Apollo 12 material effect on tobacco tissue cultures, noting pigment increase
- A72-27626
TOUCH
Prosthetic device with sensing means for detecting tactile stimuli
[NASA-CASE-NPS-16570] N72-20111
- TOWING**
Parachutist biomedical responses in aerial tow at 110-175 knots, determining heart and respiration rates and urinary catecholamines
- A72-28272
TOXICITY AND SAFETY HAZARD
Russian book on powdered metals toxicity covering industrial dust, physiological effects, safety standards, electron configurations and crystalline structure
- A72-26067
TRACKING (POSITION)
Pilot glide slope and localizer tracking performance during successive in-flight simulated ILS approaches
- A72-28260
TRAINING AIRCRAFT
Case report of rapid decompression in supersonic trainer aircraft pressurized cabin, discussing physical and blast effects, pressurization safety, decompression sickness and hypoxia
- A72-26020
TRAINING DEVICES
Training devices for training operators in use characteristics and maintenance of Naval electronic equipment
[AD-733471] N72-20116
Training value of training materials and devices
[AD-733962] N72-20118
- TRAINING SIMULATORS**
Flight stress and performance of training in general aviation simulator compared with actual flight
- A72-28261
Hypoxia effect on aircraft pilot performance, using Link GAT 1 trainer and controlled composition atmosphere under varied altitude conditions for simulated ILS landing approaches
- A72-28310
TRANSDUCERS
Cotton wick probe-transducer assembly for pneumograph recording of rabbit respiratory rate
- A72-26619
Data processing in isolated crab biological strain receptor formed by muscle, transducer and encoder, noting pulse frequency modulation in encoding process
- A72-27577
TRANSFER OF TRAINING
Automated instructional monitors for diagnosing student difficulties in acquiring complex concepts and skills
[AD-736212] N72-21090
- TRANSISTOR AMPLIFIERS**
Transistorized amplifier input elements design for biopotentials recording, providing minimum noise at high input impedance
- A72-26468
TRANSMITTERS
Common collector micropower monolithic transmitter for single or multichannel biomedical telemetry
- A72-26563
TRANSPORT AIRCRAFT
LOX supply systems installation for civil transport aircraft crew and/or passenger breathing oxygen
[SAE AIR 1223] A72-26030
- TREADMILLS**
Physical work capacity comparison during bicycle ergometry and treadmill walking tests, measuring oxygen uptake, ventilatory parameters and excess carbon dioxide production
- A72-26095
Maximal oxygen uptake and heart rate during laddermill climbing, inclined treadmill running and cycling ergometer tests
- A72-26612
TRIBOLIA
Effects of space flight on flour beetle, Tribolium confusum
[EXPT-P-1039] N72-20053
- TROPICAL REGIONS**
Role of nitrogen metabolism in biological productivity and marine food chain in temperate seas
[CU-3826-22] N72-20084
- TUNNEL DIODES**
Receptor membrane pulse generation electronic model with tunnel diode negative resistance circuit
- A72-27578
- U**
- U.S.S.R.**
Abstracts on space biology and medicine involved in cosmonaut training
[JPRS-55687] N72-21043
- ULTRASONIC TESTS**
Instantaneous and continuous blood flow velocity measurement by Doppler ultrasonic flowmeter using transcutaneous and implanted probes
- A72-26778
ULTRAVIOLET RADIATION
Life on Mars, investigating ground based and probe observations of atmospheric composition and pressure, surface temperature and features and UV radiation
- A72-27624
UNDERWATER COMMUNICATION
Biotelemetry system for EEG monitoring of free swimming diver at 15 meter depth, discussing power requirements, antenna design and signal attenuation
- A72-27478
UNDERWATER TESTS
Underwater tests of instrument system for combined skin temperature and direct heat flow measurement in thermally stressful environments
- A72-28334
Estimating absolute distance underwater, and improvement of visual judgement accuracy by training
[AD-734125] N72-20089

- Pressure regulator for space suit worn underwater to simulate space environment for testing and experimentation
[NASA-CASE-MFS-20332] N72-20097
- UNSTEADY STATE**
Solar activity effects on biospheric processes for biological and physicochemical systems in unsteady state, considering maximum effects on man at certain electromagnetic wave frequencies A72-28211
- URINALYSIS**
Parachutist biomedical responses in aerial tow at 110-175 knots, determining heart and respiration rates and urinary catecholamines A72-28272
Specifications and engineering model of urine sampling and collection system for manned space flights [NASA-CR-115507] N72-20109
- URINE**
Sleep deprivation effect on circadian rhythms in human performance, psychological fatigue ratings, catecholamine excretion and urine flow A72-26692
Radiation damage in mammals and humans indicated by biochemical changes in blood and urine [SZS-7/71-PT-1] N72-20083
Specifications and engineering model of urine sampling and collection system for manned space flights [NASA-CR-115507] N72-20109
- V**
- VACUUM EFFECTS**
Living organisms defense and preservation via refrigeration and vacuum combined use in lyophilization technique A72-27293
- VALSALVA EXERCISE**
Valsalva and M-1 maneuvers acceleration tolerance protective effects during high-g centrifuging with and without anti-g suits A72-28318
- VALVES**
Single linear measure of systolic pressure gradient for calculation of aortic valve area in stenosis severity assessment A72-27734
- VASCULAR SYSTEM**
Two stage description of middle germ layer chronic polyarthritis, noting heart muscle and vascular wall tissues necrosis A72-27822
- VASOCONSTRICTION**
Acceleration stress effects on splanchnic blood flow due to organ displacement and neurogenic vasoconstriction in vascular beds A72-28285
- VASODILATION**
Thermoregulation changes during simulated weightlessness of prolonged bed rest, noting lower sweating threshold and decreased vasodilation /autonomic dysfunction/ A72-28301
- VECTORCARDIOGRAPHY**
Gabor-Nelson myocardium electrical activity model for mathematical construction of vectorcardiograph from ECG for comparison of various lead systems A72-26629
Stress vectorcardiography quantitative analysis of ECG response to treadmill exercise test to establish diagnosis criteria for coronary heart disease A72-28282
- VELOCITY MEASUREMENT**
Instantaneous and continuous blood flow velocity measurement by Doppler ultrasonic flowmeter using transcutaneous and implanted probes A72-26778
- VERTICAL PERCEPTION**
Neck proprioception effects and otolith organ activity in perceived visual target elevation under centrifuging stress A72-28305
- VESTIBULAR TESTS**
Tandem walking on floor with eyes closed as ataxia test for vestibular function assessment A72-27476
- Vestibular, auditory, acceleration and altitude decompression testing of pilot following endolymphatic shunt surgery for Menieres disease A72-27485
- Brief vestibular disorientation test technique for assessment of potential nonpilot airborne specialists or naval flight officers A72-28256
- Motion sickness experience correlations to vestibular tests in pilots and nonpilots A72-28257
- Vision influence on acute motion sickness elicitation in slow rotation room, comparing with vestibular factors A72-28258
- Semicircular canal function correlation to thresholds, aftereffects and power functions in pilot vestibular tests A72-28259
- Nystagmus eye movements relationship to oculogyral illusion from test involving vestibular stimulation and visual stimuli velocity estimates A72-28304
- Indirect measurement of primate vestibular system function through analysis of vestibulo-ocular reflex response to various input stimuli [AD-734545L] N72-21065
- VIBRATION EFFECTS**
Aircraft pilot seating protection from dynamic environment by active vibration isolation, discussing human frequency response characteristics A72-26391
Biothermal response of increased core temperature in rhesus monkey to mechanical vibration, noting implications for pilot performance during prolonged buffeting A72-28268
Angular oscillation in yaw effect of pilot visual performance, showing vestibulo-ocular compensation and frequency response A72-28269
Supine human body mechanical impedance under combined stress of vibration and sustained acceleration A72-28270
Behavior alterations in pepper plant, Capsicum annum, in response to weightlessness, rotation, vibration, and acoustic stress [EXPT-P-1017] N72-20059
Effects of space environment, acceleration, and vibration on feeding, growth, and morphology of amoeba, Pelomyxa carolinensis [EXPT-P-1035] N72-20062
- VIBRATION ISOLATORS**
Aircraft pilot seating protection from dynamic environment by active vibration isolation, discussing human frequency response characteristics A72-26391
- VIBRATIONAL STRESS**
Clinical treatment of vibration induced disorders in construction workers [RAE-LIB-TRANS-1611] N72-21051
- VIDEO DATA**
Left ventricular volume time course from computer processing of video angiocardigraphic data based on X ray densitometry measurements A72-26627
- VISCERA**
Acceleration stress effects on splanchnic blood flow due to organ displacement and neurogenic vasoconstriction in vascular beds A72-28285
- VISUAL ACCOMMODATION**
Auditory flutter fusion frequency changes in humans during prolonged visual deprivation A72-27418
Circadian rhythms of visual accommodation responses and physiological correlations during target tracking, recording monocular focus state by IR optometer A72-28306
- VISUAL ACUITY**
Visual evoked cortical responses in objective refraction related to retinal image clarity for clinical applications A72-25349

- Retina visual acuity testing by zero and first order moire fringes, using square-wave amplitude gratings
A72-27953
- Angular oscillation in yaw effect of pilot visual performance, showing vestibulo-ocular compensation and frequency response
A72-28269
- Human visual acuity measured by chromatic square wave gratings under luminance conditions [AD-734931]
N72-21063
- VISUAL DISCRIMINATION**
- Extrageniculostriate vision in monkey, discussing circle vs triangle and red vs green discrimination
A72-26772
- Interhemispheric effects on choice reaction times to single and multiple letter displays, analyzing cerebral dominance and visual information transmission compared with verbal response
A72-27075
- VISUAL FIELDS**
- Cortico-subcortical connections transection effect on cat lateral geniculate body and visual cortex neurons spontaneous activity
A72-27652
- Automated visual sensitivity tester for determining visual field sensitivity and blind spot size [NASA-CASE-ARC-1329-1]
N72-21079
- VISUAL OBSERVATION**
- Detection range, color, brightness and flash subjective response tests to evaluate light signals for nighttime sea navigation and visual collision avoidance
A72-28326
- Goggle device for measuring visually perceptive direction of space [NASA-CR-125859]
N72-20102
- VISUAL PERCEPTION**
- Vascular-capillary study of age related anisochromatic features of human brain optic lobe
A72-26675
- Bed rest and positive radial acceleration effect on peripheral visual response time, considering blackout or grayout prediction possibilities
A72-28297
- Neck proprioception effects and otolith organ activity in perceived visual target elevation under centrifuging stress
A72-28305
- Estimating absolute distance underwater, and improvement of visual judgement accuracy by training [AD-734125]
N72-20089
- Medical research abstracts on limulus visual system, electronic neuron model development, and auditory adaptation in horseshoe crab [AD-734017]
N72-21073
- VISUAL SIGNALS**
- Russian book on visual sensor signal dynamics covering nerve signal transformation, light stimuli responses, afferent flow, bionics, neurocybernetics and communication theory
A72-26049
- Detection range, color, brightness and flash subjective response tests to evaluate light signals for nighttime sea navigation and visual collision avoidance
A72-28326
- VISUAL STIMULI**
- Visual evoked cortical responses in objective refraction related to retinal image clarity for clinical applications
A72-25349
- Lenticular conditioning-shock stimulation effect on cat visual cortex response to light stimuli, noting lateral gyrus photically evoked potential amplitude increase
A72-25801
- Orienting response indication by EEG alpha rhythm desynchronization in relation to visual stimulation intensity
A72-26238
- Intraelectroretinographic analysis of light signal spatial summation at different retinal nerve levels in frogs
A72-26454
- Response latencies and correlation in single units and visual evoked potentials in cat striate cortex following monocular and binocular stimulations
A72-26771
- Image visual recognition during voluntary saccadic eye movements, noting stimuli visible luminance change effect
A72-27310
- Visual cortex neuronal background activity in unanesthetized rabbits under stimulation and depression of lateral geniculate body and mesencephalic reticular formation, considering synaptic organization
A72-27646
- Spatial characteristics of equal energy visual stimuli in metacontrast design for targets and masks of constant separation and varying width, deriving weighting functions
A72-27680
- Vision influence on acute motion sickness elicitation in slow rotation room, comparing with vestibular factors
A72-28258
- Nystagmus eye movements relationship to oculogyral illusion from test involving vestibular stimulation and visual stimuli velocity estimates
A72-28304
- VISUAL TASKS**
- Short sleep period and oxygen breathing effects on arousal level of air traffic controller during detection task performance
A72-26686
- Work-rest scheduling and sleep loss effect on operator performance in watchkeeping and active multiple visual tasks
A72-26689
- Cumulative sleep deficit, preceding sleep or wakefulness period duration and body temperature effects on reaction time in multiple choice visual task
A72-26690
- Project Pegasus vigilance tasks for mental performance aspects of time zone change effects on human circadian rhythms
A72-26695
- Character recognition experiments to determine attention control and temporal-spatial capacity limitation during visual information processing
A72-27074
- Interhemispheric effects on choice reaction times to single and multiple letter displays, analyzing cerebral dominance and visual information transmission compared with verbal response
A72-27075
- Computer analysis of helicopter pilots eye movement patterns dependence on visual task skill and performance time
A72-27475
- VOSKHOD MANNED SPACECRAFT**
- Systems used in Vostok and Voskhod spacecraft for protection of cosmonauts from radiation hazards
N72-20047
- VOSTOK SPACECRAFT**
- Systems used in Vostok and Voskhod spacecraft for protection of cosmonauts from radiation hazards
N72-20047
- W**
- WAKEFULNESS**
- Sleep-wakefulness cycle variations effect on reaction time and spontaneous tempo during time isolation experiment, showing tendency toward circadian rhythm
A72-26687
- WALKING**
- Tandem walking on floor with eyes closed as ataxia test for vestibular function assessment
A72-27476
- WARNING SYSTEMS**
- Pilot warning systems for visual midair collision avoidance, noting reaction to imminent threats, scanning patterns and display sector size effects [SAE PAPER 720312]
A72-25576
- Head-up omnidirectional two dimensional auditory display device for visual detection facilitation in aircraft collision avoidance systems
A72-28327
- Evaluation of oxygen-sensing warning device for use in damage control suit system [AD-735377]
N72-21082

WATER LOSS

Weight loss due to respiratory tract evaporative water loss during exercise, from humidity change, ventilatory exchange and oxygen uptake data
A72-26613

A72-26612

Sleep deprivation effects relation to work duration, time of day, circadian rhythm, memory function, task performance, environmental factors, drug use and age

A72-26678

WEAPON SYSTEMS

Pilot-aircraft system model for relationship between weapons delivery accuracy and manual flight control system design, noting display, computation and control aids to pilot
A72-28121

WORK-REST CYCLE

Bicycle ergometer measurements of thermoregulation input and output under wide range of work load and climatic conditions, deriving correlation equation
A72-25874

A72-26688

Sleep loss and work-rest cycle effects on combat efficiency, considering psychomotor reactivity, vigilance and decision making capacity
A72-26688

A72-26689

Work-rest scheduling and sleep loss effect on operator performance in watchkeeping and active multiple visual tasks
A72-26689

A72-26689

WEIGHTING FUNCTIONS

Spatial characteristics of equal energy visual stimuli in metacontrast design for targets and masks of constant separation and varying width, deriving weighting functions
A72-27680

WEIGHTLESSNESS

Weightlessness effects on human organism, discussing physiological changes, artificial gravity by spacecraft rotation and exercise to counter adverse reactions
A72-26891

A72-26891

Effect of weightlessness and spacecraft environment on spontaneous and radiation induced somatic mutation rates and cytologic changes in Tradescantia
[EXPT-P-1123] N72-20054

N72-20054

Effect of weightlessness on growth and orientation of roots and shoots of wheat seedlings
[EXPT-P-1020] N72-20055

N72-20055

Effect of weightlessness on biochemical response of monocot seedlings
[EXPT-P-1138] N72-20057

N72-20057

Biochemical analyses of wheat seedling endosperms under weightless conditions of Biosatellite 2
[EXPT-P-1138] N72-20058

N72-20058

Behavior alterations in pepper plant, Capsicum annuum, in response to weightlessness, rotation, vibration, and acoustic stress
[EXPT-P-1017] N72-20059

N72-20059

Effect of weightlessness on fertilized eggs of grass frog, Rana pipiens
[EXPT-P-1047] N72-20060

N72-20060

Weightlessness effects on single cell, amoeba Pelomyxa carolinensis
[EXPT-P-1035] N72-20061

N72-20061

Effects of gamma radiation and weightlessness on cell growth of Salmonella typhimurium or induction of bacterial prophage
[EXPT-P-1135] N72-20063

N72-20063

Combined effects of radiation and weightlessness on mortality and mutagenesis of living systems
N72-20065

N72-20065

Biomedical system for measuring volume and volume variations of human body under zero gravity conditions
[NASA-CASE-MSC-13972-1] N72-20105

N72-20105

WEIGHTLESSNESS SIMULATION

Modular microbiology laboratory design considerations and zero gravity experiments to investigate microbial culture systems behavior
A72-28280

A72-28280

Thermoregulation changes during simulated weightlessness of prolonged bed rest, noting lower sweating threshold and decreased vasodilation /autonomic dysfunction/
A72-28301

A72-28301

Parametric analysis of intravehicular manned cargo transfer in simulated weightlessness
[NASA-TN-D-6774] N72-21075

N72-21075

WHITE NOISE

Periodic, continuous and aperiodic white noise effects on human serial decoding performance, relating subjective and autonomic responses
A72-28289

A72-28289

WICKS

Cotton wick probe-transducer assembly for pneumograph recording of rabbit respiratory rate
A72-26619

A72-26619

WORK CAPACITY

Physical work capacity comparison during bicycle ergometry and treadmill walking tests, measuring oxygen uptake, ventilatory parameters and excess carbon dioxide production
A72-26095

A72-26095

Maximal oxygen uptake and heart rate during laddermill climbing, inclined treadmill running and cycling ergometer tests

Y

YAW

Angular oscillation in yaw effect of pilot visual performance, showing vestibulo-ocular compensation and frequency response
A72-28269

A72-28269

YEAST

Experiments involving parasitic wasp Habrobracon, yeast, and Artemia salina on Biosatellite 2
[EXPT-P-1079] N72-20050

N72-20050

Z

ZOND SPACE PROBES

Biological experiments on plants, animals and bacteria aboard Zond 5, 6 and 7 space probes, noting flight conditions effect on physiological functions and hereditary structures
A72-25941

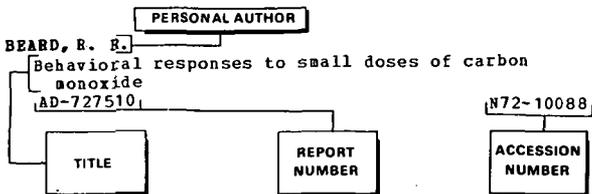
A72-25941

Personal Author Index

AEROSPACE MEDICINE AND BIOLOGY / *A Continuing Bibliography (Suppl. 104)*

JULY 1972

Typical Personal Author Index Listing



The title of the document is used to provide the user with a brief description of the subject matter. The NASA or AIAA accession number is included in each entry to assist the user in locating the abstract in the abstract section of this supplement. If applicable, a report number is also included as an aid in identifying the document.

A

- ABBRECHT, P. H.
Erythrocyte life-span in mice acclimatized to different degrees of hypoxia. A72-26608
- ABEL, J. H., JR.
Effects of weightlessness on the nutrition and growth of *Pelomyxa carolinensis* [EXPT-P-1035] N72-20062
- ABRAMS, A. J.
Information feedback: Contributions to learning and performance in perceptual identification training [AD-733451] N72-20117
- ACHKASOVA, I. U. W.
Experimental study of the effect of extremely-low-frequency electromagnetic fields on warm-blooded animals and microorganisms A72-28214
- ADAM, J.
Nycthemeral rhythms and air troop - Some preliminary results from 'Exercise Medex.' A72-26696
- ADEY, W. R.
EEG monitoring of a free-swimming diver at a working depth of 15 meters A72-27478
- ADVANI, S. H.
A model for predicting aortic dynamic response to -G sub z impact acceleration. A72-28271
- AGADZHANYAN, N. A.
Effects of hyperoxia on coagulating and anticoagulating systems in blood [JPRS-55553] N72-21044
- ALDREDGE, J. L.
The extraction of sleep information from heart rate data: Analysis of the sleep cycle [AD-734283] N72-21061
- ALDRICH, B. R.
Underwater space suit pressure control regulator [NASA-CASE-MPS-2:332] N72-20097
- ALEKSANDROVA, T. B.
Effect of the cerebral cortex on the progress of cardio-cardiac reflexes A72-27647
- ALLEN, M. P.
The USAFSAH cardiovascular disease follow-up study - 1972 progress report. A72-28292
- ALLUISI, E. A.
Influence of work-rest scheduling and sleep loss on sustained performance
- ALM, A.
The oxygen supply to the retina. II. A72-26689
- AMBLER, R. K.
Factor analysis of undergraduate and postgraduate flight training grades. A72-27841
- ANAND, B. K.
Some aspects of space ecology and physiology. A72-26018
- ANET, P.
Primary prevention of atherosclerotic cardiovascular disease among the SABENA flying personnel. A72-28293
- ANGIBOUST, R.
Attempt to evaluate the operational effectiveness of military/aeronautical personnel in the course of night duty A72-26686
- ANIKIN, L. S.
Standards for some hemodynamic criteria in airmen A72-26987
- ANSPAUGH, L. R.
Compilation of published information on elemental concentrations in human organs in both normal and diseased states. 1: raw data ordered by atomic number, subordered by organ and suborgan, listing method of analysis, geographical source, age, sex, number of individuals [UCRL-51013-PT-1-REV-1] N72-20081
- ANTHONY, J. R.
Cardiac electro-mechanical time intervals as indices of hypoxic circulatory stress in man. A72-27470
- ANTIPOV, V. V.
Results of biological investigations undertaken on the Zond-5, Zond-6, and Zond-7 stations. A72-25941
- ARLAN, D. B.
Cardiorespiratory response to breathing dense gas at exercise with imposed mechanical airway resistance. A72-28314
- ARMANTROUT, G. A.
Sensitivity problems in biological and environmental counting [UCRL-73505] N72-20079
- ARON, B. S.
Radiation effects in man: Manifestations and therapeutic effort [AD-734209] N72-20091
- ARZEN'EVA, E. H.
Study of time relations between human motor unit discharges during prolonged muscle contraction A72-27653
- ASCHOFF, J.
Energy metabolism A72-26972
- Temperature control A72-26073
- The influence of sleep-interruption and of sleep-deprivation on circadian rhythms in human performance. A72-26685
- The effects of a cumulative sleep deficit, duration of preceding sleep period and body-temperature on multiple choice reaction time. A72-26690

- AUDET, N. F.**
Development and evaluation of an oxygen-sensing warning device
[AD-735377] N72-21082
- AUERBACH, E.**
Latencies and correlation in single units and visual evoked potentials in the cat striate cortex following monocular and binocular stimulations. A72-26771
- AVANT, L. L.**
Adaptation level and visual space perception
[AD-733918] N72-20086
- B**
- BACHE, R. J.**
Simplified estimation of aortic valve area. A72-27734
- BAGDON, V. U.**
Biocidal properties of an anti-icing additive
[AD-735451] N72-21068
- BAHADUR, K.**
Detection of nucleic acid bases in photochemically synthesized self sustaining coacervates. A72-27657
- BAKANS'KA, V. V.**
Influence of ascorbic acid on the coagulogram of dogs with acute hypoxia A72-28217
- BALAZS, R.**
Effect of hormonal state on cell number and functional maturation of the brain. A72-27298
- BALE, R. M.**
Factor analysis of undergraduate and postgraduate flight training grades. A72-27472
- BANCHERO, M.**
Liquid breathing - Prevention of pulmonary arterial-venous shunting during acceleration. A72-26609
- BANCROFT, R. W.**
Arterial blood gas tensions using phased dilution oxygen delivery technics. A72-28255
Effects of exposure at 80,000 feet at different decompression rates. A72-28322
- BARRY, R. J.**
Desynchronization of the alpha rhythm of the EEG as a function of intensity of visual stimulation. A72-26238
- BARRY, W. E.**
Keratocoelus in USAF flying personnel. A72-28331
- BARTEK, P.**
Pilot incapacitation - An expression of convergent factors. A72-28284
- BARTUS, R. T.**
Electroencephalographic and behavioral effects of nocturnally occurring jet aircraft sounds. A72-27474
- BASSENGE, E.**
Treadmill exercise in dogs under beta-adrenergic blockade - Adaptation of coronary and systemic hemodynamics. A72-25802
- BEALES, J. S. M.**
Radiological assessment of arterial branching coefficients A72-26774
- BEASLEY, G. P.**
Results of intravehicular manned cargo-transfer studies in simulated weightlessness
[NASA-TN-D-6774] N72-21075
- BEBBE, T.**
The development of a motion picture measurement instrument for aptitude for air traffic control
[AD-735942] N72-21085
- BEH, H. C.**
Desynchronization of the alpha rhythm of the EEG as a function of intensity of visual stimulation. A72-26238
- BEHLING, K.**
Impulses and effector measures of thermoregulation during rest and exercise. I, II A72-25874
- BELAI, V. E.**
Pathophysiological principles of air and space pharmacology A72-27926
- BELLHOUSE, B. J.**
Fluid mechanics of a model mitral valve and left ventricle. A72-26775
- BENCHIMOL, A.**
Clinical application of the Doppler ultrasonic flowmeter. A72-26778
- BENSON, A. J.**
Effect of angular oscillation in yaw on vision. A72-28269
- BERGEN, G. A.**
A rocket propellant handler's suit for protection from chloride trifluoride and elemental fluorine
[AD-731556] N72-20115
- BERGER, K.**
Studies on the central chemosensitive mechanism of respiration. II A72-26661
Studies on the central chemosensitive mechanism of respiration. III, IV A72-27825
- BERGER, W.**
Studies on the central chemosensitive mechanism of respiration. I A72-26660
Studies on the central chemosensitive mechanism of respiration. II A72-26661
Studies on the central chemosensitive mechanism of respiration. III, IV A72-27825
- BERGEY, G. E.**
Portable detector of low amplitude electrocardiographic activity
[AD-735882] N72-21084
- BERGSTROM, R. M.**
The voluntary regulation of breathing in man. A72-27843
- BERMAN, R. A.**
The BIOMOD user's reference manual
[R-746-NIH] N72-20104
- BERNAUER, E. M.**
+Gz tolerance after 14 days bed rest and the effects of rehydration. A72-28295
- BERNDT, J.**
Studies on the central chemosensitive mechanism of respiration. I A72-26660
Studies on the central chemosensitive mechanism of respiration. II A72-26661
Studies on the central chemosensitive mechanism of respiration. III, IV A72-27825
- BERRY, C. A.**
Man, space flight and medicine. A72-26100
- BESSIS, M.**
Biophysical and cytological studies with laser microbeams
[AD-734181] N72-26090
- BEUTLER, G. C.**
Training airline flight crews. A72-26998
- BEVAN, W.**
Adaptation level and visual space perception
[AD-733918] N72-20086
- BILL, A.**
The oxygen supply to the retina. II. A72-27841
- BISHOP, V. S.**
Left ventricular pressure-dimension relationships in the conscious dog. A72-26773
- BLAKE, M. J. F.**
Introversion-extraversion and circadian rhythms. A72-26693
- BLATON, V.**
Trilyceridemia and relative weight A72-27238
- BLEICHERT, A.**
Impulses and effector measures of thermoregulation during rest and exercise. I, II

- BLOCK, P. A72-25874
Trilyceridemia and relative weight
- BOENING, D. A72-27238
Effects of a multi-hour immersion on trained and untrained subjects. II - Blood protein and electrolyte concentrations.
- BOND, V. P. A72-27480
Evaluation of long-term effects of low level whole body external radiation exposures [A/CONF-49/P/82] N72-20080
- BONDS, A. B. A72-27299
Gain control in the retina and retinal dynamics.
- BORLAND, R. G. A72-28290
Influence of workload patterns during the letdown, approach and landing of a Boeing 707 on nervous activity of the pilot.
- BOUCHARD, R. J. A72-27732
Haemodynamic effects of angiographic contrast material in man - A beat-by-beat analysis.
- BOUTELIER, C. N72-20069
A study of the transient stage of sweating in man [REPT-877]
- BOWES, D. N. A72-26619
Pneumograph recording using a cotton-wick probe.
- BRADLEY, A. E. N72-20079
Sensitivity problems in biological and environmental counting [UCRL-73505]
- BRAGG, V. C. A72-28276
A feasibility study of the use of ear protectors in aircraft.
- BRAKHNOVA, I. T. A72-26067
Toxicity of powdered metals and their compounds
- BRECHER, G. A. A72-28303
Physiological effects of backscatter of high intensity light pulses on the human pilot.
- BRENGELMANN, G. L. A72-26617
Skin and muscle components of forearm blood flow in directly heated resting man.
- BRODERSON, A. B. A72-28268
Biothermal response of the rhesus monkey to mechanical vibration.
- BRODOVSKAIA, Z. I. A72-28214
Experimental study of the effect of extremely-low-frequency electromagnetic fields on warm-blooded animals and microorganisms
- BROOKS, R. A72-27484
Electrophysiological changes in humans during perceptual isolation.
- BROWNS, H. A72-28293
Primary prevention of atherosclerotic cardiovascular disease among the SABENA flying personnel.
- BROWN, T. A72-26696
Nychthemeral rhythms and air trooping - Some preliminary results from 'Exercise Medex.'
- BROWNING, L. S. N72-20052
Genetic effects of the space environment on the reproductive cells of Drosophila adults and pupae [EXPT-P-1159]
- BRUENER, H. N72-21053
The relationship of oxygen uptake and body temperature in man in acute and severe hypoxia [DLR-FB-71-65]
- BRUNER, H. A72-26694
Psychological and physiological changes caused by desynchronization following transzonal air travel.
- BUCHHOLD, B. N72-20053
Some effects of spaceflight on the flour beetle, Tribolium confusum [EXPT-P-1039]
- BUCK, L. A72-26680
Sleep loss and information processing.
- BUCKLEY, E. P. N72-21085
The development of a motion picture measurement instrument for aptitude for air traffic control [AD-735942]
- BUCKY, S. P. A72-28263
The relationship between anxiety and success in the naval flight program.
- BULLARD, R. W. A72-26616
Adaptation to hypobarism - Sensitivity of myocardial tissue to carbon dioxide.
- BURTON, R. R. A72-28319
+G sub z protection afforded by a modified partial pressure suit.
- BUSHAY, J. L. A72-28329
Nuclear and cellular division in Pelomyxa carolinensis during weightlessness [EXPT-P-1035]
- BYARS, E. P. A72-28271
A model for predicting aortic dynamic response to -G sub z impact acceleration.
- BYFORD, G. H. A72-28312
The EEG and controlled hyperventilation.
- BYNUM, B. G. N72-20112
Ergometer [NASA-CASE-MFS-21109]
- C
- CADES, S. B. N72-21081
Airway resistance measurement at depth [AD-735462]
- CAILLE, E. J. P. A72-26688
Loss of sleep and combat efficiency - Effects of the work/rest cycle.
- CALCATERRA, P. C. A72-26391
Active vibration isolation for aircraft seating.
- CARL, G. R. N72-20106
Air-conditioned suit [NASA-CASE-LAR-10076-1]
- CARO, P. W. N72-21080
Systems engineering of Coast Guard aviator training [AD-735051]
- CASKEY, P. E. A72-26609
Liquid breathing - Prevention of pulmonary arterial-venous shunting during acceleration.
- CAVAGNA, G. A. A72-27479
Jumping on the moon - Power output at different gravity values.
- CAVONIUS, C. R. N72-21063
Visual acuity under conditions of chromatic differences without differences in luminance [AD-734931]
- CEVABER, A. M. A72-27728
Chemoreflex ventilatory response to CO₂ in man at low and high altitudes.
- CHADWICK, J. H. A72-28264
Measures of cardiovascular risk.
- CHANDLER, R. F. A72-28325
A study of female pilot control force capabilities for general aviation aircraft.
- CHAPLAIN, R. A. A72-27577
Data processing in biological sensors
- CHAPMAN, D. K. A72-27578
Biochemical changes in the endosperm of wheat seedlings in the weightless state [EXPT-P-1138] N72-20058
The liminal angle of a plagiogeotropic organ under weightlessness

- [EXPT-P-1017] N72-20059
- CHASEN, M. H. A study of the transient stage of sweating in man
[REPT-877] N72-20069
- Investigation of the primate vestibular system
function through analysis of the vestibulo-ocular
reflex response to various input stimuli
[AD-734545L] N72-21065
- CHELKOVA, ZH. D. Aural responsiveness of a pilot following
endolymphatic shunt surgery. A72-27485
- Experimental study of the effect of
extremely-low-frequency electromagnetic fields on
warm-blooded animals and microorganisms A72-28214
- CHEU, I. Nychthemeral rhythms and air troopng - Some
preliminary results from 'Exercise Medex.' A72-26696
- Radiation effects in man: Manifestations and
therapeutic effort
[AD-734209] N72-20091
- CHEN, S. C. Diurnal variation in human performance - A review. A72-26676
A72-26677
- Computer analysis of eye movement patterns during
visual search. A72-27475
- CHIRIFE, R. Automatic real-time pair feeding system for animals
[NASA-CASE-ARC-10302-1] N72-21052
- Densitography - A new method for evaluation of
cardiac performance of rest and during exercise. A72-25500
- CHRISTIE, G. A. A micropower monolithic transmitter for single- or
multichannel biomedical telemetry. A72-26563
- Preliminary results of the vigilance tests from
'Project Pegasus.' A72-26695
- CLARK, B. The effects of intermittent noise on human serial
decoding performance and physiological response. A72-28289
- The relationship between motion sickness experience
and vestibular tests in pilots and nonpilots. A72-28257
- Correlation between five measures of vestibular
function for airline pilots. A72-28259
- CLARK, D. A. A study of the effect of weightlessness on the
biochemical response of a monocotyledonous
seedling
[EXPT-P-1138] N72-20057
- The USAFSAM cardiovascular disease follow-up study -
1972 progress report. A72-28292
- CLARK, J. M. Information feedback: Contributions to learning and
performance in perceptual identification training
[AD-733451] N72-20117
- Tolerance of physically fit young men to exercise
and graded levels of inspired PCO₂ up to 40 mm Hg. A72-28322
- CLARK, R. L. Guinea pig ductus arteriosus. II - Irreversible
closure after birth. A72-27826
- The BIMOD system implementation
[R-747-NIH] N72-20067
- The BIOMOD user's reference manual
[R-746-NIH] N72-20104
- CLARKE, A. M. Underwater space suit pressure control regulator
[NASA-CASE-MFS-20332] N72-20097
- Electromyogram and myogram responses under
pre-strain conditions in normal humans as an index
of fusimotor sensitization of muscle spindles. A72-26632
- CLARKE, T. D. Microbiology in zero gravity - Design considerations
and zero gravity experiments. A72-28280
- Evaluation of the lap belt, Air Force shoulder
harness-lap belt and air bag plus lap belt
restraints during impact with anthropomorphic
dummies. A72-27471
- CLEMENT, J. The effect of weightlessness on the dividing eggs of
Rana pipiens
[EXPT-P-1047] N72-20060
- Glottis opening and airway resistance. A72-26611
- CLISHAM, W. F., JR. Introversiion-extraversiion and circadian rhythms. A72-26693
- The impact of modern equipment design on the
functions and responsibilities of the Naval Flight
Officer. A72-28291
- COBB, B. B. Effects of altitude on cellular metabolism and
terminal oxidation
[AD-734933] N72-21064
- A proposed new test for improved aptitude screening
of applicants for air traffic control training. A72-28252
- COCKETT, A. T. K. Effect of hormonal state on cell number and
functional maturation of the brain. A72-27298
- EEG monitoring of a free-swimming diver at a working
depth of 15 meters. A72-27478
- COENEN, R. Reactions of pilots to warning systems for visual
collision avoidance.
[SAE PAPER 720312] A72-25576
- Data processing in biological sensors A72-27577
- COHEN, M. E. Underwater work measurement techniques
[AD-734014] N72-20092
- Proprioceptive and otolithic variables in the
perceived elevation of visual targets. A72-28305
- COLE, A. O. Data synthesis of biological samples collected for
research in nitrogen metabolism in the sea
[CU-3826-22] N72-20084
- C14-radiorespirometry system for astronaut medical
monitoring A72-28277
- COLIN, J. Life support system
[NASA-CASE-MSC-12411-1] N72-20096
- Medical and physiological problems for passengers
and crews of supersonic transports A72-25816

D

- DAIUTOLO, H.
Dynamic tests of general aviation occupant restraint systems.
[SAE PAPER 72C325] A72-25588
- DALLAS, A.
Retinal laser irradiation diameter estimation. A72-25314
- DALTON, K. J.
The effects of added elastic loads on the respiratory response to CO₂ in man. A72-27726
- DALY, J. B.
Preliminary results of the vigilance tests from 'Project Pegasus.' A72-26695
- DAMON, E. K.
The biodynamics of airblast [AD-734208] N72-21054
- DANFORD, E., JR.
A feasibility study of the use of ear protectors in aircraft. A72-28276
- DANIELS, E. W.
Nuclear and cellular division in *Pelomyxa carolinensis* during weightlessness [EXPT-P-1035] N72-20061
- DAVIS, H. M., JR.
Physiological response in pilot/back-seat man during aerial combat maneuvers in F-4E aircraft. A72-28317
- DAVYDOV, B. I.
Problems of space biology. Volume 9: Outline of space radiobiology [NASA-TT-P-604] N72-20039
- DEGRAZIA, J. A.
C14-radiorespirometry system for astronaut medical monitoring. A72-28277
- DELAND E. C.
Interactive biochemical modeling and analysis [P-47C4] N72-20068
- DELESCLUSE, A.
Primary prevention of atherosclerotic cardiovascular disease among the SABENA flying personnel. A72-28293
- DESERRERES, P. J.
Mutagenic effectiveness of known doses of radiation in combination with zero gravity on *Neurospora crassa* [EXPT-P-1037] N72-20064
- DESSER, K. B.
Clinical application of the Doppler ultrasonic flowmeter. A72-26778
- DETRY, J.-M. R.
Skin and muscle components of forearm blood flow in directly heated resting man. A72-26617
- DEWAR, K. M. S.
Effect of hyperoxia on airways resistance in man. A72-26614
- DIETZ, A.
Cardiac rhythm disturbances in flying personnel. A72-28294
- DIKSHIT, M. B.
Rapid decompression in a supersonic trainer aircraft /A case report/. A72-26029
- DILLE, J. R.
Aural responsivity of a pilot following endolymphatic shunt surgery. A72-27485
- DISCALA, V. A.
Renal clearance studies of effect of left atrial distension in the dog. A72-27828
- DOMBROVSKIY, L. S.
Application of biotelemetry for research in the physiology of labor and sports: Equipment for studying freely moving people N72-20147
Application of biotelemetry in physiology of labor and sports N72-20148
- DOUGLAS, J. E.
Quantitative stress vectorcardiography.
- DOUMIT, J.
Triglyceridemia and relative weight A72-28282
- DRISCOLL, T. B.
Effects of bedrest and centrifugation of humans on serum thyroid function tests. A72-27238
Red cell mass plasma volume changes found in selected Apollo missions. A72-27477
- DUCROS, H.
Controlling the atmosphere of a sealed cabin by means of potassium superoxide A72-28266
- DYER, P. H.
Latencies for movement naming with congruent and incongruent word stimuli [AD-734299] N72-20095
- DYSSA, O. P.
Methods of information presentation to operators of automatic control systems and informative value estimates for such methods A72-26451

E

- EBBERSOLD, W. T.
Induction of lysogenic bacteria in the space environment [EXPT-P-1135] N72-20063
- EDWARDS, B. F.
The effect of weightlessness on the growth and orientation of roots and shoots of monocotyledonous seedlings [EXPT-P-1020] N72-20055
- EDWARDS, R. S.
A study of four days partial sleep deprivation. A72-26683
- EGSTROM, G. H.
Underwater work measurement techniques [AD-734014] N72-20092
- EICHERT, E. E., III
On the nature of electrosensing in the fish [AD-734C27] N72-20093
- EISELE, D. F.
Results of intravehicular manned cargo-transfer studies in simulated weightlessness [NASA-TN-D-6774] N72-21075
- EISERLING, P. A.
Induction of lysogenic bacteria in the space environment [EXPT-P-1135] N72-20063
- EKBERG, D. R.
Nuclear and cellular division in *Pelomyxa carolinensis* during weightlessness [EXPT-P-1035] N72-20061
- ELLERTSON, D. G.
Biomedical responses of humans to 110 through 175 knot /IAS/ aerial tow. A72-28272
- ENGEL, P.
The relation between diurnal variations in psychic and physical performance. A72-26691
- ENGELKEN, E. J.
Dynamic electrocardiography and computer analysis. A72-28281
- ENROTH-CUGELL, C.
Gain control in the retina and retinal dynamics. A72-27299
- ERICKSON, H.
Splanchnic blood flow and plus or minus G_x acceleration. A72-28235
- ERICKSON, H. H.
Cardiac beta-adrenergic receptors and coronary hemodynamics in the conscious dog during hypoxic hypoxia. A72-27482
Autonomic control of cardiac function and myocardial oxygen consumption during hypoxic hypoxia. A72-28313
Effects of exposure at 80,000 feet at different decompression rates. A72-28322
- ERNST, G. E.
Biocidal properties of an anti-icing additive [AD-735451] N72-21068

- EVANS, J. I.
Preliminary results of the vigilance tests from
'Project Pegasus.'
A72-26695
- EYLENBOSCH, W.
Triglyceridemia and relative weight
A72-27238
- FARAGGIANA, T.
Utilization of muscle elasticity in exercise.
A72-26615
Jumping on the moon - Power output at different
gravity values.
A72-27479
- FASSBENDER, H. G.
Systemic classification of chronic polyarthritis
A72-27822
- FAY, F. S.
Guinea pig ductus arteriosus. II - Irreversible
closure after birth.
A72-27826
- FEIN, H.
Microdimensional pressure measurements in
electrolytes.
A72-26623
- PEL'DMAN, L. A.
Standards for some hemodynamic criteria in airmen
A72-26987
- FELLER, D. D.
C14-radiorespirometry system for astronaut medical
monitoring
A72-28277
- FERGUSON, J. C.
A new approach to criterion development in the
replacement air group /RAG/.
A72-28262
- FERRIS, S. H.
Absolute distance perception under water and
improvement through training
[AD-734125] N72-20089
- FEURZBIG, W.
Automated instructional monitors for complex
operational tasks
[AD-736212] N72-21090
- FIEDLER, G.
Problems of functional diagnostics of the heart and
circulation system
A72-27271
- FITZGERALD, J. W.
Visual examination apparatus
[NASA-CASE-ARC-10329-1] N72-21079
- FLETCHER, E. E.
The biodynamics of airblast
[AD-734208] N72-21054
- FOGAL, G. L.
Urine sampling and collection system
[NASA-CR-115507] N72-20109
Pressure ramp programmer; IMBELMS Phase B4
Additional Tasks: Task 3.C pressure ramp
programmer
[NASA-CR-115508] N72-21074
- FORT, A.
Influence of sleep, lack of sleep and circadian
rhythm on short psychometric tests.
A72-26684
- FRAISSE, P.
The effects of variations in the sleep-wakefulness
cycle during a 'time-isolation' experiment on
reaction time and spontaneous tempo.
A72-26687
- FREEDMAN, S.
The effects of added elastic loads on the
respiratory response to CO2 in man.
A72-27726
- FREGLY, A. R.
Walk on floor eyes closed /WOPEC/ - A new addition
to an ataxia test battery.
A72-27476
Effect of environmental temperature on motion
sickness sweating.
A72-28362
- FREUDENTHAL, H. D.
Microbiology in zero gravity - Design considerations
and zero gravity experiments.
A72-2828C
- FREY, A. H.
On the nature of electrosensing in the fish
A72-27484
- [AD-734027] N72-20093
- FRISCH, G. D.
Retinal laser irradiation diameter estimation.
A72-25314
- FROBERG, J.
Circadian variations in performance, psychological
ratings, catecholamine excretion and urine flow
during prolonged sleep deprivation.
A72-26692
- FROST, H.
Interhemispheric effects on choice reaction times to
one-, two-, and three-letter displays.
A72-27075
- FUKUDA, K.
Growth and recovery of temporary threshold shift at
4 kHz due to a steady state noise and impulse
noises.
A72-25873
- FUNG, Y. C.
Pulmonary alveolar blood flow.
A72-26702
- PURRY, D. E.
Aeromedical considerations in the management of
paranasal sinus barotrauma.
A72-28274
- G**
- GARDNER, G. T.
Visual processing capacity and attentional control.
A72-27074
- GARSDALE, C.
Data synthesis of biological samples collected for
research in nitrogen metabolism in the sea
[CU-3826-22] N72-20084
- GASAWAY, D. C.
Listening levels preferred by flying personnel
[AD-734778] N72-20088
- GATLIN, W. P.
Roles of the ground and flight crew in Apollo
operations.
[AIAA PAPER 72-236] A72-26557
- GAULT, J. H.
Haemodynamic effects of angiographic contrast
material in man - A beat-by-beat analysis.
A72-27732
- GAUME, J. G.
Pilot incapacitation - An expression of convergent
factors.
A72-28284
- GAUSE, R. L.
Ergometer
[NASA-CASE-MFS-21109] N72-20112
- GAUTIER, H.
Chemoreflex ventilatory response to CO2 in man at
low and high altitudes.
A72-27728
- GAZENKO, O. G.
Results of biological investigations undertaken on
the Zond-5, Zond-6, and Zond-7 stations.
A72-25941
- GEBBEN, V. D.
Design of a specialized computer for on-line
monitoring of cardiac stroke volume
[NASA-TN-D-6658] N72-20108
- GERATHEWOHL, S. J.
Physiological effects of backscatter of high
intensity light pulses on the human pilot.
A72-28303
Field evaluation of light signals for use in
navigation and visual collision avoidance.
A72-28326
- GETMAN, P. F.
Certain problems involving procedures and objective
evaluation of rheoencephalogram /REG/ parameters
A72-28218
- GHOSH, P. K.
Evaluation of impact protection of crash helmets.
A72-26016
- GIBBS, C. B.
Sleep loss and information processing.
A72-2668C
- GIBSON, G. L. H.
Sleepy pilot evaluation - A simple, inexpensive
method to measure alertness.
A72-28323
- GIDEON, W. P.
Electrophysiological changes in humans during
perceptual isolation.
A72-27484

- GIEDKE, H.
The influence of sleep-interruption and of
sleep-deprivation on circadian rhythms in human
performance. A72-26685
- GIFFORD, E. C.
Selected anthropometric dimensions of naval aviation
personnel [AD-735131] N72-21067
- GILSON, J. C.
Health hazards of asbestos. A72-25548
- GIRARD, J. P. J.
Loss of sleep and combat efficiency - Effects of the
work/rest cycle. A72-26688
- GIVEN, R. R.
EEG monitoring of a free-swimming diver at a working
depth of 15 meters. A72-27478
- GLASER, Z. R.
Bibliography of reported biological phenomena
(effects), and clinical manifestations attributed
to microwave and radio frequency radiation
[AD-734391] N72-21071
- GLESER, G. C.
Radiation effects in man: Manifestations and
therapeutic effort [AD-734209] N72-20091
- GLOD, G. D.
Pathophysiological principles of air and space
pharmacology A72-27926
- GNEVYSHEV, M. N.
Effect of solar activity on the earth's atmosphere
and biosphere A72-28206
- GOBEL, F. L.
Hemodynamic correlates of myocardial oxygen
consumption during upright exercise. A72-26618
- GOLD, A. J.
Effects of altitude on cellular metabolism and
terminal oxidation [AD-734933] N72-21064
- GOLD, R. E.
Effect of hypoxia on aircraft pilot performance.
A72-28310
- GOLUBEV, A. P.
Use of a nonspecialized tape recorder for arterial
pressure recording in a form convenient for
subsequent digital processing A72-27649
- GORDON, S. I.
Impact analysis of the skull-brain system
[AD-733986] N72-20087
- GOUARS, M.
Attempt to evaluate the operational effectiveness of
military/aeronautical personnel in the course of
night duty A72-26686
- GRAGG, C. D.
Evaluation of the lap belt, Air Force shoulder
harness-lap belt and air bag plus lap belt
restraints during impact with anthropomorphic
dummies. A72-27471
- GRASSMAN, E. D.
Dynamic electrocardiography and computer analysis.
A72-28281
- GRAY, S. W.
The effect of weightlessness on the growth and
orientation of roots and shoots of
monocotyledonous seedlings [EXPT-P-1020] N72-20055
- GRAYBIEL, A.
Walk on floor eyes closed /WOPEC/ - A new addition
to an ataxia test battery. A72-27476
- The influence of vision on susceptibility to acute
motion sickness studied under quantifiable
stimulus-response conditions. A72-28258
- Goggle device for measuring the visually perceived
direction of space [NASA-CR-125859] N72-20102
- GREBENYUK, V. P.
The effect of vibration on the human body
[RAE-LIB-TRANS-1611] N72-21051
- GREEN, J. A.
Biochemical changes in the endosperm of wheat
seedlings in the weightless state [EXPT-P-1138] N72-20058
- The liminal angle of a plagiogeotropic organ under
weightlessness [EXPT-P-1017] N72-20059
- GREEN, R. S.
Aeromedical significance of frontal sinus hematomas.
A72-28275
- GREENLEAF, J. E.
+Gz tolerance after 14 days bed rest and the effects
of rehydration. A72-28295
- Comparative changes in plasma protein concentration,
hematocrit and plasma volume during exercise,
bedrest and + Gz acceleration. A72-28296
- GREENSTEIN, G.
Microbiology in zero gravity - Design considerations
and zero gravity experiments. A72-28280
- GRISHANOV, N. G.
High altitude equipment for civil aviation aircraft
[JPRS-55454] N72-20107
- GRONER, G. F.
The BIMOD system implementation [R-747-NIH] N72-20067
- The BIONOD user's reference manual [R-746-NIH] N72-20104
- GROSCHE, D. S.
Mutational and physiologic responses of Habrobracon
in Biosatellite 2 [EXPT-P-1079] N72-20050
- GROWNEY, R.
Spatial characteristics of metacontrast. A72-27680
- GRUBAR, J. C.
Loss of sleep and combat efficiency - Effects of the
work/rest cycle. A72-26688
- GUEDRY, F. E., JR.
The brief vestibular disorientation test as an
assessment tool for non-pilot aviation personnel.
A72-28256
- GUENTHER, B.
Metabolism and body size - Dimensional analysis and
similarity theories A72-26074
- GUHA, S. K.
Design for positive pressure respirators. A72-26631
- GUIER, W. H.
QRS-wave detector evaluation. A72-25499
- GUNTHER, E.
Psychological and physiological changes caused by
desynchronization following transzonal air travel.
A72-26694
- GUREVICH, M. I.
Effect of physical stress on hemodynamics in dogs
with acute arterial hypertension A72-28216
- GURFINKEL, V. S.
Biocontrol systems in cardiological studies
A72-26455
- GUTHRIE, J. W.
Investigation of the primate vestibular system
function through analysis of the vestibulo-ocular
reflex response to various input stimuli
[AD-734545L] N72-21065
- GVOZDEV, P. I.
Changes in individual physiological indexes of
parachutists A72-26988

H

- HAACK, D. W.
Effects of weightlessness on the nutrition and
growth of *Pelonyxa carolinensis* [EXPT-P-1035] N72-20062
- HAGAN, K.
Vapor cycle energy system for implantable
circulatory assist devices [PB-205474] N72-21086
- HAHN, P. M.
EEG monitoring of a free-swimming diver at a working

- depth of 15 meters. A72-27478
- HAINES, R. F.
+Gz tolerance after 14 days bed rest and the effects of rehydration. A72-28295
Effect of bedrest and positive radial acceleration upon peripheral visual response time. A72-28297
Visual examination apparatus [NASA-CASE-ARC-1:329-1] N72-21079
- HALL, E. E.
Systems engineering of Coast Guard aviator training [AD-735651] N72-21080
- HALTUNEN, P. K.
The voluntary regulation of breathing in man. A72-27843
- HAMILTON, P.
A study of four days partial sleep deprivation. A72-26683
Nychthemeral rhythms and air troopng - Some preliminary results from 'Exercise Medex.' A72-26696
- HANLEY, J.
EEG monitoring of a free-swimming diver at a working depth of 15 meters. A72-27478
- HARRIS, D. J.
Human exposure to Halon 1301 /CBrF3/ during simulated aircraft cabin fires. A72-28308
- HARRISON, G. A.
Ultrastructural changes in rat lung during long-term exposure to oxygen. A72-27531
- HART, F. D.
Electroencephalographic and behavioral effects of nocturnally occurring jet aircraft sounds. A72-27474
- HASBROOK, A. H.
Pilot tracking performance during successive in-flight simulated instrument approaches. A72-28260
A study of female pilot control force capabilities for general aviation aircraft. A72-28325
- HAUTY, G. T.
Psychological correlates of physiological circadian periodicity. A72-26681
- HAY, A. E.
The EEG and controlled hyperventilation. A72-28312
- HECTOR, E. G.
Methods of auditory display for aircraft collision avoidance systems. A72-28327
- HELLOT, M. F.
Chemoreflex ventilatory response to CO2 in man at low and high altitudes. A72-27728
- HENDEY, N. I.
Biocidal properties of an anti-icing additive [AD-735451] N72-21068
- HENDRICKS, P. L.
Cardiorespiratory response to breathing dense gas at exercise with imposed mechanical airway resistance. A72-28314
- HESSE, G.
A micromethod for rapid and specific series determination of the protein content of intact microorganisms [NASA-TT-P-14253] N72-21042
- HEWITT, J. E.
Radiation exposures during the Biosatellite 2 flight N72-20065
- HILBERMAN, M.
A phase method of calculating respiratory mechanics using a digital computer. A72-26620
- HILDEBRANDT, G.
The relation between diurnal variations in psychic and physical performance. A72-26691
- HILL, L. E.
Influence of workload patterns during the letdown, approach and landing of a Boeing 707 on nervous activity of the pilot. A72-28290
- HILL, P. R.
Reactions of pilots to warning systems for visual collision avoidance. [SAE PAPER 720312] A72-25576
- HILL, R. J.
Aural responsivity of a pilot following endolymphatic shunt surgery. A72-27485
- HILLEGAS, J.
Data synthesis of biological samples collected for research in nitrogen metabolism in the sea. [CU-3826-22] N72-20084
- HILZ, R.
Visual acuity under conditions of chromatic differences without differences in luminance [AD-734931] N72-21063
- HITCHMAN, M. J.
Automatic real-time pair feeding system for animals [NASA-CASE-ARC-10302-1] N72-21052
- HOCKEY, G. R. J.
Diurnal variation in human performance - A review. A72-26677
- HODY, G. L.
Combined skin temperature and direct heat flow measurement in a thermally stressful environment. A72-28334
- HOELEN, A. J.
An electrode system with rounded edges for direct ventricular defibrillation. A72-26628
- HOFFMAN, R. A.
Comparison of calcium and phosphorus excretion with bone density changes during restraint in immature Macaca nemestrina primates. A72-27473
- HOFFMANN, K.
Gastric motility during rest and physical exercise [NASA-TT-P-14207] N72-20074
- HOFFMANN, S. H.
Effect of a general aviation simulator on the stress of flight training. A72-28261
- HOHLWECK, H.
The technology of respiration and pulse rate measurements involving pilots A72-27417
Mechanical impedance of supine humans under sustained acceleration. A72-28270
- HOLDEN, P. M.
Analysis of five selected factors in pursuit tracking performance of men during acceleration. A72-28320
- HOLDEN, R. L.
Effects of exposure at 80,000 feet at different decompression rates. A72-28322
- HOLLAND, D.
The effects of added elastic loads on the respiratory response to CO2 in man. A72-27726
- HOLMES, S.
Safe use of asbestos plastics. A72-25549
- HOLMQUIST, R.
Theoretical foundations for a quantitative approach to paleogenetics. I, II. A72-27160
- HOLTMANN, H. W.
The relationship of oxygen uptake and body temperature in man in acute and severe hypoxia [DLR-FB-71-65] N72-21053
- HOLTZ, J.
Treadmill exercise in dogs under beta-adrenergic blockade - Adaptation of coronary and systemic hemodynamics. A72-25802
- HOOD, W. H.
Comparison of calcium and phosphorus excretion with bone density changes during restraint in immature Macaca nemestrina primates. A72-27473
- HOROWITZ, N. H.
The search for life on Mars - Where we stand today. A72-27624
- HORVAT, M.
Serum cortisol, plasma free fatty acids, and urinary catecholamines as indicators of complications in

- acute myocardial infarction. A72-26787
- HORVATH, S. H.**
Comparisons between bicycle ergometry and treadmill walking maximum capacity tests. A72-26095
- HORWITZ, H.**
Radiation effects in man: Manifestations and therapeutic effort [AD-734209] N72-20091
- HORWITZ, L. D.**
Left ventricular pressure-dimension relationships in the conscious dog. A72-26773
- HOVEY, R. J.**
Research and development of an ocular laser protective filter [AD-735799] N72-21083
- HUDSON, P. H.**
A monolithic micropower command receiver. A72-26564
- HUFFMAN, F. H.**
Vapor cycle energy system for implantable circulatory assist devices [PB-255474] N72-21086
- HUMBERT, J. E.**
Automatic real-time pair feeding system for animals [NASA-CASE-ARC-11302-1] N72-21052
- HYMAN, R.**
Interhemispheric effects on choice reaction times to one-, two-, and three-letter displays. A72-27075
- I
- IAKIMENKO, A. V.**
Biocontrol systems in cardiological studies A72-26455
- IAKIMOV, N. A.**
Recognition of figures during voluntary saccadic eye movements. A72-27310
- IAMOVSKII, E. SH.**
Responses of auditory-cortex neurons to electrical stimulation of the medial geniculate body A72-27651
- IASHKOV, V. T.**
Biocontrol systems in cardiological studies A72-26455
- ICHEV, K. N.**
Ultrastructure of the capillaries of the spinal cord upon hypothermy. A72-27304
- IKELS, K. G.**
Contaminant detector for aviator's breathing oxygen. A72-28253
- INOUE, G. T.**
Ultrasensitive magnetic field measurements in the presence of high ambient noise levels - Application to magnetocardiography. A72-27288
- INTAGLIETTA, M.**
On-line measurement of microvascular dimensions by television microscopy. A72-26621
- IUSHINA, L. V.**
Models and characteristics of olfactory receptors A72-26453
- J
- JACEY, M. J.**
Biochemistry of submarine and diving stress. 1: Lactate-pyruvate and redox chronic hypercapnia [AD-734120] N72-21057
Biochemistry of submarine and diving stress. 4: Responses of blood lactate-pyruvate and redox state to chronic exposure to 3 percent CO2 [AD-734122] N72-21059
- JACKMAN, R. W.**
Contamination threats to critical surfaces from handling and storage practices. A72-27042
- JACOBY, I.**
Safety margins in the implementation of planetary quarantine requirements [NASA-CR-126032] N72-21050
- JAIN, V. K.**
Design for positive pressure respirators. A72-26631
- JANSSEN, P. J.**
A study of the absorption and scattering factors of light in whole blood. A72-26630
- JASKUNAS, S. R.**
Effects of hyperoxic breathing gases on blood cell formation. A72-28298
- JEANTHEAU, G. G.**
Training device employment materials [AD-733962] N72-20118
- JERRETT, S. A.**
Seizures, H2O2 formation, and lipid peroxides in brain during exposure to oxygen under high pressure. A72-28300
- JETHON, Z.**
Weightlessness A72-26891
- JOHANSSON, R. B.**
Biotechnology and applied psychology [RAE-LIB-TRANS-1597] N72-20073
- JOHNSON, L.**
Sleep stages and performance. A72-26682
- JOHNSON, P. C.**
Effects of bedrest and centrifugation of humans on serum thyroid function tests. A72-27477
Red cell mass plasma volume changes found in selected Apollo missions. A72-28266
- JOHNSON, S. P.**
Biochemical changes in the endosperm of wheat seedlings in the weightless state [EXPT-P-1138] N72-20058
The liminal angle of a plagiogeotropic organ under weightlessness [EXPT-P-1017] N72-20059
- JONES, K. W.**
Self-estimates of distractibility as related to lapses of attention during perceptual-motor performance. A72-28307
- JONES, R. K.**
The biodynamics of airblast [AD-734208] N72-21054
- JORDAN, J. P.**
Metabolic effects of artificial environments [NASA-CR-62079] N72-21041
- JORGENSEN, C. R.**
Hemodynamic correlates of myocardial oxygen consumption during upright exercise. A72-26618
Simplified estimation of aortic valve area. A72-27734
- JOVI, D.**
Psychological and physiological changes caused by desynchronization following transzonal air travel. A72-26694
- JUDGE, D. L.**
Ultrasensitive magnetic field measurements in the presence of high ambient noise levels - Application to magnetocardiography. A72-27288
- JUNKER, A. M.**
Investigation of the primate vestibular system function through analysis of the vestibulo-ocular reflex response to various input stimuli [AD-734545L] N72-21065
- K
- KACIRK, J. J.**
Combined skin temperature and direct heat flow measurement in a thermally stressful environment. A72-28334
- KADOBAYASHI, I.**
Effects of lenticular stimulation on unitary and mass responses of the visual cortex to light. A72-25801
- KAGAN, M. R.**
Airway resistance measurement at depth [AD-735462] N72-21081
- KAHNG, S. K.**
Blood-pressure transducer. A72-27961

- KABON, E.**
Maximal aerobic power during laddermill climbing, uphill running, and cycling. A72-26612
- KAPLAN, H. O.**
Separate physiological roles for two isozymes of pyridine nucleotide-linked glycerol-3-phosphate dehydrogenase in chicken. A72-27161
- KARIM, B. B.**
A study of female pilot control force capabilities for general aviation aircraft. A72-28325
- KARLNER, J. S.**
Haemodynamic effects of angiographic contrast material in man - A beat-by-beat analysis. A72-27732
- KARLSSON, C. G.**
Circadian variations in performance, psychological ratings, catecholamine excretion and urine flow during prolonged sleep deprivation. A72-26692
- KELLER, E. C., JR.**
Induction of lysogenic bacteria in the space environment [EXPT-P-1135] N72-20063
- KELLY, J. R.**
Effect of a general aviation simulator on the stress of flight training. A72-28261
- KELLOGG, R. H.**
The effect of graded hypoxia with and without exercise on ventilatory acclimatization. A72-27727
- KENNEDY, K. W.**
Involuntary head movements, and helmet motions during centrifuge runs of up to 6 Gz. A72-28288
Displacements of a helmet-attached reticle under G-forces. A72-28330
- KENNEDY, R. S.**
Selected anthropometric dimensions of naval aviation personnel [AD-735101] N72-21067
- KENYON, E.**
Astronauts' menu problem. A72-27442
- KEREIAKES, J. G.**
Radiation effects in man: Manifestations and therapeutic effort [AD-734209] N72-20091
- KHILTUNEN, H.**
Effect of the cerebral cortex on the progress of cardio-cardiac reflexes A72-27647
- KHUDIAKOV, A. V.**
Biocontrol systems in cardiological studies A72-26455
- KING, A. B.**
Ventilation response to hypoxia and acute mountain sickness. A72-27481
- KINNEY, M. J.**
Renal clearance studies of effect of left atrial distension in the dog. A72-27828
- KIRBY, A.**
Gain control in the retina and retinal dynamics. A72-27299
- KIRCHHOFF, H. W.**
Cardiac rhythm disturbances in flying personnel. A72-28294
- KIRK, J. H.**
Body weight variation in primates exposed to 55 Mev protons [AD-734779] N72-21066
- KISER, H. N.**
Quantitative stress vectorcardiography. A72-28282
- KISLOVSKII, L. D.**
A possible molecular mechanism of the effects of solar activity on processes in the biosphere A72-28213
- KISSEN, A. T.**
Free 17-hydroxycorticosteroid levels in parotid fluid as indicators of physiologic strain in hyperthermic stress. A72-28335
- KITAHARA, K.**
Hemodynamic correlates of myocardial oxygen consumption during upright exercise. A72-26618
- KITZING, J.**
Impulses and effector measures of thermoregulation during rest and exercise. I, II A72-25874
- KLEIN, K. E.**
Psychological and physiological changes caused by desynchronization following transzonal air travel. A72-26694
The relationship of oxygen uptake and body temperature in man in acute and severe hypoxia [DLR-FB-71-65] N72-21053
- KLEMM, D. E.**
Biocidal properties of an anti-icing additive [AD-735451] N72-21068
- KO, W.-H.**
A micropower monolithic transmitter for single- or multichannel biomedical telemetry. A72-26563
- KOBLINGER, L.**
Two codes for calculation of dose distribution in human phantoms irradiated by external photon sources [KFKI-71-12] N72-20082
- KOCH, H.**
Sonar Doppler discrimination in high noise environments [AD-734118] N72-21056
- KOLACZKOWSKA, B.**
Serum peptidases in myocardial infarction. A72-25851
- KONING, G.**
An electrode system with rounded edges for direct ventricular defibrillation. A72-26628
- KORABOWSKI, J. J.**
Method of forming a root cord restrained convolute section [NASA-CASE-MSC-12398] N72-20098
- KOSHIDER, S.**
Experimental and clinical studies in the treatment of arrhythmias due to digitalis by sodium citrate [NASA-TT-P-14194] N72-21045
- KOWALSKY, H. B.**
Cardiac electro-mechanical time intervals as indices of hypoxic circulatory stress in man. A72-27470
- KRAEV, I. N.**
Some results of the development and investigation of devices for checking the cardiovascular system A72-26464
- KRAMER, K.**
Energy metabolism A72-26072
Energy conversion in humans during muscle activity A72-26075
- KRAUSE, H.**
Mechanical impedance of supine humans under sustained acceleration. A72-28270
- KRISHNAMURTI, S.**
Effects of positive acceleration on the electrocardiogram. A72-26015
- KROEMER, K. H. E.**
Involuntary head movements, and helmet motions during centrifuge runs of up to 6 Gz. A72-28288
Displacements of a helmet-attached reticle under G-forces. A72-28330
- KRUPINA, T. N.**
Pedal operation by the seated operator [AD-735315] N72-21089
Changes in the nervous system during a 120 day clinostatic hypokinesia and the prophylaxis of hypokinetic disorders [NASA-TT-P-14225] N72-21046
- KRUTZ, R. W.**
Arterial blood gas tension using phased dilution oxygen delivery technics. A72-28255
- KRZANOWSKI, W. J.**
Influence of workload patterns during the letdown, approach and landing of a Boeing 707 on nervous activity of the pilot. A72-28290

- KUCHARCZYK, M.
Treadmill exercise in dogs under beta-adrenergic blockade - Adaptation of coronary and systemic hemodynamics. A72-258C2
- KUL'BABA, G. I.
Certain problems involving procedures and objective evaluation of rheoencephalogram /REG/ parameters A72-28218
- KULAK, L. L.
Effect of hypoxia on aircraft pilot performance. A72-28310
- KURTISHVILI, T. G.
Age-related angioarchitectonic features of the optic lobe of the human brain A72-26675
- L
- LAGEMANN, K.
Gastric motility during rest and physical exercise [NASA-TT-F-142C7] N72-20074
- LANCASTER, M. C.
Dynamic electrocardiography and computer analysis. A72-28281
Quantitative stress vectorcardiography. A72-28282
USAF aeromedical consult service experience in causes for grounding over the past fifteen years. A72-28316
- LANDSBERG, W.
Analysis of aircraft accidents in a F-104 squadron of the navy A72-2782C
- LANE, N. E.
Utilization of anthropometric data in resolving pilot/aircraft incompatibility. A72-28324
- LANGSTON, E. D.
Effectiveness of restraint equipment in enclosed areas [FAA-AM-72-6] N72-21978
- LANSDOWN, E. L.
Computer determination of left ventricular volume using videodensitometry. A72-26627
- LATEGOLA, M. T.
The use of simple indicators for detecting potential coronary heart disease susceptibility in the air traffic control population. A72-28265
- LAU, C.
Adrenocortical function in hypothalamic deafferented rats maintained at high altitude. A72-27829
- LAWTON, B. W.
Effects of noise on the performance of a memory decision response task [NASA-TN-D-6675] N72-20071
- LAZAREV, I. I.
Recommendations for drawing up provisional safety rules for working with lasers. A72-27615
- LEACH, C. S.
Effects of bedrest and centrifugation of humans on serum thyroid function tests. A72-27477
- LEBEDEV, V. P.
Use of a nonspecialized tape recorder for arterial pressure recording in a form convenient for subsequent digital processing A72-27649
- LEDINGHAM, I. MCA.
Effect of hyperoxia on airways resistance in man. A72-26614
- LEFEBVRE, L.
Triacylglyceridemia and relative weight A72-27238
- LEFRANCOIS, R.
Chemoreflex ventilatory response to CO₂ in man at low and high altitudes. A72-27728
- LENOX, J. B.
Tolerance of physically fit young men to exercise and graded levels of inspired PCO₂ up to 40 mm Hg. A72-28311
- LEON, H. A.
Automatic real-time pair feeding system for animals [NASA-CASE-ARC-1C302-1] N72-21052
- LEONARD, J. M.
Biocidal properties of an anti-icing additive [AD-735451] N72-21068
- LEONDES, C. T.
Modeling the effects of pilot performance on weapon delivery accuracy. A72-28121
- LEROY, J.
Chemoreflex ventilatory response to CO₂ in man at low and high altitudes. A72-27728
- LESSO, W. G.
Astronauts' menu problem. A72-27442
- LEVCHENKO, D. G.
Principles of designing the input elements of transistorized amplifiers of biopotentials A72-26468
- LEVERE, T. E.
Electroencephalographic and behavioral effects of nocturnally occurring jet aircraft sounds. A72-27474
- LEVERETT, S. D., JR.
Physiological response in pilot/back-seat man during aerial combat maneuvers in F-4E aircraft. A72-28317
Protective effects of the Valsalva and M-1 maneuvers during +G sub z acceleration. A72-28318
+G sub z protection afforded by a modified partial pressure suit. A72-28319
- LEVI, L.
Circadian variations in performance, psychological ratings, catecholamine excretion and urine flow during prolonged sleep deprivation. A72-26692
- LEWIS, S. A.
Preliminary results of the vigilance tests from 'Project Pegasus.' A72-26695
- LEWIS, S. T.
Decompression sickness in USAF operational flying, 1968-1971. A72-28283
- LIDBERG, L.
Circadian variations in performance, psychological ratings, catecholamine excretion and urine flow during prolonged sleep deprivation. A72-26692
- LIND, A. R.
Comparison of volume and strain-gauge plethysmography during static effort. A72-26622
- LINDNER, R.
A micromethod for rapid and specific series determination of the protein content of intact microorganisms [NASA-TT-F-14253] N72-21042
- LITTELL, J. K.
Erythrocyte life-span in mice acclimatized to different degrees of hypoxia. A72-26608
- LIU, F. P.
Respiratory analysis system [NASA-CASE-MS-C-13436-1] N72-20113
- LLOYD, A. J.
Auditory EMG feedback during a sustained submaximum isometric contraction [AD-734300] N72-20094
The physical performance of the hyperventilator [AD-734298] N72-21072
- LOTHAR, W.
Use of moire fringes for testing visual acuity of the retina. A72-27953
- LOVE, J. S.
A model for predicting aortic dynamic response to -G sub z impact acceleration. A72-28271
- LOW, A. F.
The significance of hydrospace medicine for manned interplanetary space flights A72-27415
- LOWE, O. A.
Compilation of published information on elemental concentrations in human organs in both normal and diseased states. 1: raw data ordered by atomic

- number, subordered by organ and suborgan, listing method of analysis, geographical source, age, sex, number of individuals
[UCRL-51013-PT-1-REV-1] N72-20081 A72-26615
Jumping on the moon - Power output at different gravity values. A72-27479
- LOWREY, D. L.
Effectiveness of restraint equipment in enclosed areas
[FAA-AM-72-6] N72-21078
- LOBIN, A.
Sleep stages and performance. A72-26682
- LODLAM, W. M.
The use of visual evoked responses in objective refraction. A72-25349
- LUKAS, G.
Automated instructional monitors for complex operational tasks
[AD-736212] N72-21090
- LUTZ, A. M.
KWIC index to biological effects and related technology of lasers and light
[PB-205391] N72-21070
- LYLE, R. G.
Contamination control through filtration of microorganisms
[NASA-CR-126035] N72-21047
Contamination control by use of ethylene oxide
[NASA-CR-126034] N72-21048
- LYMAN, C. P.
Sensitivity to low temperature in hibernating rodents. A72-27827
- LYON, C. J.
Growth physiology of the wheat seedling in space
[EXPT-P-1096] N72-20056
- M**
- MAAS, J.
Quantity of bone marrow which must be protected in order to ensure the survival of pigs irradiated with a lethal dose
[FRNC-TH-97] N72-20078
- MACK, P. B.
Comparison of calcium and phosphorus excretion with bone density changes during restraint in immature Macaca nemestrina primates. A72-27473
- MALCOLM, J.
Primary prevention of atherosclerotic cardiovascular disease among the SABENA flying personnel. A72-28293
- MANONOVA, E. I.
Methods of information presentation to operators of automatic control systems and informative value estimates for such methods A72-26451
- MANCINI, R.
Advance techniques for monitoring human tolerance to +Gz accelerations. A72-28328
- MANGIALARDI, J. K.
Urine sampling and collection system
[NASA-CR-115507] N72-20109
- MANN, H.
The effects of a cumulative sleep deficit, duration of preceding sleep period and body-temperature on multiple choice reaction time. A72-26690
- MANNING, R. R.
Contamination threats to critical surfaces from handling and storage practices. A72-27042
- MANSUROV, T.
Effect of physical stress on hemodynamics in dogs with acute arterial hypertension A72-28216
- MANUKHIN, B. B.
Effect of preadaptation to hypoxia on the myocardium noradrenalin content in rats with experimental vitium cordis A72-27648
- MARCUS, P.
Some effects of radiant heating of the head on body temperature measurement at the ear. A72-28333
- MARGARIA, R.
Utilization of muscle elasticity in exercise.
- MARINUTHU, K. M.
Radiobiologic studies of Tradescantia plants orbited in Biosatellite 2
[EXPT-P-1123] N72-20054
- MARROWI, M. A., JR.
Method of forming a root cord restrained convolute section
[NASA-CASE-MSC-12398] N72-20098
- MARTIN, W. H.
Compilation of published information on elemental concentrations in human organs in both normal and diseased states. 1: raw data ordered by atomic number, subordered by organ and suborgan, listing method of analysis, geographical source, age, sex, number of individuals
[UCRL-51013-PT-1-REV-1] N72-20081
- MARTONE, J. A.
A rocket propellant handler's suit for protection from chloride trifluoride and elemental fluorine
[AD-731556] N72-20115
- MATHEWS, J. J.
A proposed new test for improved aptitude screening of applicants for air traffic control training. A72-28252
- MATSUO, J. T.
Biomedical responses of humans to 110 through 175 knot /IAS/ aerial tow. A72-28272
- MATTONI, R. H. T.
Induction of lysogenic bacteria in the space environment
[EXPT-P-1135] N72-20063
- MAY, E.
Mechanical impedance of supine humans under sustained acceleration. A72-28270
- MAYS, D. M.
Technical facilities summary
[AD-734544] N72-20119
- MCCLURE, J. A.
Effect of environmental temperature on motion sickness sweating. A72-28302
- MCCULLOUGH, B.
An energy-absorbing seat design for light aircraft.
[SAE PAPER 720322] A72-25585
- MEERSON, F. Z.
Effect of preadaptation to hypoxia on the myocardium noradrenalin content in rats with experimental vitium cordis A72-27648
- MEIER, U.
Effects of a multi-hour immersion on trained and untrained subjects. II - Blood protein and electrolyte concentrations. A72-27480
- MEINDL, J. D.
A monolithic micropower command receiver. A72-26564
- MEINERI, G.
Pulmonary capillary blood flow of human subjects in different body positions. A72-28286
- MELTON, C. E., JR.
Effect of a general aviation simulator on the stress of flight training. A72-28261
- MELVIN, J. M.
Panper or ignore. A72-27516
- MERCER, T. T.
Production and characterization of aerosols
[UR-3490-3] N72-20085
- MERTENS, J.
Psychological and physiological changes caused by desynchronization following transzonal air travel. A72-26694
- MERZ, J.
Cardiorespiratory response to breathing dense gas at exercise with imposed mechanical airway resistance. A72-28314
- MESSIER, A. A.
Biochemistry of submarine and diving stress. 4: Responses of blood lactate-pyruvate and redox

- state to chronic exposure to 3 percent CO2
[AD-734122] N72-21059
- MEYERS, R. R.
The use of visual evoked responses in objective
refraction. A72-25349
- MICHAELIS, B.
Data processing in biological sensors A72-27577
Engineering modeling of data encoding in biological
sensors A72-27578
- MICHAELSON, E. D.
An ear oximeter for use on the human centrifuge.
A72-28278
Blood oxygenation in man during high, sustained +Gz.
A72-28287
- MICHAELSON, S. H.
Human exposure to nonionizing radiant energy -
Potential hazards and safety standards. A72-27963
- MILLER, D. A.
Improved dialyzer
[NASA-CASE-HQN-10741] N72-20114
- MILLER, E. F., II
Goggle device for measuring the visually perceived
direction of space
[NASA-CR-125859] N72-20102
- MILLER, G. L.
Cardiorespiratory response to breathing dense gas at
exercise with imposed mechanical airway
resistance. A72-28314
- MILLER, R. L.
Contaminant detector for aviator's breathing oxygen.
A72-28253
- MILLER, W. J.
Portable detector of low amplitude
electrocardiographic activity
[AD-735882] N72-21084
- MILLS, J. H.
Influence of sleep, lack of sleep and circadian
rhythm on short psychometric tests. A72-26684
- MILROY, W. C.
Neuroendocrine effects of microwave radiation.
A72-28321
- MIMS, J. L., III
An evaluation of the Landolt ring radioactive plaque
night vision tester. A72-28332
- MINKE, B.
Latencies and correlation in single units and visual
evoked potentials in the cat striate cortex
following monocular and binocular stimulations.
A72-26771
- MITCHELL, J. W.
Respiratory weight losses during exercise. A72-26613
- MIZUNUMA, H.
Metabolic and hormonal effects of prolonged
hypo-dynamics. A72-28267
- MOHS, G.
Engineering modeling of data encoding in biological
sensors A72-27578
- MONTEIL, A. C.
Loss of sleep and combat efficiency - Effects of the
work/rest cycle. A72-26688
- MOONEY, V.
Orthopedic applications of biocarbon implants.
A72-28295
- MOORE-ROBINSON, H.
Preliminary results of the vigilance tests from
'Project Pegasus.' A72-26695
- MORIUCHI, S.
New method of dose evaluation by spectrum dose
conversion operator and determination of the
operator
[JAERI-1209] N72-20076
- MORONEY, W. F.
Utilization of anthropometric data in resolving
pilot/aircraft incompatibility. A72-28324
Selected anthropometric dimensions of naval aviation
personnel
- [AD-735101] N72-21067
- MORRILL, C. G.
The effect of graded hypoxia with and without
exercise on ventilatory acclimatization. A72-27727
- MORSE, A. L.
Ultrasensitive magnetic field measurements in the
presence of high ambient noise levels -
Application to magnetocardiography. A72-27288
- MOSES, J.
Sleep stages and performance. A72-26682
- MUECKENHOFF, K.
Studies on the central chemosensitive mechanism of
respiration. I A72-26660
- MUELLEB, R.
A micromethod for rapid and specific series
determination of the protein content of intact
microorganisms
[NASA-TT-P-14253] N72-21042
- MURPHY, M. R.
Circadian rhythms of visual accommodation responses
and physiological correlations. A72-28306
- MURTY, V. S. N.
An episode of disorientation in flight /A case
report/. A72-26019
- MUZALEVSKAIA, N. I.
Biological activity of a perturbed geomagnetic field
A72-28210
- MUZZY, W. H.
Evaluation of the lap belt, Air Force shoulder
harness-lap belt and air bag plus lap belt
restraints during impact with anthropomorphic
dummies. A72-27471
- MYHIN, D.
Computer determination of left ventricular volume
using videodensitometry. A72-26627
- N
- NADEL, E. R.
Respiratory weight losses during exercise. A72-26613
- NAGORNYI, S. I.
Standards for some hemodynamic criteria in airmen
A72-26987
- NAITOH, P.
Sleep stages and performance. A72-26682
- NAKAYA, M.
Metabolic and hormonal effects of prolonged
hypo-dynamics. A72-28267
- NESTERENKO, M. T.
Recommendations for drawing up provisional safety
rules for working with lasers. A72-27615
- NEVILLE, E. D.
C14-radiorespirometry system for astronaut medical
monitoring. A72-28277
- NICHOLSON, A. N.
Influence of workload patterns during the letdown,
approach and landing of a Boeing 707 on nervous
activity of the pilot. A72-28290
- NIELSEN, M.
The control of body temperature in muscular work
[RAE-LIB-TRANS-1610] N72-20072
- NINOW, E. H.
The man-machine interface - A study of injuries
incurred during ejection from U.S. Navy aircraft.
A72-28273
- NOSOV, V. M.
Principles of designing the input elements of
transistorized amplifiers of biopotentials
A72-26468
- NOVIKOV, A. A.
Certain problems involving procedures and objective
evaluation of rheoencephalogram /REG/ parameters
A72-28218
- NOWOSAD, H.
Serum peptidases in myocardial infarction.

- O
- A72-25851 Circle vs triangle and 'red vs green' discrimination.
- O'BRIEN, R. C. Sensitivity to low temperature in hibernating rodents. A72-27827
- O'CONNOR, P. J. The EEG and controlled hyperventilation. A72-28312
- OGLE, J. S. Whole body measurement system [NASA-CASE-HSC-13972-1] N72-20105
- OKADA, A. Growth and recovery of temporary threshold shift at 4 kHz due to a steady state noise and impulse noises. A72-25873
- OKHOTSKAYA, V. W. Models and characteristics of olfactory receptors A72-26453
- OL', A. I. Effect of solar activity on the earth's atmosphere and biosphere A72-28206
- OLERON, G. The effects of variations in the sleep-wakefulness cycle during a 'time-isolation' experiment on reaction time and spontaneous tempo. A72-26687
- OOSTERVELD, W. J. The influence of vision on susceptibility to acute motion sickness studied under quantifiable stimulus-response conditions. A72-28258
- ORBAN, V. Biochemical changes in blood and urine indicating radiation damage: A literature review, part-1 [SZS-7/71-PT-1] N72-20083
- ORNER, G. M. Development and evaluation of an oxygen-sensing warning device [AD-735377] N72-21082
- ORSBORN, J. Nycthemeral rhythms and air drooping - Some preliminary results from 'Exercise Medex.' A72-26696
- OSTER, I. I. Genetic implications of spaceflight [EXPT-P-116C] N72-20051
- P
- PAGE, W. Triglyceridemia and relative weight A72-27238
- PANDOLF, K. B. Maximal aerobic power during laddermill climbing, uphill running, and cycling. A72-26612
- PANGMAN, C. H. Changes in auditory flutter fusion frequency during prolonged visual deprivation. A72-27418
- PARFENOV, G. P. Results of biological investigations undertaken on the Zond-5, Zond-6, and Zond-7 stations. A72-25941
- PARKER, E. L. Application and design characteristics of generalized training devices [AD-733471] N72-20116
- PARKHURST, H. J. +G sub z protection afforded by a modified partial pressure suit. A72-28319
- PARNELLY, W. W. Serum cortisol, plasma free fatty acids, and urinary catecholamines as indicators of complications in acute myocardial infarction. A72-26787
- PASIK, P. Extrageniculostriate vision in the monkey. III - Circle vs triangle and 'red vs green' discrimination. A72-26772
- PASIK, T. Extrageniculostriate vision in the monkey. III -
- PASQUIS, F. Chemoreflex ventilatory response to CO2 in man at low and high altitudes. A72-26772
- PATTIJN, J. Glottis opening and airway resistance. A72-27728
- PATTON, J. M. S. The effects of added elastic loads on the respiratory response to CO2 in man. A72-26611
- PEARSON, R. G. The effects of intermittent noise on human serial decoding performance and physiological response. A72-28289
- PEETERS, H. Triglyceridemia and relative weight A72-27238
- PELLIGNA, R. Advance techniques for monitoring human tolerance to +Gz accelerations. A72-28328
- PETERS, R. H. A phase method of calculating respiratory mechanics using a digital computer. A72-26620
- PETERS, W. R. An ear oximeter for use on the human centrifuge. A72-28278
A portable, self-contained digital thermometer [AD-735662] N72-21087
- PHELPS, P. L. Sensitivity problems in biological and environmental counting [UCRL-73505] N72-20079
- PICCARDI, G. Solar activity and chemical tests A72-28212
- PILMANIS, A. A. EEG monitoring of a free-swimming diver at a working depth of 15 meters. A72-27478
- PINNEY, L. R. Mathematical analysis and description of continuous human behavior [AD-734681] N72-21060
- PODOLAK, E. Measures of cardiovascular risk. A72-28264
- PODVIGIN, N. P. Study of the spatial interaction of retinal nerve cells A72-26454
- POEHLMANN, H. C. Contamination threats to critical surfaces from handling and storage practices. A72-27042
- PONNAMPERUMA, C. Primordial organic chemistry and the origin of life. A72-27529
- POPPEL, E. The influence of sleep-interruption and of sleep-deprivation on circadian rhythms in human performance. A72-26685
- POPPELL, S. E. Arterial blood gas tensions using phased dilution oxygen delivery technics. A72-28255
- PRAKASH, R. Serum cortisol, plasma free fatty acids, and urinary catecholamines as indicators of complications in acute myocardial infarction. A72-26787
- PRAETHER, J. W. Pneumograph recording using a cotton-wick probe. A72-26619
- PRICE, R. W. Effects of weightlessness on the nutrition and growth of *Pelomyxa carolinensis* [EXPT-P-1035] N72-20062
- PROFIE, V. R. Recommendations for drawing up provisional safety rules for working with lasers. A72-27615

- PROVOST, J. B.
Selected anthropometric dimensions of naval aviation personnel
[AD-735101] N72-21067
- PSHENNIKOVA, M. G.
Effect of preadaptation to hypoxia on the myocardium noradrenalin content in rats with experimental vitium cordis A72-27648
- PULEO, L. E.
Oxygen-modified collagen and its possible pathological significance. A72-27483
- Q**
- QUIDEAU, A. M. C.
Loss of sleep and combat efficiency - Effects of the work/rest cycle. A72-26688
- R**
- RAINA, V.
Detection of nucleic acid bases in photochemically synthesized self sustaining coacervates. A72-27657
- RAISHMAN, G.
An experimental study of the projection of the amygdala to the accessory olfactory bulb and its relationship to the concept of a dual olfactory system. A72-26770
- RANDLE, R. J.
Circadian rhythms of visual accommodation responses and physiological correlations. A72-28306
- RANGANAYAKI, S.
Detection of nucleic acid bases in photochemically synthesized self sustaining coacervates. A72-27657
- RANKINE, R. R., JR.
Modeling the effects of pilot performance on weapon delivery accuracy. A72-28121
- RAO, P. L. N.
Cardiovascular responses in pressure breathing. A72-26017
- RASMUSSEN, P. G.
Pilot tracking performance during successive in-flight simulated instrument approaches. A72-28260
- RASQUIN, J. R.
Underwater space suit pressure control regulator [NASA-CASE-MFS-20332] N72-20097
- RAVEN, P. B.
Comparisons between bicycle ergometry and treadmill walking maximum capacity tests. A72-26095
- RAYMAN, R. B.
Aircraft accidents/incidents among aircrewmembers flying with medical waiver. A72-28315
- RAZUMEEV, A. N.
Pathophysiological principles of air and space pharmacology A72-27926
- REED, W.
Effectiveness of restraint equipment in enclosed areas [FAA-AM-72-6] N72-21078
- REESE, R. D.
Effect of bedrest on thermoregulation. A72-28301
- REID, D. H.
Biomedical responses of humans to 110 through 175 knot /IAS/ aerial tow. A72-28272
- REINHARDT, C. G.
Urine sampling and collection system [NASA-CR-115507] N72-20109
Pressure ramp programmer; IMBLS Phase B4
Additional Tasks: Task 3.0 pressure ramp programmer [NASA-CR-115508] N72-21074
- RENEHAN, R. S.
An electrode system with rounded edges for direct ventricular defibrillation. A72-26628
- RENTSCH, W.
A thermistor pulse transducer - Theoretical and practical aspects. A72-26633
- REPLOGLE, C. R.
Analysis of five selected factors in pursuit tracking performance of men during acceleration. A72-28320
Investigation of the primate vestibular system function through analysis of the vestibulo-ocular reflex response to various input stimuli [AD-734545L] N72-21065
- REYNOLDS, O. E.
The scientific conclusions of Biosatellite 2 N72-20066
- RICE, E. V.
The man-machine interface - A study of injuries incurred during ejection from U.S. Navy aircraft. A72-28273
- RICH, P. M.
Reactions of pilots to warning systems for visual collision avoidance. A72-25576
[SAE PAPER 720312]
- RICHARDSON, B.
Effects of hyperoxic breathing gases on blood cell formation. A72-28298
- RICHARDSON, P. C.
The extraction of sleep information from heart rate data: Analysis of the sleep cycle [AD-734283] N72-21061
- RICHMOND, D. R.
The biodynamics of airblast [AD-734208] N72-21054
- RIMPLER, A.
Psychological and physiological changes caused by desynchronization following transzonal air travel. A72-26694
- RITMAN, E. L.
Liquid breathing - Prevention of pulmonary arterial-venous shunting during acceleration. A72-26609
- ROBINSON, C. E.
Contaminant detector for aviator's breathing oxygen. A72-28253
- ROBINSON, S. M.
Ventilation response to hypoxia and acute mountain sickness. A72-27481
- ROBINSON, W. L.
Compilation of published information on elemental concentrations in human organs in both normal and diseased states. 1: raw data ordered by atomic number, subordered by organ and suborgan, listing method of analysis, geographical source, age, sex, number of individuals [UCRL-51013-PT-1-REV-1] N72-20081
- ROELS, O. A.
Data synthesis of biological samples collected for research in nitrogen metabolism in the sea [CU-3826-22] N72-20084
- ROGERS, A. F.
Antarctic climate, clothing and acclimatization [AD-734071] N72-21055
- ROGERS, D. B.
Analysis of five selected factors in pursuit tracking performance of men during acceleration. A72-28320
- ROHIG, W. R.
Induction of lysogenic bacteria in the space environment [EXPT-P-1135] N72-20063
- ROSEN, A.
Ultrasensitive magnetic field measurements in the presence of high ambient noise levels - Application to magnetocardiography. A72-27288
- ROSITANO, S.
Advance techniques for monitoring human tolerance to +Gz accelerations. A72-28328
- ROSITANO, S. A.
Visual examination apparatus [NASA-CASE-ARC-10329-1] N72-21079
- ROSS, R. S.
QRS-wave detector evaluation. A72-25499
- ROTH, R. C.
Pamper or ignore. A72-27516

- ROWELL, L. B.
Skin and muscle components of forearm blood flow in directly heated resting man. A72-26617
- ROZENBERG, V. D.
Experimental study of the effect of extremely-low-frequency electromagnetic fields on warm-blooded animals and microorganisms A72-28214
- ROZENBLAT, V. V.
Application of biotelemetry in physiology of labor and sports N72-20148
- RUBIN, J.
A technique for the solution of massive set covering problems, with application to airline crew scheduling [TR-320-3004] N72-20099
Airline crew scheduling: The non-mathematical problem [TR-320-3006] N72-20100
- RUFF, S.
Experimental and theoretical investigation of the decompression problem [DLR-FB-71-48] N72-20075
- ROTEMPRANZ, J.
The effects of a cumulative sleep deficit, duration of preceding sleep period and body-temperature on multiple choice reaction time. A72-26690
- RYBAKOV, B. K.
Effects of hyperoxia on coagulating and anticoagulating systems in blood [JPRS-55553] N72-21044
- S**
- SAENGER, E. L.
Radiation effects in man: Manifestations and therapeutic effort [AD-734209] N72-20091
- SAIKI, H.
Metabolic and hormonal effects of prolonged hypo-dynamics. A72-28267
- SAKSONOV, P. P.
Problems of space biology. Volume 9: Outline of space radiobiology [NASA-TT-F-604] N72-20039
- SALDIVAR, J. T., JR.
Effect of a general aviation simulator on the stress of flight training. A72-28261
- SAMONINA, G. E.
Effect of the cerebral cortex on the progress of cardio-cardiac reflexes A72-27647
- SANDLER, H.
Splanchnic blood flow and plus or minus Gx acceleration. A72-28285
+Gz tolerance after 14 days bed rest and the effects of rehydration. A72-28295
Advance techniques for monitoring human tolerance to +Gz accelerations. A72-28328
- SASS, D. J.
Liquid breathing - Prevention of pulmonary arterial-venous shunting during acceleration. A72-26609
- SAUNDERS, J. F.
The experiments of Biosatellite 2 [NASA-SP-204] N72-20048
The scientific conclusions of Biosatellite 2 N72-20066
- SCARPERI, M.
Impulses and effector measures of thermoregulation during rest and exercise. I, II A72-25874
- SCARPERI, S.
Impulses and effector measures of thermoregulation during rest and exercise. I, II A72-25874
- SCHADE, C. M.
Optimal regulation of physiological systems via real-time adaptive model synthesis [AD-735900] N72-21088
- SCHAEFER, K. E.
Biochemistry of submarine and diving stress. 1: Lactate-pyruvate and redox chronic hypercapnia [AD-734120] N72-21057
Biochemistry of submarine and diving stress. 4: Responses of blood lactate-pyruvate and redox state to chronic exposure to 3 percent CO2 [AD-734122] N72-21059
- SCHAIER, L. A.
Radiobiologic studies of Tradescantia plants orbited in Biosatellite 2 [EXPT-P-1123] N72-20054
- SCHALKOWSKI, S.
Safety margins in the implementation of planetary quarantine requirements [NASA-CR-126032] N72-21050
- SCHUEER, J.
Effect of physical training on the mechanical and metabolic response of the rat heart to hypoxia. A72-26701
- SCHILDER, P.
Extrageniculostrate vision in the monkey. III - Circle vs triangle and 'red vs green' discrimination. A72-26772
- SCHMAHL, K.
Automatic ECG recording and evaluation by digital computer A72-27821
- SCHMID, P. G.
Comparison of volume and strain-gauge plethysmography during static effort. A72-26622
- SCHMIDT, H.
Studies on the central chemosensitive mechanism of respiration. II A72-26661
Studies on the central chemosensitive mechanism of respiration. III, IV A72-27825
- SCHNEIDER, H.
An electrode system with rounded edges for direct ventricular defibrillation. A72-26628
- SCHROEDER, D. J.
Aural responsivity of a pilot following endolymphatic shunt surgery. A72-27485
- SCOTT, W. L.
An improved prosthetic device [NASA-CASE-MFS-16570] N72-20111
- SEARS, W. J.
Arterial blood gas tensions using phased dilution oxygen delivery technics. A72-28255
- SEBESTA, P. D.
The effect of weightlessness on the dividing eggs of Rana pipiens [EXPT-P-1047] N72-20060
- SERAPETINIDES, E. A.
Electrophysiological changes in humans during perceptual isolation. A72-27484
- SERKOV, P. N.
Responses of auditory-cortex neurons to electrical stimulation of the medial geniculate body A72-27651
- SHANNON, R. H.
A new approach to criterion development in the replacement air group /RAG/. A72-28262
The impact of modern equipment design on the functions and responsibilities of the Naval Flight Officer. A72-28291
- SHAPLEY, R.
Gain control in the retina and retinal dynamics. A72-27299
- SHELMUTT, J. B.
The impact of modern equipment design on the functions and responsibilities of the Naval Flight Officer. A72-28291
- SHETTY, B. V. S.
Evaluation of impact protection of crash helmets. A72-26016
- SHEVELEV, I. A.
Dynamics of visual sensor signal A72-26049

- SHIPPRIN, E. M.
Visual processing capacity and attentional control.
A72-27074
- SHORT, D.
Clinical significance of minor ST/T depression in resting electrocardiogram.
A72-27733
- SHUBROOKS, S. J., JR
Protective effects of the Valsalva and M-1 maneuvers during +G sub z acceleration.
A72-28318
- SHURLEY, J. T.
Electrophysiological changes in humans during perceptual isolation.
A72-27484
- SIFFRE, M.
The effects of variations in the sleep-wakefulness cycle during a 'time-isolation' experiment on reaction time and spontaneous tempo.
A72-26687
- SILAKOV, V. L.
The effect of transection of cortico-subcortical connections upon the spontaneous activity of the lateral geniculate body and visual cortex neurons
A72-27652
- SILBERSTEIN, E. B.
Radiation effects in man: Manifestations and therapeutic effort
[AD-734209] N72-20091
- SILVER, E. C.
Nuclear and cellular division in *Pelomyxa carolinensis* during weightlessness
[EXPT-P-1035] N72-20061
- SILVER, I. L.
Some effects of spaceflight on the flour beetle, *Tribolium confusum*
[EXPT-P-1039] N72-20053
- SIMATOS, D.
Application of the combined action of vacuum and cold for the defence and preservation of living organisms
A72-27293
- SINCLAIR, R. D.
Tolerance of physically fit young men to exercise and graded levels of inspired PCO₂ up to 40 mm Hg.
A72-28311
- SINGH, V.
Effects of positive acceleration on the electrocardiogram.
A72-26015
- SIRKIS, J. A.
Field evaluation of light signals for use in navigation and visual collision avoidance.
A72-28326
The benefits of the use of shoulder harnesses in general aviation aircraft
[FAA-AM-72-3] N72-21077
- SKRETTINGLAND, K.
Advance techniques for monitoring human tolerance to +Gz accelerations.
A72-28328
- SLATER, J. V.
Some effects of spaceflight on the flour beetle, *Tribolium confusum*
[EXPT-P-1039] N72-20053
- SMILES, K. A.
Analysis of five selected factors in pursuit tracking performance of men during acceleration.
A72-28320
- SMITH, D. G.
Human exposure to Halon 1301 /CBF3/ during simulated aircraft cabin fires.
A72-28308
- SMITH, P. L.
Psychological correlates of physiological circadian periodicity.
A72-26681
- SMITH, G.
Effect of hyperoxia on airways resistance in man.
A72-26614
- SMITH, J. P.
Aeromedical considerations in the management of paranasal sinus barotrauma.
A72-28274
- SMITH, M. J.
Factor analysis of undergraduate and postgraduate flight training grades.
A72-27472
- Walk on floor eyes closed /WOPEC/ - A new addition to an ataxia test battery.
A72-27476
- SMITH, P. F.
Sonar Doppler discrimination in high noise environments
[AD-734118] N72-21056
- SMITH, R. H.
Mutational and physiologic responses of *Habrobracon* in Biosatellite 2
[EXPT-P-1079] N72-20050
- SNOLAREZ, W.
Experimental and clinical studies in the treatment of arrhythmias due to digitalis by sodium citrate
[NASA-TT-P-14194] N72-21045
- SNOW, C. C.
A study of female pilot control force capabilities for general aviation aircraft.
A72-28325
- SOBEL, H. H.
Oxygen-modified collagen and its possible pathological significance.
A72-27483
- SOBIN, S. S.
Pulmonary alveolar blood flow.
A72-26702
- SOLLE, M.
Biochemical changes in blood and urine indicating radiation damage: A literature review, part-1
[SZS-7/71-PT-1] N72-20083
- SOPER, E. J.
Modification of one man life raft
[NASA-CASE-LAR-10241-1] N72-21076
- SOUHRADA, J. P.
Adaptation to hypobarism - Sensitivity of myocardial tissue to carbon dioxide.
A72-26616
- SOUZA, K. A.
The effect of weightlessness on the dividing eggs of *Rana pipiens*
[EXPT-P-1047] N72-20060
- SPADY, A. A., JR.
Results of intravehicular manned cargo-transfer studies in simulated weightlessness
[NASA-TN-D-6774] N72-21075
- SPARROW, A. H.
Radiobiologic studies of *Tradescantia* plants orbited in Biosatellite 2
[EXPT-P-1123] N72-20054
- SPENCE, A. A.
Effect of hyperoxia on airways resistance in man.
A72-26614
- SPODICK, D. H.
Densitography - A new method for evaluation of cardiac performance of rest and during exercise.
A72-25500
- SPROUFFSKE, J. F.
Evaluation of the lap belt, Air Force shoulder harness-lap belt and air bag plus lap belt restraints during impact with anthropomorphic dummies.
A72-27471
- SQUIRES, R. D.
Portable detector of low amplitude electrocardiographic activity
[AD-735882] N72-21084
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Contamination control through filtration of microorganisms
[NASA-CR-126035] N72-21047
- STACY, R. W.
A phase method of calculating respiratory mechanics using a digital computer.
A72-26620
- STANESCU, D. C.
Glottis opening and airway resistance.
A72-26611
- STEGEMANN, J.
Effects of a multi-hour immersion on trained and untrained subjects. II - Blood protein and electrolyte concentrations.
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- STEINER, R. E.
Radiological assessment of arterial branching coefficients.
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- STERN, J. A.
Computer analysis of eye movement patterns during visual search.
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- STEVENS, S. S.
Stability of human performance under intense noise.
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- STEWART, J. D.
The relationship between motion sickness experience
and vestibular tests in pilots and nonpilots.
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Correlation between five measures of vestibular
function for airline pilots.
A72-28259
- STEZOSKI, S. W.
Effect of physical training on the mechanical and
metabolic response of the rat heart to hypoxia.
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- STOIAN, D.
Treadmill exercise in dogs under beta-adrenergic
blockade - Adaptation of coronary and systemic
hemodynamics.
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Assessment of temperature rise suppression by edge
losses during irradiation
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Respiratory weight losses during exercise.
A72-26613
- STONE, G. M.
Hyperactive cardio-inhibitory reflex manifested by a
near-syncopal episode - A case report.
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- STONE, H. L.
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hemodynamics in the conscious dog during hypoxic
hypoxia.
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Splanchnic blood flow and plus or minus Gx
acceleration.
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Autonomic control of cardiac function and myocardial
oxygen consumption during hypoxic hypoxia.
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- STORER, J. B.
Evaluation of long-term effects of low level whole
body external radiation exposures
[A/CONF-49/P/82] N72-20080
- STORK, E. J.
Effects of hyperoxic breathing gases on blood cell
formation.
A72-28298
- STOWE, D. E.
Quantitative stress vectorcardiography.
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- STROUD, R. H.
Contamination control by use of ethylene oxide
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Reactions of pilots to warning systems for visual
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Effects of positive acceleration on the
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A qualitative investigation of the dynamics of
neuron networks
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A research program on hyperbaric environmental
effects upon primates and other animals
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Serum cortisol, plasma free fatty acids, and urinary
catecholamines as indicators of complications in
acute myocardial infarction.
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Effectiveness of restraint equipment in enclosed
areas
[FAA-AM-72-6] N72-21078
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Serum peptidases in myocardial infarction.
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Comparisons between bicycle ergometry and treadmill
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C14-radiorespirometry system for astronaut medical
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The influence of the crowding phenomenon on the
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effects upon primates and other animals
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Hemodynamic correlates of myocardial oxygen
consumption during upright exercise.
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- TEMLIKOV, F. E.
Methods of information presentation to operators of
automatic control systems and informative value
estimates for such methods
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- TEMUR'YANTS, N. A.
Experimental study of the effect of
extremely-low-frequency electromagnetic fields on
warm-blooded animals and microorganisms
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- THACKRAY, R. I.
Self-estimates of distractibility as related to
lapses of attention during perceptual-motor
performance.
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- THOMAS, I.
Nychthemeral rhythms and air troopings - Some
preliminary results from 'Exercise Medex.'
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Utilization of muscle elasticity in exercise.
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The liminal angle of a plagiogeotropic organ under
weightlessness
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A study of the transient stage of sweating in man
[REPT-877] N72-20069
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Adrenocortical function in hypothalamic deafferented
rats maintained at high altitude.
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Changes in the nervous system during a 120 day
clinostatic hypokinesia and the prophylaxis of
hypokinetic disorders
[NASA-TT-F-14225] N72-21046
- TOBIAS, C. A.
Some effects of spaceflight on the flour beetle,
Tribolium confusum
[EXPT-P-1039] N72-20053
- TOMPKINS, W. R.
On-line measurement of microvascular dimensions by
television microscopy.
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- TOUCHSTONE, R. M.
Self-estimates of distractibility as related to
lapses of attention during perceptual-motor
performance.
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- TREDICI, T. J.
Keratoconus in USAF flying personnel. A72-28331
An evaluation of the Landolt ring radioactive plaque night vision tester. A72-28332
- TREMOR, J. W.
The effect of weightlessness on the dividing eggs of *Rana pipiens* [EXPT-P-1047] N72-20060
- TRENHOLM, B. G.
Computer determination of left ventricular volume using videodensitometry. A72-26627
- TROMP, S. W.
Biological effects of simulated high altitude climate in pressurized commercial planes on passengers and flying personnel. A72-27486
- TROUT, E. M.
Evaluation of the lap belt, Air Force shoulder harness-lap belt and air bag plus lap belt restraints during impact with anthropomorphic dummies. A72-27471
- TROY, M.
Computer analysis of eye movement patterns during visual search. A72-27475
- TUMARKIN, A.
A biologist looks at psycho-acoustics. A72-25732
- U**
- UDEL'NOV, M. G.
Effect of the cerebral cortex on the progress of cardio-cardiac reflexes A72-27647
- UHL, R. R.
Cardiorespiratory response to breathing dense gas at exercise with imposed mechanical airway resistance. A72-28314
- ULMER, H.-V.
Effects of a multi-hour immersion on trained and untrained subjects. II - Blood protein and electrolyte concentrations. A72-27480
- ULRICH, M. T.
Free 17-hydroxycorticosteroid levels in parotid fluid as indicators of physiologic strain in hyperthermic stress. A72-28335
- UMILTA, C.
Interhemispheric effects on choice reaction times to one-, two-, and three-letter displays. A72-27075
- UNDERHILL, B.
An energy-absorbing seat design for light aircraft. [SAE PAPER 720322] A72-25585
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Application of biotelemetry for research in the physiology of labor and sports: Equipment for studying freely moving people N72-20147
- V**
- VAN BEAUMONT, W.
+Gz tolerance after 14 days bed rest and the effects of rehydration. A72-28295
Comparative changes in plasma protein concentration, hematocrit and plasma volume during exercise, bedrest and + Gz acceleration. A72-28296
- VAN DE WOESTIJNE, K. P.
Glottis opening and airway resistance. A72-26611
- VAN DEN ABBELE, K. G.
Primary prevention of atherosclerotic cardiovascular disease among the SABENA flying personnel. A72-28293
- VANDERVEIKEN, F.
Triglyceridemia and relative weight A72-27238
- VASIL'EV, P. V.
Pathophysiological principles of air and space pharmacology A72-27926
- VASTESAEGER, M.
Triglyceridemia and relative weight A72-27238
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Synaptic organization of neuronal background activity in the visual cortex A72-27646
- VERDESCA, A. S.
The value of the computer as a screening tool for routine electrocardiograms. A72-26975
- VERGHESE, C. A.
Evaluation of impact protection of crash helmets. A72-26016
- VILJANEN, A. V.
The voluntary regulation of breathing in man. A72-27843
- VINCENT, G. M.
QRS-wave detector evaluation. A72-25499
- VINOGRADOV, S. A.
Experimental study of the effect of extremely-low-frequency electromagnetic fields on warm-blooded animals and microorganisms A72-28214
- VLADIMIRSKII, B. M.
Possible solar activity factors influencing processes in the biosphere A72-28211
Experimental study of the effect of extremely-low-frequency electromagnetic fields on warm-blooded animals and microorganisms A72-28214
- VOGT, P. B.
The extraction of sleep information from heart rate data: Analysis of the sleep cycle [AD-734283] N72-21061
- VOGT, L.
Mechanical impedance of supine humans under sustained acceleration. A72-28270
- VOLYNSKII, A. M.
Experimental study of the effect of extremely-low-frequency electromagnetic fields on warm-blooded animals and microorganisms A72-28214
- VONBORSTEL, R. C.
Mutational and physiologic responses of *Habrobracon* in Biosatellite 2 [EXPT-P-1079] N72-20050
- VOUKYDIS, P. C.
Application of the Gabor-Nelson theory in electrocardiography. A72-26629
- VUYLSTEEK, K.
Triglyceridemia and relative weight A72-27238
- VYSOKOSOV, E. P.
Recommendations for drawing up provisional safety rules for working with lasers. A72-27615
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- WAAG, W. L.
A new approach to criterion development in the replacement air group /RAG/. A72-28262
- WADHAWAN, M. L.
Cardiovascular responses in pressure breathing. A72-26017
- WALKER, L.
Pneumograph recording using a cotton-wick probe. A72-26619
- WALKINSHAW, C. H.
Apollo 12 lunar material - Effects on plant pigments. A72-27626
- WALTER, W. H., III
Dynamic electrocardiography and computer analysis. A72-28281
- WANG, Y.
Hemodynamic correlates of myocardial oxygen consumption during upright exercise. A72-26618
Simplified estimation of aortic valve area. A72-27734

- WARNKE, D.
Problems of functional diagnostics of the heart and circulation system
A72-27271
- WEBB, G. N.
QRS-wave detector evaluation.
A72-25499
- WEBB, J. A., JR.
Design of a specialized computer for on-line monitoring of cardiac stroke volume
[NASA-TN-D-6658] N72-20108
- WEBB, W. B.
Patterns of sleep behaviour.
A72-26679
- WEETE, J. D.
Apollo 12 lunar material - Effects on plant pigments.
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- WEGMANN, H. H.
Psychological and physiological changes caused by desynchronization following transzonal air travel.
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Aeromedical significance of frontal sinus hematomas.
A72-28275
- WEISSTEIN, W.
Spatial characteristics of metacontrast.
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- WELCH, A. J.
The extraction of sleep information from heart rate data: Analysis of the sleep cycle
[AD-734283] N72-21061
- WELTMAN, G.
Underwater work measurement techniques
[AD-734014] N72-20092
- WENGER, C. B.
Heat of evaporation of sweat - Thermodynamic considerations.
A72-26610
- WEVER, R.
The influence of sleep-interruption and of sleep-deprivation on circadian rhythms in human performance.
A72-26685
- WHITE, C. S.
The biodynamics of airblast
[AD-734208] N72-21054
- WHITE, H. B., III
Separate physiological roles for two isozymes of pyridine nucleotide-linked glycerol-3-phosphate dehydrogenase in chicken.
A72-27161
- WHITING, A. B.
Mutational and physiologic responses of Habrobracon in Biosatellite 2
[EXPT-P-1079] N72-20050
- WILKINSON, B. T.
Sleep deprivation - Eight questions.
A72-26678
A study of four days partial sleep deprivation.
A72-26683
- WILKS, S. S.
Growth responses of Paramecium caudatum to hypo- and hyperbaric environments - Induction of cellular tolerance to hyperbaric oxygen pressures.
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- WILLIAMS, B. A.
Effect of bedrest on thermoregulation.
A72-28301
Circadian rhythms of visual accommodation responses and physiological correlations.
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- WILLIS, H. A.
Underwater work measurement techniques
[AD-734014] N72-20092
- WILLOUGHBY, R.
The effect of weightlessness on the dividing eggs of Rana pipiens
[EXPT-P-1047] N72-20060
- WILSON, F. H., JR.
The USAFSAF cardiovascular disease follow-up study - 1972 progress report.
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- WILTON-DAVIES, C. C.
Computer-assisted monitoring of ECG's and heart sounds.
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- WINGET, C.
Radiation effects in man: Manifestations and therapeutic effort
[AD-734209] N72-20091
- WINTER, D. A.
Computer determination of left ventricular volume using videodensitometry.
A72-26627
- WINTER, W. B.
Physiological response in pilot/back-seat man during aerial combat maneuvers in F-4E aircraft.
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- WIRTH, J.
Problems of functional diagnostics of the heart and circulation system
A72-27271
- WOLFER, B. M.
Roles of the ground and flight crew in Apollo operations.
[AIAA PAPER 72-236] A72-26557
- WOOD, E. H.
Liquid breathing - Prevention of pulmonary arterial-venous shunting during acceleration.
A72-26609
- WOODCOCK, R. P.
Research and development of an ocular laser protective filter
[AD-735799] N72-21083
- WORSLEY, D.
Nycthemeral rhythms and air trooping - Some preliminary results from 'Exercise Medex.'
A72-26696
- WYSS, C.
Skin and muscle components of forearm blood flow in directly heated resting man.
A72-26617
- Y**
- YAMAHURA, K.
Growth and recovery of temporary threshold shift at 4 kHz due to a steady state noise and impulse noises.
A72-25873
- YANG, T.
Some effects of spaceflight on the flour beetle, Tribolium confusum
[EXPT-P-1039] N72-20053
- YANOWITZ, F. G.
Quantitative stress vectorcardiography.
A72-28282
- YENNI, K. R.
Results of intravehicular manned cargo-transfer studies in simulated weightlessness
[NASA-TN-D-6774] N72-21075
- YESSENOW, H. D.
An investigation of the relationship between nystagmus eye movements and the oculogyral illusion.
A72-28304
- YON, E. T.
A micropower monolithic transmitter for single- or multichannel biomedical telemetry.
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- YOUNG, H. L.
+Gz tolerance after 14 days bed rest and the effects of rehydration.
A72-28295
- YOUNG, R. S.
The effect of weightlessness on the dividing eggs of Rana pipiens
[EXPT-P-1047] N72-20060
- YUSKEV, J. W.
+Gz tolerance after 14 days bed rest and the effects of rehydration.
A72-28295
- Z**
- ZAITSEV, V. K.
Principles of designing the input elements of transistorized amplifiers of biopotentials
A72-26468
- ZAJUSZ, K.
Experimental and clinical studies in the treatment of arrhythmias due to digitalis by sodium citrate
[NASA-TT-F-14194] N72-21045
- ZAMBOHI, A.
Jumping on the moon - Power output at different gravity values.
A72-27479

- ZAPLATKINA, A. I.
Functional state of the central nervous system in
dogs reanimated by means of artificial blood
circulation after long periods of clinical death
by drowning in salt water
A72-28215
- ZARKESHEV, E. G.
The effect of transection of cortico-subcortical
connections upon the spontaneous activity of the
lateral geniculate body and visual cortex neurons
A72-27652
- ZEBNER, A. R.
Physiological effects of backscatter of high
intensity light pulses on the human pilot.
A72-28303
- ZUBER, J. P.
Changes in auditory flutter fusion frequency during
prolonged visual deprivation.
A72-27418
- ZUILI, M.
The effects of variations in the sleep-wakefulness
cycle during a 'time-isolation' experiment on
reaction time and spontaneous tempo.
A72-26687
- ZWEIZIG, J. R.
EEG monitoring of a free-swimming diver at a working
depth of 15 meters.
A72-27478

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