Soviet and Japanese Aerospace Literature

Throughout 1990 the *AIAA Journal* will carry selected abstracts on leading research topics from the Soviet aerospace literature and, as space permits, from similar Japanese literature. The topics will be chosen and the abstracts reviewed for pertinency by *AIAA Journal* editors. This month features Aerospace Medicine from the USSR and Japan.

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Soviet Aerospace Literature This month: *Aerospace Medicine*

A89-42439 Testing for irregularities of the cardiac rhythm and conduction in flight personnel by means of a combined functional test (Vyiavlenie narushenii ritma serdtsa i provodimosti u letchikov s pomoshch'iu kombinirovannoi funktsional'noi proby). E. G. MUKHAMEDOV and V. I. PLAKHATNIUK, *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), March 1989, pp. 46, 47.

A functional test was designed for the detection of irregularities in cardiac rhythm and conduction in otherwise healthy humans, in which subjects are asked to perform deep knee-bends while holding breath. Results of ECGs taken at rest and after the test made it possible to diagnose arrhythmia and cardiogenic blocks in 19 out of seemingly normal 167 subjects, among whom only seven were diagnosed for cardiac arrhythmia before the test. In two of the arrhythmic subjects the combined test induced changes in the character of the arrhythmia. Results of clinical studies indicated that, in eight cases, the arrhythmia and conduction irregularities were caused by infection of nasopharynx and mouth cavity.

A89-39751 Methods for assessing the psychophysiological reserves of a pilot (Metodika otsenki psikhofiziologicheskikh rezervov letchika). A. V. SHAKULA and A. D. KLIUNK, *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), Feb. 1989, pp. 46-49.

A complex of diagnostic methods for assessing the psychophysiological reserves of a pilot is described, which is based on cardiovascular-system parameters and changes in these parameters effected by a bicycle ergometer test. The bicycle ergometer test includes simple and complex sensomotor problems superimposed on physical loads. It was found that the psychophysiological reserves could be significantly increased by an electrotranquilizer.

A89-30143 Evaluation of the functional reserves of the organism during adaptation to different heights (Otsenka funktsional'nykh vozmozhnostei organizma pri adaptatsii k razlichnym vysotam). V. P. MAKHNOVSKII, A. S. SHANAZAROV, and E. E. VOLKOV, *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), Nov. 1988, pp. 40-42.

The effects of adaptation to different heights on the characteristics of the hemodynamics and the autonomic nervous system were investigated in men who resided for periods of half a year or a year and a half in regions located at 800 (control), 2800, 3600, or 3800 m. The Flack test was used to evaluate the functional status of the subjects. It was found that the year-and-a-half-long adaptation to high altitudes increased the functional reserves of the subjects, whereas the functional reserves of subjects adapted for only half a year were limited, particularly at heights of 3600 and 3800 m.

A89-21551 The problems of morbidity and the medical disqualification of flight personnel (Voprosy zabolevaemosti i meditsinskoi diskvalifikatsii letnogo sostava). V. D. VLASOV and E. M. PANOVA, *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), Sept. 1988, pp. 44-46. 18 Refs.

U.S. data on the morbidity of military personnel are reviewed, with special attention given to the causes of the medical disqualification of military flight personnel. Attention is given to the high incidence of 'hidden' coronary atherosclerosis in U.S military pilots killed in aircraft accidents, and of increasing instances of osteochondrosis and spondylosis with flight time in veteran pilots. Special consideration is given to the causes responsible for the loss of consciousness in pilots and to programs developed to prevent the medical disqualification of U.S. military flight personnel.

A89-10748 Physiological mechanisms of autogenic training and its application to seamen during prolonged trips (O fiziologicheskikh mekhanizmakh autogennoi trenirovki i ee primenenii u moriakov v dlitel'nom plavanii). I. A. POGORELOV and E. G. SHIMANOVICH, *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050),July 1988, pp. 57, 58.7 Refs.

This paper describes the effects of autogenic training, using a procedure based on the psychological gymnastics developed by Repin (1979), on the occurrence of the symptoms of neurotic asthenia in fishing vessel personnel on a prolonged trip. The training, conducted between days 45 and 55 of the trip, was found to benefit 90 percent of the seamen, as compared to nontrained controls. The paper also discusses the processes taking place in various brain compartments in the course of an autogenic training procedure.

A88-55434 Space exploration and preventive medicine. O. G. GAZENKO, R. M. BAEVSKII, and A. D. EGOROV, IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 7 pp. 20 Refs., IAF Paper 88-502.

The applications of space medicine achievements to medicine in general are considered. A prognostic approach to health assessment has been developed, and automatic systems for large-scale prognostic examinations of various population groups have been designed and developed. These systems help detect prenosological and premorbid states and determine risk factors of different diseases. They recognize that the major risk factor for disease is the deterioration of adaptive capabilities. It is emphasized that advances in preventive medicine can be achieved with the aid of methods developed in space medicine.

A89-40498 Dependence of optokinetic nystagmus on the width of the vision field (Zavisimost' optokineticheskogo nistagma ot shiriny polia zreniia). V. S. TODOROVA and V. K. POPOV, *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), Vol. 75, March 1989, pp. 312-317. 20 Refs.

The effect of the vision field covered by the visual stimulus on the optokinetic response was investigated in normal human subjects. The optokinetic nystagmus (OKN) was elicited by moving vertical gratings of widths ranging from 30 to 170 deg, with a large range of velocities (10-120 deg/sec), and a constant stimulus frequency (0.13 cycle/deg). Results indicate that the parameters of OKN can be changed both qualitatively and quantitatively by changing the width of the stimulus. The optimal OKN was found under conditions of the whole field stimulation. Progressive masking of the periphery caused an OKN reduction whose magnitude was fixed in different stimulus ranges, while eliminating the central stimulation resulted in a complete OKN suppression. The role of the stimulation eccentricity and of the stationary edges in the observed OKN changes is discussed.

A89-39752 Give more attention to a healthy lifestyle of flight personnel (Bol'she vnimaniia zdorovomu obrazu zhizni letnogo sostava). N. I. FROLOV and IU. V. SHMELEV, *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), Feb. 1989, pp. 55-57.

The effects of continuously increasing the levels of psychic and physical loads on the flight personnel of modern aircraft on the well-being of the personnel are discussed together with the lifestyle factors that would improve the well-being and work capacity of flight personnel. It is emphasized that such factors as the upgrading of the aviator's technical education, the ecological conditions to which the aviators are exposed, and social factors such as an increase of psychic and informational loads are of utmost importance to the well-being of an aviator. Consideration is given to the effects of automation on the muscular and cardiovascular systems and to the importance of physical exercise for the maintenance of these systems. Particular attention is given to factors responsible for the development of cardiac ischemia.

A89-34021 Analysis of temperature patterns in humans (Analiz temperaturnykh patternov cheloveka). F. F. SULTANOV, I. I. ERMAKOVA, A. G. GRIGOR'IAN, and I. M. MOMMADOV, *Fiziologiia Cheloveka* (ISSN 0131-1646), Vol. 15, Jan.-Feb. 1989, pp. 117-120. 11 Refs.

The method of Ermakov and Grigor'ian (1986) for plotting skin-temperature patterns (STPs) on a circular diagram was used to plot STPs of 47 subjects acclimated to temperatures of 21, 28, and 41 C at respective humidity values of 48, 49, and 30 percent, and the subjects' STPs were correlated with their thermoregulating reactions. Skin temperatures were measured at eight locations, including the forehead, trunk, shoulder, hand, and foot, as well as two arm locations and two leg locations. The STP plots obtained at 28 C revealed individual differences among different subjects, making it possible to group the subjects into three types according to their STP pattern. Measurements at 41 C and under conditions of physical load resulted in characteristic STP changes, indicating that STP is a reliable index of temperature homeostasis and thermoregulatory ability.

A89-34020 Central hemodynamics of healthy humans during a gradual decrease of circulating blood volume (Tsentral'naia gemodinamika zdorovogo cheloveka vo vremia dozirovannogo umen'sheniia ob'ema tsirkuliruiushchei krovi). V. E. KATKOV, V. V. CHESTUKHIN, V. V. RUMIANTSEV, E. M. NIKOLAENKO, and A. V. MASLENNIKOV, *Fiziologiia Cheloveka* (ISSN 0131-1646), Vol. 15, Jan.-Feb. 1989, pp. 75-80. 18 Refs.

The effects of gradual decreases of the circulating-blood volume (CBV) on the parameters of central blood circulation, acid-base balance, and blood oxygen were investigated in nine human subjects subjected to gradual (400 ml in 4-5 min) removals of arterial or venous blood. It was found that even small losses of blood induced a fall of venous pressure in the intrathorax region (the central venous pressure and pulmonary-artery pressure), which continued to decrease with increasing CBV loss. On the other hand, the parameters of acid-base balanced arterial oxygenation, the stroke volume, and the minute volume remained unchanged. A linear regression equation was derived for the relationship between the CBV on the one hand and the central venous pressure and the pulmonary-artery pressure on the other.

A88-44210 Investigation of the effect of the conditions of stimulation on the threshold characteristics of electrodermal sensitivity (Issledovanie vliianiia uslovii stimuliatsii na porogovye kharakteristiki elektrokozhnoi chuvstvitel'nosti). IU. M. NIKITIN and N. V. IAKOVLEVA, *Fiziologiia Cheloveka* (ISSN 0131-1646), Vol. 14, May-June 1988, pp. 512-515. 6 Refs.

The effects of the electrode features, such as its area in the 7-92 sq mm range, shape (round or rectangular), the configuration of its contact portion (flat, convex, or concave), and its coating (silver, silver oxide, or stainless steel), as well as the degree of contact pressure, on the threshold of electrodermal sensitivity of the subject were investigated. It was found that the electrode area was not a factor in any of the sensitivity measurements. When the threshold was measured by the level of applied voltage, the electrode coating, the shape, the configuration of the contact, or the contact pressure had no effect. On the other hand, the threshold values measured by the current intensity and by the electric-signal power depended on the electrode coating and configuration.

A89-30144 Effect of background backbone anomalies on the development of its injuries in flight personnel under acceleration loading (Vliianie fonovykh izmenenii pozvonochnika na razvitie ego povrezhdenii u lits letnogo sostava pri peregruzkakh). R. V. POLETAEV, *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), Nov. 1988, pp. 43-45.

The impact of certain anomalies in the backbone on the appearance of backbone injuries caused by acceleration loading was investigated in a group of healthy pilots aged 21-45, each of whom experienced a one-time acceleration load in the head-to-pelvis direction that resulted in a fractured backbone. It was found that the subjects could be divided into four groups according to the type of background deviation present before the accident: (1) a control group, with no backbone anomalies, (2) with complicated anomalies, (3) with uncomplicated anomalies, and (4) with backbone alterations but without anomalies. The qualitative and quantitative characteristics of the backbone fractures in these subjects were found to differ substantially according to the type of background deviation. The greatest percentage (52.6 percent) of patients with fractured backbone belonged to the group with complicated anomalies, while the smallest percentage (3.57 percent) occurred in the control group.

A89-27457 Individual reactivity of the human respiratory system and its estimation (Individual'naia reaktivnost' sistemy dykhaniia cheloveka i ee otsenka). V. A. BEREZOVSKII and T. V. SEREBROVSKAIA, *Fiziologicheskii Zhurnal* (ISSN 0201-8489), Vol. 34, Nov.-Dec. 1988, pp. 3-7. 9 Refs.

This paper presents a method for the estimation of individual reactivity and the reserve capacity of the human respiratory system. The method was developed on the basis of measurements of the respiratory-system responses of 125 normal human subjects and 44 subjects suffering from various cardiorespiratory conditions to an increasing hypercapnic stimulus up to the individually endured limit. It was found that the reactivity of the respiratory system is a genetically determined trait which reflects the level of total physiological reactivity. A nomogram developed on the basis of these findings makes it possible to determine the respiratory reactivity and reserve capacity for three types of individuals: normal, hyporeactive, and hyperreactive.

A89-25999 Factors limiting work capacity in the case of additional resistance to breathing (Faktory, ogranichivaiushchie rabotosposobnost' pri dobavochnom soprotivlenii dykhaniiu). I. S. BRESLAV, G. G. ISAEV, A. V. KOCHUBEEV, K. S. RYMZHANOV, N. A. TRUSHKOVA et al., *Fiziologiia Cheloveka* (ISSN 0131-1646), Vol. 14, Nov.-Dec. 1988, pp. 933-937. 16 Refs.

Factors responsible for the decline of work capacity in humans exercising on bicycle ergometers and subjected to successive additions of progressively increasing breathing-resistance loads were investigated. In experiments conducted under conditions of free breathing and breathing through a perforated diaphragm in the spirometer-mask, the values of maximally endured exercise loads were determined for various levels of additional breathing resistance. It was found that the major single factor responsible for the decline in the work capacity upon an increase in breathing resistance is an excessive tension in the respiratory musculature.

A89-16645 Fatigue problems of flight personnel (Concepts, causes, symptoms, classification) (Problemy utomleniia letnogo sostava /Poniatiia, prichiny, priznaki, klassifikatsiia/). V. A. BODROV, *Fiziologiia Cheloveka* (ISSN 0131-1646), Vol. 14, Sept.-Oct. 1988, pp. 835-843. 51 Refs.

The concepts defining fatigue and overfatigue in flight personnel are discussed together with the causes of these phenomena and their symptoms. It is noted that, at present, there is no single system for defining symptoms of overfatigue and for its diagnosis. This is due to the fact that the effects of various factors causing overfatigue are accompanied by many nonspecific symptoms which can characterize one or more other functional conditions; in addition, the fatigue phenomenon induces reactions of compensation and adaptation, which may be manifested as both a slow-down and an activation. Complex factors that have to be considered in the evaluation of the fatigue syndrome in pilots are discussed.

A88-55334 Main results of medical investigations during long-duration space flights onboard Salyut-7 - Soyuz-T. O. G. GAZENKO, A. I. GRIGOR'EV, and A. D. EGOROV, IAF, International Astronautical Congress, 39th, Bangalore, India, Oct. 8-15, 1988. 7 pp. 16 Refs., IAF Paper 88-074.

Medical investigations conducted during six long-term missions (65 to 237 days) and five short-term missions (8 to 12 days) between 1982 and 1986 on the orbital complex Salyut-7-Soyuz-T are discussed. The flight parameters of Salyut-7 are presented including the environmental parameters, diet, water supply, work and rest arrangements, and exercise habits. Results are presented from experiments concerning cosmonauts' health status, nervous responses, sleep, and work capacity. Decreases in body mass and leg volume, and changes in vestibular function, motor activity, and the cardiovascular system are reported. The fluid-electrolyte metabolism and hormonal status of the cosmonauts are given, including an increase in the production of ADH and aldosterone, activation of the sympathoadrenal, cholinergic and histaminergic systems, and inhibition of the serotoninergic system. Experiments on bones, immunology, and extravehicular activity are also presented.

A88-54007 Medical investigations results obtained in 125-day flight on 'Salyut-7' and 'Mir' orbital stations. A. EGOROV, O. ANASHKIN, O. ITSEKHOVSKII, I. ALFEROVA, L. GOLUBCHIKOVA et al., Physiologist, Supplement (ISSN 0031-9376), Vol. 31, Feb. 1988, pp. S-1 to S-3.

The results of medical experiments and monitoring performed on a long-term Soviet space mission in 1986 are summarized. Topics addressed include monitoring during normal operations and EVAs, in-depth medical examinations in the resting state, functional tests, metabolic and regulatory experiments, environmental monitoring, and evaluation of proposed prophylactic measures against the adverse effects of weightlessness. Although the cosmonauts were generally healthy throughout the mission, several significant cardiovascular changes were recorded, including redistribution of fluid and general deconditioning. Numerical data on these changes are presented in tables and briefly characterized.

A88-48727 Effect of microclimate on adaptation of seamen during voyages at low latitudes (Vliianie mikroklimata na adaptatsiiu moriakov pri plavanii v nizkikh shirotakh). N. N. PLAKHOV and L. G. TEPINA, Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), May 1988, pp. 51-53.10 Refs.

The effect of an air-conditioned (AC) environment on the primary adaptation reactions of seamen during low-latitude voyages to hot and humid climate was investigated by periodically measuring (at rest and after exercise) the heart rate, blood pressure, and other parameters of the thermoregulatory system in the subjects of three experimental groups. The subjects of the first group worked and rested in an AC environment (at 24-27 C, and 50-70 percent relative humidity); the subjects of the second group worked in the open (at 28 to 41 C and 50 to 90 percent rel. humidity) but rested in AC rooms; the subjects of the third group worked in the open and rested in non-AC rooms (at 31-35 C and 60-90 percent rel. humidity). The results showed that, in the first period of the voyage, the characteristics of thermal adaptation were least favorable in the subjects of the third group, with many reactions exceeding physiological norms. The regime of the second group (i.e., step-adaptation) was found to be the most favorable one. Limited exposures to a hot environment resulted in adequate adaptation without signs of excessive stress.

A88-44209 The characteristics of vegetative-hormonal reactions during the performance of various types of mental work (Osobennosti vegetativno-gormonal'nykh reaktsii pri vypolnenii raznykh vidov umstvennoi raboty). E. V. BELOVA, V. P. EMTSEVA, and IU. A. OBOLENSKII, *Fiziologiia Cheloveka* (ISSN 0131-1646), Vol. 14, May-June 1988, pp. 482-485. 18 Refs.

The effect of the type of mental work on cardiovascular parameters and on the concentration of ACTH, adrenaline (A), and noradrenaline (NA) in blood or urine was investigated in healthy subjects performing two types of mental test. The subjects in the first test group (the 'clock and compass', C/C test) were asked to determine the correct position of the clock hand or the compass needle from a displaced-position dial; the second test consisted in counting. It was found that subjects in the C/C test group, subjected to higher emotional stress, exhibited moderate increases in systolic pressure and decreases in blood ACTH, while the second-group subjects showed greater increases in systolic pressure and, in most cases, increases in ACTH. The excretion of A was found to increase in both test groups, but the noradrenalin (NA) excretion pattern was different. Namely, in the C/C group, the percentage of subjects with increased NA was higher than in the counting group, while the percentage of subjects exhibiting lower-than-normal NA excretion was lower.

A88-44207 The characteristics of perspiration during work hyperthermia (Osobennosti potootdeleniia pri rabochei gipertermii). A. S. PAVLOV, *Fiziologiia Cheloveka* (ISSN 0131-1646), Vol. 14, May-June 1988, pp. 434-440. 12 Refs.

The kinetics of heat accumulation and of perspiration (P) in humans were investigated in two groups of subjects (trained athletes and untrained healthy controls) after the subjects completed a continuous step-test exercise to exhaustion and after completion of an exercise scheme that included three 10-min-long periods of less rigorous muscular work separated by 3 min of rest. Perspiration was measured by electrodermal resistance. It was found that, in trained athletes, the latent period of P was almost four times shorter, the stabilization of the P level occurred sooner, and the levels of P were 29-32 percent lower than in controls. Increases in P registered after the interrupted-work experiments were significantly higher than the increases recorded during the continuous and more strenuous step-test exercise. The dynamics of the P process in all subjects did not coincide with the dynamics of body-temperature increases.

A88-43103 Some opthalmological problems encountered in the practice of aviation medicine (Nekotorye voprosy oftal'mologii v praktike vrachebno-letnoi ekspertizy). L. M. ASYEV, *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), April 1988, pp. 48, 49.

Consideration is given to the possibility of misdiagnosis of some ophthalmological conditions in flight personnel and to the need of quick diagnosis upon the original complaint. Examples are presented illustrating the consequences of an original misdiagnosis or a delay in treatment. Specific recommendations are presented for aviation ophthalmologists concerning the frequency and the scope of periodic eye examinations for individual pilots with and without corrected vision, as well as for physicians concerning examination, maintenance, and training of eyesight.

A88-39920 The possibilities of the correlational rhythmography method for the assessment of pilots' preflight condition (Vozmozhnosti metoda korreliatsionnoi ritmografii v otsenke predstartovogo sostoianiia letchikov). G. N. GRECHIKHIN, V. G. DOROSHEV, and V. V. GRISHCHENKO, *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), March 1988, pp. 36-38.

Correlational rhythmography (CRG), widely used in clinical diagnostics for testing the quality of heart-rhythm (HR) regulation, was used to assess the physiological condition of pilots shortly (1-1.5 h) before a flight. The experimental group included 50 group-1 and group-2 pilots aged 27-36, who were previously admitted to flight activity without limitations. The results of the rhythmogram analysis showed normal sinusoidal rhythm in 70.6 pilots. One pilot exhibited sinusoidal isorhythmia (with no subjective complaints); a subsequent ECG examination indicated a history of a minor infarct of the left ventricle, which occurred two weeks before the flight and which was not diagnosed at the time due to the absence of typical symptoms. Pilots with rigid rhythms were also found to exhibit abnormalities of the circulation system, as indicated by ECG examinations. It is concluded that the CRG method can be used as a rapid routine control for pilots assigned to flight duty.

A88-36100 Methods and criteria for estimating overfatigue in flight personnel (Metody i kriterii otsenki pereutomleniia letnogo sostava). V. A. BODROV, A. N. KOL'TSOV, and V. A. SERGEEV, *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), Feb. 1988, pp. 61-64.

The qualitative and quantitative measures of chronic fatigue, overfatigue, and overfatigue complicated by neurosis are assessed. Physiological, psychological, and biochemical analyses were conducted on subjects in whom overfatigue symptoms of differing severity were induced by physical exercise. The results showed that the most sensitive indices signaling acute fatigue were the skin electroconductivity, coordination, light-flicker fusion, reaction time to visual stimuli, heart rate, and orthostatic and step tests. Methods related to voluntary activity, such as counting at a prescribed rate or a search for prescribed numbers, were not informative.

A88-36009 Spatial organization of the elements revealed in the detection or identification of visual stimuli (Prostranstvennaia organizatsiia elementov, vyiavliaemykh v usloviiakh obnaruzheniia ili opoznaniia zritel'nykh stimulov). V. M. BONDARKO and V. E. GAUZEL'MAN, *Fiziologiia Cheloveka* (ISSN 0131-1646), Vol. 14, Mar.-Apr. 1988, pp. 204-211. 18 Refs.

The spatial organization of visual-system elements participating in the detection and identification of visual stimuli was studied. Subjects were asked to signal the detection thresholds and to identify stimuli that consisted of a series of vertical stripes or a rectangular lattice. The contrast thresholds were determined using the 'scaling' method. The analysis of weight functions calculated for spatial elements involved in the detection and in the identification processes has revealed significant differences in the organization of these elements. The results of these analyses are interpreted in terms of different mechanisms responsible for the detection and the identification processes.

A88-32136 Effect of acute hypoxic hypoxia on the immune system, homeostasis, and the acid-base status of blood (Vliianie ostroi gipoksicheskoi gipoksii na immunnuiu sistemu, gemostaz i kislotno-shchelochnoe sostoianie krovi). B. T. TULEBEKOV, T. A. PONOMAREVA, G. F. VOROB'EV, L. R. ISEEV, and V. I. CHADOV, *Fiziologiia Cheloveka* (ISSN 0131-1646), Vol. 14, Jan.-Feb. 1988, pp. 115-122. 24 Refs.

The effect of hypoxia on the immune system and on blood coagulation in humans was investigated in subjects who remained for 300-min in a barometric chamber (at 5100 m altitude) conducting tests before exposure to hypoxia (control), 30-min after a stay at 5100 m, and seven days after the exposure. The parameters of the acid-base status of blood, monitored during the exposure as an index of oxygen shortage in blood, were found to be significantly altered after 60 min at 5100 m. Thirty minutes after the onset of hypoxia, changes in the coagulation parameters indicated increased activation of intravascular coagulation and fibrinolysis. On the other hand, changes in the immune system were observed only seven days after the exposure.

A88-32135 Changes in blood circulation after two-percent water load (Izmeneniia v sisteme krovoobrashcheniia posle dvukhprotsentnoi vodnoi nagruzki). M. D. ROIFMAN and A. IA. TERNER, *Fiziologiia Cheloveka* (ISSN 0131-1646), Vol. 14, Jan.-Feb. 1988, pp. 100-107. 23 Refs.

The effect of a water intake equivalent to 2 percent of total body mass (i.e., 2-percent fluid load) on the elasticity of major arteries and on the interrelation between the cardiovascular and the renal responses of humans was investigated in resting fasting subjects. It was found that 2-percent fluid load caused a decrease of pulse rate and an increase in arterial blood pressure. The increase in pulse pressure, which was maximal at 40-min after the water intake, coincided with abrupt changes in elasticity indices. Thus, the pulse increments of blood volume decreased, while the values for the arterial-wall resistance, impedance coefficient, and exponential index of arterial elasticity dynamics increased. These reactions preceded the onset of diuresis. It is concluded that the reaction to fluid load includes not only the heart, the kidneys, and arterioles, but also the major arteries, whose increased tonus might contribute to the stability of hemodynamic homeostasis.

A88-32048 Physiological reserves of the body (O fiziologicheskikh rezervakh organizma). V. P. ZAGRIADSKII and Z. K. SULIMO-SA-MUILLO, *Voenno-Meditsinskii Zhurnal* (ISSN 0026-9050), Jan. 1988, pp. 51-53.

The demands placed on the physiology of the body by military activity and, often, by the extremal conditions of such activity rely on the mobilization of the reserves in metabolic energy and on the activation of systems that regulate energy distribution. Different mechanisms that induce the mobilization of energy under different extremal conditions, such as hypoxia or sustained physical load, are discussed together with the parameters characterizing mobilization of physiological reserves and the role played by physical training in increasing these reserves. It is shown that physical training increases the respiratory capacity, the volume of pulmonary ventilation, and, during exposure to physical load, the minute blood output and stroke output.

A88-32016 Reactions of the cardiovascular system to static load in athletes and in untrained subjects (Reaktsii sistemy krovoobrashcheniia na statricheskuiu nagruzku u sportsmenov i malotrenirovannykh lits). M. A. VODOP'IANOVA, N. V. DROBOTIA, and G. S. KARAPETIAN, *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), Vol. 74, Feb. 1988, pp. 294-299. 17 Refs.

The effect of physical training on the cardiovascular system was investigated by measuring cardiovascular responses to a static load (a 3-kg load held with the arm outstretched) in untrained subjects (group 1) and in trained cyclists (group 2). In the group-1 subjects, the effect of the load included increases in systolic output, pulse rate, minute blood volume, rate of pulse wave propagation, and mean hemodynamic pressure. In the group-2 subjects, the load-induced responses also increased the pulse rate, minute blood volume, and mean hemodynamic pressure; however, the systolic output and peripheral vasoconstriction indices were decreased, indicating a reaction of energy economy. It is suggested that the increases in the systolic output, the rate of pulse-wave propagation, and the mean hemodynamic pressure can serve as criteria for predicting the degree of fatigue.

A88-33835 A shift in the set point of temperature regulation under physical load conditions (Sdvig ustanovochnoi tochki temperaturnoi reguliatsii v usloviiakh fizicheskoi nagruzki). S. A. PAVLOV, *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia* (ISSN 0002-3329), Mar.-Apr. 1988, pp. 229-237. 20 Refs.

Human organisms exposed to prolonged physical load with the accompanying muscle hyperthermia experience a shift in the temperature set point rather than a tendency to return to the original temperature. This paper examines the changes in the temperature-regulation set point under physical load and the role of the set-point shift in the increase in the work capacity observed after reaching the stable level of core hyperthermia. It is shown that the new set point which is about 1.5 C above the normothermic level is accompanied by the optimal mobilization of the cardiorespiratory system. The new set point is stable, i.e., it is physiologically regulated.

A89-30074 Neurosis and hypertensive disease (Nevroz i gipertonicheskaia bolezn'). V. B. ZAKHARZHEVSKII, *Fiziologicheskii Zhurnal SSSR* (ISSN 0015-329X), Vol. 74, Nov. 1988, pp. 1645-1653. 21 Refs.

The relationship between neurosis and psychosomatic pathology were investigated using clinical and laboratory data as well as literature reports. Results obtained from experimental modeling of psychosomatic diseases indicate that, in a visceral system, there is a combined action of neurotization and the destabilization of regulatory mechanisms. A suppression of the vascular system's self-regulatory mechanism was detected in subjects in initial stages of hypertensive disease, in contrast to a neurosis with a hypertensive syndrome, suggesting that different mechanisms are active in the formation of a neurosis and of hypertensive disease.

Japanese Aerospace Literature This month: *Aerospace Medicine*

A89-38366 Development of electrophoresis equipment for SFU (Space Flyer Unit). NOBORU HAMANO, KENJI MITANI, KUNIYOSHI TSUBOUCHI, YUSUKE TAKAGI, TSUTOMU OKUSAWA et al., *Proceedings of the 16th International Symposium on Space Technology and Science,* Sapporo, Japan, May 22-27, 1988, Vol. 2 (A89-38031 16-12). Tokyo, AGNE Publishing, Inc., 1988, pp. 2459-2464. Research supported by the Ministry of International Trade and Industry.

Results obtained during conceptual studies of electrophoresis equipment for a space flyer unit are presented. The thermal and fluid mechanical characteristics of the separation chambers were analyzed. Areas of further development include: (1) the determination of a detailed specification of the system based on the thorough interaction between main investigators and the equipment developer, and (2) the establishment of a sterilization method suitable for the equipment aboard the SFU.

A89-38350 Response of rats to short- and long-term centrifugal acceleration. MASAMICHI SUDOH, KUMIKO SHIODA, SACHIO IKAWA, and HISASHI SAIKI, *Proceedings of the 16th International Symposium on Space Technology and Science,* Sapporo, Japan, May 22-27, 1988, Vol. 2 (A89-38031 16-12). Tokyo, AGNE Publishing, Inc., 1988, pp. 2337-2342. 9 Refs.

The physiological changes in rats exposed to hypergravity for 30 min and 3 weeks are studied. Changes in respiratory and circulatory functions are of particular interest. In the short-term experiment, female rats were exposed to hypergravity in intensities of 3, 4, 5, and 6 G in the following directions: back-to-abdomen (-Gx), head-to-tail (+Gz), and tail-to-head (-Gz). While the heart rate did not change during the -Gx and +Gz exposures, it showed a slight decrease during the -Gz exposure.

A89-38031 International Symposium on Space Technology and Science, 16th, Hokkaido University, Sapporo, Japan, May 22-27, 1988, Proceedings. Volumes 1 & 2. KYOHEI KONDO, ED. Symposium sponsored by Hokkaido Aerospace Industry Development Council, Ad Melco Co., Ltd., National Space Development Agency of Japan, et al., Tokyo, AGNE Publishing, Inc., 1988. Vol. 1, 1448 p.; Vol. 2, 1310 pp. For individual items see A89-38032 to A89-38396.

Recent advances in space science and technology are discussed in reviews and reports, mainly from Japan. Topics addressed include propulsion, materials and structures, flight dynamics and astrodynamics, fluid dynamics, thermophysics and thermochemistry, electronic components and devices, computers and data systems, systems engineering, and space transportation systems. Consideration is given to guidance, navigation, and control; spacecraft systems; the International Space Station and manned space technology; balloons; satellite communication and broadcasting; lunar and planetary exploration; terrestrial remote sensing; space medicine; biology and the cosmos; microgravity; space industrialization; and the Japanese national space program.

A87-50649 Changes of pilots' skin temperature in flight. HIROHIDE URANO, HIROTAKA SATAKE, and TAKASHI KAWASHIMA, *Japanese Journal of Aerospace and Environmental Medicine* (ISSN 0387-0723), Vol. 24, March 1987, pp. 1-6. 9 Refs.

The skin temperatures of nine amateur pilots aged 28 to 40 years old were taken in 10 experimental flights from May through December 1986 using thermistors and an analog tape recorder. The temperature went up and down slowly with little delay following changes in cabin air temperature. All crews showed a small fall in skin temperature over one hour of flight. Abrupt drops in temperature overlapped the slow changes. The skin temperature fall during takeoff was 0.6 C lower at level flight in traffic than during taxiing. The same small drop occurred during turbulence or steep turn, but no change was observed during calm cruise. A 0.4-C drop in skin temperature occurred during plane landing even though cabin temperature was rising. Tachycardia and cold sweat were observed simultaneously with the drop in skin temperature.

A87-44094 Skin potential reflex corresponding to transient motion discomfort. NAOKI ISU, NOBUYUKI TAKAHASHI, JIRO KOO, *Aviation, Space, and Environmental Medicine* (ISSN 0095-6562), Vol. 58, June 1987, pp. 576-580. 13 Refs.

The qualitative and quantitative correspondence between the degree of motion discomfort and the skin potential reflex (SPR) was examined in four subjects. Head movement was provided three times during body rotation at three different angular velocities (Coriolis stimulus) to induce motion discomfort, and at rest as a control. SPRs were caused in the arousal sweat area by head movement. The wave form, latency, time-to-peak, and amplitude of SPR were analyzed. The amplitude of the depolarizing response (P response) of SPR increased proportionally to the angular velocity of body rotation and decreased in the course of repetitive Coriolis stimulation. It was revealed that the amplitude of P response of SPR in the arousal sweat area corresponds to the degree of transient motion discomfort.

A89-36353 Symptoms and signs associated with anti-G training. FUKUMI NOZAWA, AKIO NAKAMURA, TADAO YANAKA, TOYOFUMI KAKU, WATARU MITSUHASHI et al., *Japan Air Self Defense Force, Aeromedical Laboratory Reports* (ISSN 0023-2858), Vol. 29, June 1988, pp. 77-83. 9 Refs.

The symptoms displayed by three groups in anti-G training are examined. The sypmtoms include autonomic imbalance due to motion sickness and spatial disorientation and visual syptoms due to high-G hydrostatic stress. The severity of symptoms among groups in different types of training are compared. The frequency of symptoms which occur at each phase of training is discussed. The types of training considered include basic course pattern, gradual and rapid onset rate, and simulated air combat maneuver training for F-15 pilots.