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LESLIE D [illegible]RACIA J KIRK, PHILLIP A PAYNE, ROY L GERBER, SUSAN D NEWTON, and BILL A WILLIAMS. *Aviation Space and Environmental Medicine*, Vol 48, Feb 1977. P. 138–145. 36 Refs.

Changes in blood flow and blood redistribution were measured by impedance plethysmography in the pelvic and leg regions of six male and four female subjects during three 5-min exposures to—20, —40, and—60 mm Hg lower body negative pressure (LBNP). Female subjects demonstrated significantly higher mean heart rate and lower leg blood flow indices than the male subjects during the recumbent control periods. Men had slightly higher mean resting systolic and diastolic blood pressures and higher mean control pelvic blood flow indices. Women demonstrated significantly less blood pooling in the legs and slightly less in the pelvic region than the men. All of the 18 tests with male subjects at −60 mm Hg were completed without initial signs of syncope, while only two of the tests with women were completed successfully without the subject exhibiting presyncopal conditions. The results of this study indicate that impedance plethysmography can be used to measure segmental cardiovascular responses during LBNP and that females may be less tolerant to—60mm Hg LBNP than males.

2. Disorienting effects of aircraft catapult launchings: III. Cockpit displays and piloting performance. MALCOLM M COHEN, *Aviation Space and Environmental Medicine*, Vol. 48, Sept 1977, P. 797-804, 12 Refs.

Accelerations closely approximating those encountered in catapult launchings of carrier-based aircraft were generated on the Naval Air Development Center's human centrifuge Dynamic Flight Simulator. Flight instruments, controls, and flight dyna[illegible] an A-7 aircraft were provided to four expe[illegible] Naval aviators, who exercised closed-loop co[illegible] a simulated climbout immediately after the[illegible] exposed to the accelerations. Four experi[illegible] conditions were employed for each aviator: [illegible] operational flight instruments, (2) conventional [illegible] instruments, (3) a single carrier takeoff d[illegible] display, and (4) conventional flight instrument[illegible] the takeoff director display operating concur[illegible] Measures of flight parameters, including [illegible] airspeed, angle of attack, rate of climb, altitude [illegible] attitude, and pitch trim adjustments were moni[illegible] throughout the simulation. Subjective reaction[illegible] piloting performance were examined under each [illegible] the four conditions. Results indicate that the co[illegible] takeoff director display significantly reduced [illegible] workload and enhanced performance during [illegible] climbout.

3. Mechanism of head and neck response in [illegible] impact acceleration: A Math modeling approa[illegible] GEORG D. FRISCH, LOUIS D'AULER[illegible] and JOSEPH O'ROURKE, *Aviation Space [illegible] Environmental Medicine*, Vol. 48, March 19[illegible] P. 223–230, 12 Refs.

Mathematical modeling has attained wider accep[illegible] tance in recent years. In particular, the use of com[illegible] puter programs to simulate the dynamic response [illegible] a human in a crash situation has become an attra[illegible] tive alternative to full-scale experimental testing. This paper analyzes data on the dynamic response of the living human head and neck to-Gx, impact acceleration, where the motion of the subject's head and neck in the midsagittal plane was monitored with inertial instrumentation and high-speed photography for confirmation. The Calspan "3D Computer Simulator of Motor Vehicle Crash Victims" was used to predict expected responses for the deceleration pulses employed. These estimates were compared to the fully instrumented human test runs. The simu-

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ad 15-segment and 14-joint representation of the
segment was modified to include two sternoclavicular
joint, increasing the articulation in the upper torso.
Analysis of the data indicated that muscular activity
of the head and neck seemed to be evident and does
obscure motion of the head, even at relatively
low (10-G peak, 530 G/s onset) acceleration levels.
Simulation of muscular contraction, using a spring-
damper arrangement, improved the results signifi-
cantly. Additionally, possible limitations to head-
neck motion, such as ligament restrictions, were
also modeled.

4. **Visual field contraction during G stress at 13°, 45° and 65° seatback angles.** KENT K GILLINGHAM and GRANT B MCNAUGHTON, *Aviation Space and Environmental Medicine*, Vol. 48, February 1977, P. 91–96, 7 Refs.

In support of the High Acceleration Cockpit program, two groups of six experienced subjects, operating a high-resolution visual field limit tracker, were exposed to gradual-onset (0.067 G/s) G stress to a 7-G maximum on the USAFSAM human centrifuge. Data obtained from one group described the G-induced vertical visual field contraction, and that from the other described horizontal visual field contraction as they occurred in relaxed subjects in seats with 13°, 45°, and 65° seatback angles. Curves of peripheral vision remaining vs. G level indicated a statistically significant difference in tolerance provided by the 65° seat over that provided by the 13° and 45° seats in the 5- to 7-G range, and a significant difference in tolerance provided by the 45° and 65° seats over that provided by the 13° seat in the 4- to 5-G range. Two dimensional reconstructions of the superior half of mean binocular vision remaining at the various levels of G stress showed complete visual loss near 5-G in the 13° seat, complete loss near 6-G in the 45° seat, and substantial peripheral vision remaining at 7-G in the 65° seat.

II. ENVIRONMENTAL PHYSIOLOGY

5. **Altitude decompression sickness: Hyperbaric therapy results in 145 Cases.** J C DAVIS, P J SHEFFIELD, L SCHUKNECHT, R D HEIMBACH, J M DUNN, G DOUGLAS and G K ANDERSON, *Aviation Space and Environmental Medicine*, Vol. 48, August 1977, P. 722–730, 36 Refs.

Most cases of decompression sickness that occur at altitude resolve upon descent to lower altitudes. Before the use of hyperbaric therapy, cases that did not resolve accounted for some of the most difficult medical management problems in military aerospace medicine. On 27 March, 1941, the U. S. Navy Diving School successfully used hyperbaric therapy for a case of altitude-induced decompression sickness that did not resolve on return to ground level. Since then, over 145 such cases have been treated by hyperbaric therapy. At first, treatments involved using compressed air, with varying success. Current medical management of altitude-induced decompression sickness requires immediate compression to 2.8 ATA, equivalent to 60 ft. of sea water (FSW) pressure, and a series of intermittent oxygen and air breathing periods during the subsequent slow decompression to surface. This report confirms the treatment recommendations set forth by Behnke and Downey, and crystallized by Goodman in 1964. Conclusions are based on treatment experience in the management of 120 cases in U. S. Air Force hyperbaric chambers, and a survey of hyperbaric facilities which have treated 25 other cases.

6. **Causes of high blood O_2 affinity of animals living at high altitude.** D PETSCHOW, I WURDINGER, R BAUMANN, J DUHM, G BRAUNITZER and G BAUER, *Journal of Applied Physiology, Vol. 42, February 1977, P. 139-143, 34 Refs.*

We have measured the partial pressure of O_2 at 50% saturation (P_{50}) and the concentration of various phosphate compounds in the erythrocytes of the bar-headed goose and the guanaco to establish the cause of the high blood O_2 affinity in animals who normally reside at high altitude. The same data were obtained in the blood of two goose species, that live at sea level, and in human blood. At standard conditions (pH 7.4 PCO_2 40 Torr, 37°C), P_{50} was 29.7 Torr in the blood of the bar-headed goose and was about 10 Torr higher in the goose species living at sea level. Since the concentration of organic phosphates was not markedly different in the erythrocytes of either goose species we conclude that the hemoglobin of the bar-headed goose reacts more weakly with organic phosphates, which can also be inferred from studies on purified hemoglobin solutions. Likewise the low P_{50} of guanaco blood in comparison with human blood can be explained by a reduced interaction of 2, 3—bisphosphoglycerate of guanaco hemoglobin compared to the human pigment.

7. **Effect of breathing helium-oxygen on static lung volumes and lung recoil in normal man.** MICHAEL A HUTCHEON, JOSEPH, R RODARTE, and ROBERT E HYATT, *Journal of Applied Physiology*, Vol. 42, June 1977, P. 899-902, 11 Refs.

Static lung volumes and static elastic recoil pressure (Pel) were measured in normal subjects breathing air and 80% helium plus 20% oxygen ($He + O_2$). In 22 subjects, $He + O_2$ produced small but significant increases in total lung capacity (TLC) (mean 0.11 litre, $p < 0.001$) and residual volume (mean 0.10 litre, $p < 0.01$) without change in vital capacity or functional residual capacity. The mechanisms for this change are obscure. In 10 subjects, breathing $He + O_2$ had no significant effect on pel (paired t-test) at any lung volume measured (50-80% TLC). In one subject, Pel at 70 and 80% TLC was significantly higher on air than on $He + O_2$ (unpaired t-test, $p < 0.5$). Because changes in lung volumes and lung recoil were small, we conclude that these effects do not negate the clinical utility of $He + O_2$ flow-volume curves.

8. **Recurrent heat exposure: Effects on levels of plasma and urinary sodium and potassium in resting and exercising men.** RALPH FRANCESCONI, JOHN MAHER, GAITHER BYNUM, and JOHN MASON, *Aviation Space and Environmental Medicine*, Vol. 48, May 1977, P. 399-404, 18 Refs.

Heat acclimatization was induced in a group of healthy young men by walking on a treadmill (5.6 km/h, 49°C/27°C dry/wet bulb, 90 min/day, 7 d) and confirmed by observing significantly reduced final rectal temperatures and heart rate on the seventh day of exercise in the heat. A second group of men, paired for maximal oxygen consumption and body weight, remained sedentary under identical environmental conditions. While the mild exercise combined with the severe heat conditions induced significant hyperkalemia ($p < 0.02$, minimal significance) on both the first and final days, there did occur an attenuated response with significantly ($p < 0.01$) reduced plasma K^+ after 45 mins on the seventh day when compared with first day levels. No significant inter- or intra-group differences in plasma Na^+ levels were found although the Na^+ content of 24-h urine samples showed that men exercising in the heat retained an increased ability to conserve Na^+, while sedentary individuals consistently displayed increased [illegible] of Na^+. Thus, we concluded that even the exercise described herein effected hyperkalemia each sampling time, but the level of hyperkalemia was attenuated after acclimatization, and while [illegible] was conserved in the exercising men, no such adaptive processes occurred in sedentary individuals.

9. **Responses to temperate, cold and hot environments and the effect of physical training.** E SHVARTZ, Z GLICK and A MOZANIK, *Aviation Space and Environmental Medicine*, Vol. 48, March 1977, P. 254-260, 25 Refs.

Ten young men underwent several tests before and after a training program: a bicycle ergometer test and 60 min of moderate exercise performed in temperate 24°C; the same work load performed in heat (40.0°C DB, 30.4°C WB) for 3 h; and cold (10°C) exposure for 60 min. Training consisted of 13 1-h sessions of hard, strenuous and exhaustive work performed in temperate conditions four times a week. Training resulted in substantial decrease in heart rate and rectal temperature responses to exercise in temperate, minor increases in hot, and no significant changes in cold conditions. Subjects who showed good responses to heat, also showed good responses at 24°C, and poor compensatory responses to cold which were indicated by relatively low heat production and rectal temperature values, and relatively high body heat loss and extremities temperature values. Subjects who showed poor heat tolerance also showed poor responses in temperate and poor compensatory responses in cold conditions. Positive correlation coefficients were found between rectal temperatures in the three environments, and between heart rate and sweat rate responses in temperate and hot conditions. The results indicated that moderate severe training causes minor tolerance improvement in heat and no changes in cold, and that responses in temperate, cold, and hot environments are independent.

10. **Studies on heat output from the hands of frostbite subjects.** C. S. NAIR, INDER SINGH, M. L. MALHOTRA, LAZER MATHEW, A DAS GUPTA, S. S. PURAKAYASTHA, and J. SHANKER, *Aviation Space and Environmental Medicine*, Vol. 48, March 1977, P. 192-194, Refs.

We studied 12 subjects, who had suffered first- third-degree frostbite at high altitude during winter at Delhi, India. At normal sea level pressure the

PB 740 mm Hg) and in a decompression chamber at a simulated altitude of 4085 m, the studies were at both 26°C and 6.8°C. A group of control (non-frostbite) subjects of comparable age were also studied for their heat output at 26°C, PB 740 mm Hg. Heat output from the hands of group of mountaineers from the sea level was also studied at 2121 m at 25°C and 4485 m at 7°C. The results indicated that the frostbite subjects had a significantly higher heat output at PB 740 mm Hg and 26°C than the non-frostbite subjects. When the former were tested at sea level (PB 740 mm Hg), at 6.8°C, the hand heat output showed a marked and significant decrease. On testing them at a simulated altitude of 4085 m at 26°C and at 6.8°C, a very highly significant reduction in hand heat output was observed compared to their initial value at sea level (740 mm Hg) and 26°C. Their hand heat output also showed a very highly significant decrease compared to mountaineers at 4485 m and 7°C.

11. **Ten-year survey of altitude chamber reactions using the FAA Training chamber flight profiles.** CHARLES D VALDEZ, *Aviation Space and Environmental Medicine*, Vol. 48, August 1977, P. 718-721, 6 Refs.

The Federal Aviation Administration since 1962 has trained nonmilitary government-employed flightcrews and civilian pilots in aspects of altitude and its effects on the human body. The standard military altitude chamber flight profile was not used and the reasons are explained. Two different chamber profiles were used for a 10-year period and both included a rapid decompression, but the altitudes attained were limited to 25,000 ft. (7,620 m) and 29,000 ft. (8,839m). During the 10-year period cited in this report, 4,759 students were exposed to these altitudes and none experienced an evolved gas problem.

III. CLINICAL AVIATION MEDICINE

12. **Coronary heart disease index based on longitudinal electro-cardiography.** JOHN C TOWNSEND and JEREMIAH P CRONIN, *Aviation Space and Environmental Medicine*, Vol. 48, August 1977, P. 765-770, 9 Refs.

A coronary heart disease index was developed from longitudinal ECG (LCG) tracings to serve as a cardiac health measure in studies of working and, essentially, asymptomatic populations, such as pilots and executives. For a given subject, the index consisted of a composite score based on the presence of LCG aberrations and weighted values previously assigned to them. The index was validated by correlating it with the known presence or absence of CHD as determined by a complete physical examination, including treadmill, resting ECG, and risk factor information. The validating sample consisted of 111 subjects drawn by a stratified-random procedure from 5000 available case histories. The CHD index was found to be significantly more valid as a sole indicator of CHD than the LCG without the use of the index. The index consistently produced higher validity coefficients in identifying CHD than did treadmill testing, resting ECG, or risk factor analysis.

13. **Coronary risk factors in flying personnel: A Progress Report** WILLIAM H. KING, LOUIS F. OWENS and JEANNE A FADUSKO, *Aviation Space and Environmental Medicine*, Vol. 48, February 1977, P. 162-163.

Since October 1971, the Flight Surgeon's Office at the USAF Hospital Dover has implemented a program of early detection and treatment of coronary risk factors in aircrew personnel. The program is integrated with USAF periodic physical examinations with interval follow-up of members found to have possible risk factors. A report of initial (baseline) findings was presented at the Aerospace Medical Association meeting in May 1975. During the past year, the base did experience one death due to myocardial infarction in an aircrew member, while two others were grounded due to serial ECG changes, consistent with silent myocardial infarction by review at the USAF – SAM ECG Library.

14. **Evaluation of the hazards of sickle trait in Aviation.** JESS M. MCKENZIE, *Aviation Space and Environmental Medicine*, Vol. 48, August 1977, P. 753-762, 75 Refs.

This report presents some of the technical background necessary for understanding the aeromedical importance of sickle-cell disease and the sickle-trait state in individuals whose erythrocytes contain mixtures of hemoglobin S and normal hemoglobin A. This carrier state (type AS) is not limited to Negroes; it has been found, with lower

frequency, in people exhibiting no evidence of African inheritance. Reports of type AS people who died suddenly, exhibiting sickle cell at necropsy, and other reports of sickling crises in these AS individuals at mild altitudes have led some authors to conclude that airmen and air passengers who are of type AS are at considerable risk. Other reports, particularly those based on the flying experience of large numbers of pilots with sickle trait as well as on the results of experimental exposures of type AS people to simulated altitude, indicate that isolated instances of sudden death and altitude intolerance are infrequent in this phenotype. The author concludes that sickle trait — in the absence of a positive history of sickling crises, unusual difficulties in anesthesia, or known contributing factors — is no basis for suspecting an intolerance to moderate altitudes. It is possible, however, that in a few individuals with sickle trait, other factors may be present that can lower the threshold to sickling. Therefore, training in the use of oxygen equipment is especially important to airmen with sickle trait. This training does not require a hypoxic experience and such experiences in altitude indoctrination courses should be eliminated, possibly for all individuals.

15. Hematologic changes after two exposures to 6.7 ATA air at three-day intervals. MICHAEL J JACEY, ALFONSO GONZALES, and DONALD V. TAPPAN, *Journal of Applied Physiology*, Vol. 42, June 1977, P. 838–844, 29 Refs.

Hematologic parameters were studied in human subjects exposed to various diving regimens. A series of exposures in a dry chamber to a simulated depth of 188 ft of seawater gauge (fswg), 6.7 ATA utilizing compressed air, were carried out according to standard Navy diving tables. The subjects were serially followed for a control period prior to diving and subsequently for up to 1 wk. Little significant change occurred except for alterations in some platelet factors. In another series of experiments, the single excursion was followed by a second dive to 188 fswg 3 days later, again with appropriate hematologic monitoring. A pronounced eosinopenia and increased clotting times were observed soon after reaching the surface. Platelet depletion associated with increased platelet clumping and elevated megathrombocyte levels persisted long after the second excursion. A latent hemodilution also developed 3–5 days after the second dive. These [illegible] clearly demonstrate that repeated hyperbaric exposures produce additive effects and further [illegible] that no diving procedure is completely innocuous.

16. Hemodynamic response to graded exercise after chronic beta-adrenergic blockade. TONY [illegible] BROUCK, ANTOON AMERY, and [illegible] BILLET, *Journal of Applied Physiology*, [illegible] 42, February 1977, P. 133–138, 27 Refs.

The effect of sustained beta-adrenergic blockade (BB) on the hemodynamic response to graded exercise has been studied in 31 patients with [illegible] blood pressure. Hemodynamic investigations were conducted during a control period and were repeated after 1 mo of BB. Similar readjustments were observed at rest and during submaximal and maximal exercise. No significant change occurred in maximal physical working capacity during [illegible] blockade. This resulted from hemodynamic readjustments. Maximal exercise heart rate was reduced by 34%, and this was compensated for by a 5[illegible] enhancement in stroke index. Consequently cardiac index decreased by only 14%. In the Fick equation the decrease in cardiac index was further compensated by an increase of the total arteriovenous O2 difference of 8%, thereby maintaining O2 delivery to the tissues. At maximal exercise mean brachial artery pressure dropped 14.5%, while mean pulmonary artery pressure increased by 20%. It is concluded that the compensatory action of the stroke volume, resulting from the interaction of an increased preload and a decreased impedance, played a major role in the hemodynamic readjustments following chronic BB to maintain maximal working capacity.

17. Hypercapnia during oxygen therapy in acute exacerbations of chronic respiratory failure. MICHAEL RUDOLF, R. A. BANKS, S. J. G. SEMPLE, *The Lancet*, Vol. II, Sept 1977, P. 483–486, 23 Refs.

A modification is proposed to the well-known hypothesis which explains the development of progressive carbon-dioxide retention in patients with acute exacerbations of chronic respiratory failure when they are given supplementary oxygen to breathe. It is suggested that, in these patients, increased production of lactic acid by the brain

...e to profound hypoxia, leads to a central hypoxic ...ve to breathing which is absent in a remission ...ect the arterial oxygen tension is higher. Evidence ...m the literature in support of this modification ...ought by comparing the respiratory response to ...gen of patients in an acute exacerbation of ...piratory failure with the response of patients in ...ronic stable state. Three patients are described ...whom the response to oxygen during an acute ...ective espisode was very different from their ...ponse when in remission.

...Use of hyperbaric oxygen in paralytic ileus. R.E. LODER, *British Medicol Journal*, June 1977, P. 1448-1449, 5 Refs.

During the past five years 12 cases of paralytic ...us with varying and increasing degrees of disten...on and toxicity have been treated with hyperbaric ...ygen at this hosital (Peterborough District Hospi..., Peterborough). Ten cases occurred after acute ...ction — five from acute appendicitis, two from ...erforations of the large intestine (stab wound and ...ecal carcinoma), two with no obvious cause found ...t laparotomy, and one from empyema of the gall ...bladder — one after vagotomy and pyloroplasty, and ...ne after laparotomy for abdominal trauma, at ...which a retroperitoneal haematoma was the only ...finding. All the patients had shown either no im...provement or a worsening of their condition despite ...continuous gastric suction, intravenous fluids, and ...correction of biochemistry. When indicated laparo...tomy had been performed, the cause treated, sepsis ...drained, and antibiotics given.

Hyperbaric oxygen was begun on the second ...day of illness in four cases, the third day in five ...cases, and the fourth, seventh, and eight days in the ...remaining cases. It was given over one hour twice ...daily in a Vickers single-person chamber at two-and-...a-half atmospheres, gastric suction and intravenous ...fluids being continued.

The patients received four to 10 hours of hyperbaric oxygen, and all were improved, 11 recovering completely. The remaining patient (case 7), with a perforated carcinoma of the caecum, died on the third day of treatment, although his bowel function was recovering. There were no complications referable to the hyperbaric oxygen.

19. Athletic endurance training—Advantage for space flight? The significance of physical fitness for selection and training of spacelab crews. KARL E. KLEIN, HANS M. WEGMANN, and PAUL KUKLINSKI, *Aviation Space and Environmental Medicine*, Vol. 48, March 1977, P. 215-22, 41 Refs.

While intensive physical exercise has been part of the conditioning of astronauts and cosmonauts for spaceflights, its benefits have been questioned. After reviewing the pertinent literature, it is concluded that the morphological and functional changes obtained with athletic endurance training are rather specific and of no general advantage for the tolerance to space stresses. Particularly during gravitational loads, in the relaxed subject, these changes allow a more pronounced shift of fluid into the lower extremities, with the possible consequence of a reduced tolerance. This unfavourable response, obviously, is accentuated through immersion and weightlessness. The aerobic work capacity is also more impaired in athletes. Based on these conclusions, recommendations for crews and passengers of future Spacelab missions are given with respect to selection and pre and in-flight physical exercise.

20. Effect of superoxide dismutase and succinate on the development of hyperbaric oxygen toxicity. EDWARD R BLOCK. *Aviation Space and Environmental Medicine*, Vol. 48, July 1977, P. 644-648, 26 Refs.

Prolonged exposure to hyperbaric 0_2 (HBO) causes seizures and eventual death. The precise molecular basis for 0_2 toxicity is not known but may be due to increased biological production of superoxide dismutase (SOD), an enzyme that superoxide anion (0_2^-) In the present study, catalyzes the dismutation of 0_2^- to less toxic forms, was evaluated for its ability to protect against HBO-induced seizures and death, and the results were compared to those concurrently obtained with succinate (SUCC), an agent previously reported to protect against HBO-induced seizures. Preconvulsion rime and survival time in normal and vitamin E-deficient rats exposed to 100% 0_2 at 5 ATA were not significantly prolonged by pretreatment with 2 to 20 mg/kg SOD intraperitoneally (ip) or 0.1 to 1.0 mg/kg SOD intrathecally. In contrast, 12 mmol/kg SUCCIP by significantly prolonged preconvulsion

time in normal and vitamin E-deficient rats and survival time in normal rats. The ability of SUCC to stimulate ATP production may account for the protective role. Reasons for the failure of SOD to protect against O_2 toxicity are discussed.

21. Review of Epidemiology in Clinical Cardiology. VICTOR F FROELICHER, Jr. *Aviation Space and Environmental Medicine*, Vol. 48, July 1977, P. 659–664, 60 Refs.

The application of epidemiological techniques to clinical cardiology has led to very significant advances in the diagnosis and treatment of coronary atherosclerosis. However, these epidemiological techniques almost necessitate the use of modern computer technology, including data base management systems, in the application of which medicine has lagged behind other areas. Businessmen have come to rely on computerized methods of data storage, retrieval, and analysis to sell commercial products and manage our finances – while their medical counterparts rely on incomplete data in forgetful minds beset with bias and emotion to use powerful therapeutic tools in the treatment of patients. Hopefully, the next decade will see a new generation of clinical researchers who will combine epidemiology and computer technology for the improvement of health care delivery.

IV. FLIGHT SAFETY

22. Aeromedical support of flying safety programs. ROYCE MOSER, Jr. and HUBERT F. BONFILI, *Aviation Space and Environmental Medicine*, Vol. 48, May 1977, P. 465–467, 9 Refs.

One of the most significant responsibilities of the flight surgeon is support of flying safety programs. This discussion reviews the prerequisites necessary to provide such support and then considers activities the flight surgeon can accomplish in enhancing flying safety programs.

23. Complexities of human factors in Aviation. MILES S MOORE, *Aviation Space and Environmental Medicine*, Vol. 48, May 1977, P. 471–473.

Statistics continue to show an increased incidence of serious aircraft accidents where the cause has been attributed to "human factors," although the factors themselves have not always been specifically determined. This paper is an attempt to outline some of the stress factors which may cause a pilot to react improperly in a given situation and thus set in motion a train of events potentially leading to an accident.

24. Suicide by aircraft : A Case Report. R JONES, *Aviation Space and Environmental Medicine*, Vol. 48, May 1977, P. 454–456, Refs.

A 36-year-old pilot took his plane on an unauthorised flight that ended in a high vertical crash next to the runway. A retrospective "psychological autopsy" yielded strong positive evidence of an unrecognized depressive man with manipulative and mildly antisocial characteristics. His withdrawal from his usual pattern of behaviour was, instead, regarded as a desperate return to "normal" behaviour. This case report includes comments on the role of the psychological autopsy in aircraft accident investigation, anniversary reactions, the use of psychiatric diagnoses to support the agreed-upon decision on the deceased's position, some aspects of subintentional aberrant behaviour, a brief review of the literature on suicide by aircraft, and consideration of the role of the flight surgeon in preventing such occurrences through early recognition of depression.

25. Organization and operation of civil aviation medicine in the Soviet Union. STANLEY R MOHLER. *Aviation and Space Environmental Medicine*, Vol. 48, July 1977, P. 665–667.

The United States of America and the Soviet Union formalized an agreement in 1973 whereby periodic exchanges of information in civil aviation medicine would take place. During the period Aug 21 – Sept 9, 1975 the author and an associate visited the Soviet Union as part of the exchange agreement. During the visit the following information was covered. The civil aviation medicine program in the Soviet Union involves preflight physical examinations for aircrew members, including flight attendants, quarterly physical examinations on pilots and flight engineers, and a special central hospital for diagnosis and treatment of problem medical cases occurring in aviation personnel. In addition, prophylactoria (special rest facilities) for flight crew are maintained at major airports. Certain other aspects of Soviet

aviation medicine include preflight examinations on all children, and the provision at each aircraft of a designated medical emergency facility.

V. HUMAN ENGINEERING

26. Coordination of the Head and Eyes in pursuit of predictable and random target motion. M GRESTY and J LEECH, *Aviation Space and Environmental Medicine*, Vol. 48, August 1977, P. 741-744, 9 Refs.

Subjects were required to use their head and eyes in pursuit of visual targets, which moved randomly or sinusoidally in the horizontal plane. All subject disliked moving their heads to pursue the random motion, apparantly because the motion broke fixation which resulted in a predominance of the vestibulo-ocular compensatory reflex over the smooth pursuit reflex. As a consequence gaze (head plus eye movement) was at times in the opposite direction to the motion of the target. In steady state pursuit of sinusoidal targets, eye movement consisted of a combination of pursuit and vestibulo-ocular reflex eye movements. At frequencies below 0.5 Hz the vestibular reflex was used at times of minimum target velocity to stabilize fixation whereas during maximum target velocity the head movement was slowed and the smooth pursuit reflex predominated. At 1 Hz and over, there was a failure to suppress the compensatory vestibulo-ocular reflex; however, the saccades of vestibular nystagmus were used to "catch up" the target. There was a preference not to use the head in predictable pursuit.

27. Efficient Oxygen Mask of Patients Undergoing Hyperbaric Oxygen Therapy. PAUL J SHEFFIELD, ROGER L STORK and THOMAS R MORGAN, *Aviation Space and Environmental Medicine*, Vol. 48, Feb 1977 P. 132-137, 24 Refs.

Hyperbaric Oxygen (HBO) is established therapy for various disorders, but its effectiveness depends on the efficiency of the oxygen delivery system. A mask oxygen delivery system, consisting of the standard USAF aviator's A-14 regulator and the MBU-5/P oxygen mask, is installed in all USAF hyperbaric chambers. The efficiency of the mask oxygen delivery system at the USAF Hyperbaric Center, Brooks AFB, Tx, was evaluated breath-by-breath at sea level and 2.4 ATA *via* two different measuring techniques. Three groups of subjects were evaluated. Four subjects in Group I and seven subjects in Group II were randomly selected to use a single instrumented mask which was improperly fitted. The result was variable inspired oxygen levels from 61% to 100%. Six subjects in Group III wore properly fitted masks and achieved end-inspired oxygen level of 88.5 ± 3.5 (SE) % was achieved within 5 min of mask donning. Inspiratory gas analysis indicates that the USAF aviator MBU-5/P mask and the A-14 regulator as used at the USAF Hyperbaric Center constitute a highly efficient oxygen delivery system for HBO therapy. This view has been reflected in arterial blood gas measurements and in preliminary data from tissue oxygen measurements in a gas gangrene patient. Future improvements in patient therapy masks are recommended.

VI. AVIATION OPHTHALMOLOGY

28. Direct and indirect ophthalmoscopy for a more accurate baseline evaluation in aircrew members. WILBUR C. BLOUNT, *Aviation Space and Environmental Medicine*, Vol. 48, March 1977, P. 269–274, 9 Refs.

The currently required Federal Aviation Agency visual evaluation for commercial and airline pilots often does not detect quiescent retinal disease, unless there is a specific history or a current change in visual acuity which dictates the need for a dilated ophthalmoscopic evaluation. Statistics indicate that there may be a significant number of undetected retinal changes which can cause sudden and irreversible alterations in visual acuity during an airman's career. The requirements for an ophthalmoscopic examination should include, at the time of entry as an aircrew member into the aviation industry, a dilated fundus examination by the binocular indirect and direct ophthalmoscopic methods. In addition, documentary photography, visual fields, and other specific studies as indicated for these patients would be accomplished. These studies should be required by both the Federal Aviation Agency and the military services just as baseline ECG's, chest films, SMA 12, and other laboratory studies are utilized.

29. Effects of alcohol on human accommodation. J. LEVETT and L. KARRAS, *Aviation Space and Environmental Medicine*, Vol. 48, May 1977, P. 434–437, 14 Refs.

Ingestion of alcohol affects the mental and physiological response of the human being. The

eye is one of the systems affected. These ocular "side effects" are divided between those of chronic alcoholism and those of acute intoxication. In the acute stage, nystagmus occurs and esophoria may be present during distance viewing which can lead to convergent strabismus with diplopia. Pupil dilation may also occur. It has been stated, on the one hand, that alcohol affects the eye's ability to accommodate while, on the other, that "accommodation is usually not impaired but convergence may be poor." However, little is known about the effects of alcohol on the factors which characterize a static accommodation response, which is defined as the accommodation from one fixed point of focus to another. Two factors, latency response time and total accommodation, were studied as a function of the blood alcohol of each subject. Each of the three subjects was tested, as a control, in a dark environment and his accommodation measured monocularly. The accommodation task involved a 2-diopter change in lens power. Each subject was then given an alcoholic beverage and his ability to accommodate was monitored for levels of blood alcohol in the range of 50 mg of ethanol/100 ml of blood to 100 mg/100 ml. Within this range the blood alcohol levels it was found that the accommodation response times were increased by 10–30% over controls.

30. Effect of Emotional Stress on Recognition of Visual Patterns. PV SIMONOW, MV FROLOV, V F EVTUSHENKO and E P SVIRIDOV, *Aviation Space and Environmental Medicine* Vol. 48, Sep. 1977, P. 856–858, 7 Refs.

The object of the study was to observe the changes in efficiency of perceptive activity of man (recognition of visual patterns against a background of noises) throughout an increase in emotional stress caused by a forthcoming parachute jump. A moderate degree of emotional stress can improve performance efficiency and decrease the number of the subject's errors. Later an impairment of differentation of similar signals was seen and an increase in the number of "false alarm" errors along with a decrease in the number of omissions to reactions signals. The neurophysiological basis of such changes in perceptive activity consists in a transition from conditional behaviour to reaction through mechanisms of Ukhtomsky's dominant focus.

31. Prevention of visual Anxiety and Proficiency Problems in the Senior Air Transport Pilot. STANLEY DIAMOND and M FREDERICK LEEDS, *Aviation Space and Environmental Medicine*, Vol. 48, Sep. 1977, P. 877–881, 9 Refs.

Several actual cases were presented to show the problems encountered with flight deck vision in the middle age presbyopic pilot both in the simulator and in flight. We have gained useful knowledge of the proper flight-deck needs and optical corrections for these pilots, which should be passed on to aviation examiners, eye specialists, and pilots themselves. This would relieve a great deal of unnecessary lost time and anxiety which results when the pilot has a correction unsuited for the cockpit and encounters extreme difficulty in simulator work and in actual flight conditions which he does not understand and which can become very frustrating and a source of anxiety because his career is at stake. This anxiety may lead to other functional ocular problems, is unnecessary, and can be prevented.

VII. AVIATION OTOLARYNGOLOGY

32. Optokinetic motion sickness: Continuous head movements attenuate the visual induction of apparent self-rotation and symptoms of motion sickness, JAMES R LACKNER and RICHARD A TEIXEIRA, *Aviation Space and Environmental Medicine*, Vol. 48, March 1977, P. 248–253, 27 Refs.

Symptoms of motion sickness are sometimes experienced during exposure to optokinetic stimulation. Two experiments were performed to compare the symptoms of motion sickness elicited when subjects were exposed to incremental changes in optokinetic stimulation while sitting passively and while continuously executing shoulder-to-shoulder head movements. In the first experiment, a fixed head-movement frequency (20 cpm) was used, whereas in the second the subjects varied the frequency of their head movements in order to maintain suppression of illusory self-rotation. In both experiments, subjects in the head-moving condition had fewer and less severe symptoms of motion sickness and experienced illusory self-rotation after longer exposure times and at higher optokinetic velocities than in the head-stationary condition. Subjects in the head-movement condition of the second experiment

increased the frequency of their head movements as the velocity of optokinetic stimulation increased. The symptoms of motion sickness elicited during optokinetic stimulation tended to be dizziness, headache, eye-strain, and stomach awareness appearing in no fixed order. The pattern and constellation of symptoms are unlike those elicited by vestibular stimulation.

33. **On the interaction of otolithic and cupular sensations.** L. IVAN EPSTEIN, *Aviation Space and Environmental Medicine*, Vol. 48, March 1977, P. 200–202, 14 Refs.

A differential equation is proposed for describing how the brain compromises between a sensation of rotation about a particular axis (derived from the semicircular canals) and a sensation of gravity perpendicular to this axis (derived from the otolith organs). It is shown that this differential equation, with suitably chosen and reasonable values of the parameters and initial conditions, will satisfactorily explain the experimental results of Lansberg Guedry, and Graybiel.

VIII. AVIATION PATHOLOGY

34. **Post-mortem blood alcohol in general aviation pilots.** T. C. BROWN and J. C. LANE. *Aviation Space and Environmental Medicine*, Vol. 48, August 1977, P. 771–775, 24 Refs.

Blood alcohol concentrations are reviewed from a series of 250 consecutive fatal accidents, involving 259 pilots for the years 1962 through 1975. BACs were obtained in 150 of 213 fatally injured pilots whose bodies were recovered. Positive BACs were 18% of total estimations. Impairment by alcohol was probably a factor in about 9% of accidents in which valid BACs were obtained. These percentages are not significantly different from lumped U.S. data. Comparison with fatal accidents in other modes of personal transportation shows alcohol plays a part in the following descending order: cars in single-vehicle accidents, all cars, motorcycles, general aviation aircraft.

IX. AVIATION PSYCHIATRY

35. **Performance in a 12-Hour, 300-Rad Profile.** MICHAEL G. YOCHMOWITZ and G. CARROLL BROWN, *Aviation Space and Environmental Medicine*, Vol. 48, March 1977, P. 241–247, 22 Refs.

A discrete behavioral task was initiated to study the effects of a 300-rad variable dose rate exposure profile upon positively (food reward) and negatively (mild shock) reinforced groups of primates. Animals performed the task for 12 h. Performance decrements were readily apparent in 2 of 8 shock and 2 of 7 food animals, while delaying reaction times were found in 3 of 8 shock and 3 of 7 food animals. Of the 7 food animals, 4 exhibited emesis, while 1 of 8 shock animals vomited. Such information is useful to military planners who need guidelines to indicate potential aircrew nuclear vulnerability and survivability.

36. **Sequelae of concussion caused by minor head injuries.** WILLIAM H. RUTHERFORD, JOHN D. MERRETT, JOHN R. McDONALD, *The Lancet*, Vol. 1, January 1977, P. 1–4, 8 Refs.

Of 145 patients with concussion from minor head injuries admitted to the Royal Victoria Hospital, Belfast, over one year, 19.0% had no symptoms, 38.9% had between 1 and 6 symptoms, and 2.1% had more than 6 symptoms about six weeks after the accident. There was significant correlation between a high symptom-rate at six weeks and positive neurological signs and symptoms at twenty-four hours. Postconcussions symptoms were more frequent in women, in those injured by falls, and in those who blamed their employers or large impersonal organisations for their accidents. The results suggest that both organic and neurotic factors are involved in the pathogenesis of symptoms at six weeks.

37. **Arousal from sleep: The physiological and subjective effects of a 15 dB(A) reduction in Aircraft flyover noise.** T. E. LEVERE and N DAVIS. *Aviation Space and Environmental Medicine*, Vol. 48, July 1977, P. 606–611, 15 Refs.

The present research was concerned with whether or not a 15 dB(A) reduction in overall noise level would lessen the sleep disturbing properties of jet aircraft flyover noise and, if less disturbing, whether this would be subjectively appreciated by the sleeping individual. The results indicate that a reduction of 15 dB(A) does result in less sleep disruption but only during sleep characterized by fast-wave electro-encephalographic activity. During sleep characterized by slow-wave electroencephalo-

graphic activity, such a reduction in the sleep-disturbing properties of jet aircraft noise has little effect. Moreover, even when effective during fast-wave sleep, the decreased arousal produced by the lower noise levels is not subjectively appreciated by the individual in terms of his estimate of the quality ated by the sleeping individual. The results indicate of his night's sleep. Thus, reducing the overall noise level of jet aircraft flyovers by some 15 dB (A), is, at least, minimally beneficial to sleep.

38. Some psychological correlates of motion sickness susceptibility. WILLIAM E. COLLINS and J. MICHAEL LENTZ. *Aviation Space and Environmental Medicine*, Vol. 48, July 1977, P. 587–594, 35 Refs.

Four groups of 37 subjects each (highly susceptible men, highly susceptible women, nonsusceptible men, and nonsusceptible women) were obtained from a population of 2,432 college students ranging in age from 18 to 39 years. Susceptibility to motion sickness was determined by scores on a motion sickness questionnaire (MSQ); only individuals with extreme scores were considered for inclusion in the experimental groups. The following tests were administered: Floor Ataxia Test Battery, State-Trait Anxiety Inventory, Menstrual Distress Questionnaire, Cornell Medical Index, Cornell Word Form, Eysenck Personality Inventory, Rotter Internal-External Locus of Control Scale, and the 16 Personality Factors test. Each subject was tested on at least three, but not more than six, of the eight tests. Significant sex differences were obtained on the ataxia battery and the Cornell Medical Index. Susceptible subjects did not differ significantly from nonsusceptibles on the ataxia battery but did differ significantly on all personality tests except the Menstrual Distress Questionnaire (administered only to women) and the Rotter Scale. The generally consistent and significant patterns of results from the psychological tests probably reflect the selection factors used in defining the subject group: certain personality characteristics are associated with [illegible] degree of susceptibility to motion sickness.

39. Hyperbaric Oxygenation in the treatment [illegible] Postencephalitic Amnesic Syndrome. [illegible] S LEVIN, and BRUCE H PETERS. [illegible] *Space and Environmental Medicine*, Vol. [illegible] 1977, P. 668–671, 10 Refs.

The efficacy of hyperbaric oxygenation [illegible] treatment of an amnesic disorder was studied [illegible] young woman with a residual memory impairment 2 years after Herpes Simplex Encephalitis. Quantitative testing of memory was performed under [illegible] trolled conditions before, during, and immediately following treatment. There was no systematic [illegible] in storage and retrieval of either verbal or [illegible] nonverbal information when testing was performed during hyperbaric oxygenation or after termination of four daily treatment sessions. The findings [illegible] recent studies which have indicated a lack of [illegible] peutic effects of hyperbaric oxygenation [illegible] mental efficiency of older demented patients.

X. SPACE MEDICINE

40. Prolonged Weightlessness Effect on Pe[illegible] Plasma Thyroid Hormones. CAROLYN [illegible] LEACH, PHILIP C JOHNSON, and THEO[illegible] B DRISCOLL. *Aviation Space and Environmental Medicine*, Vol. 48, July 1977, P. 59[illegible] 8 Refs.

Blood drawn before and after spaceflight from nine Skylab astronauts showed a statistically significant increase in mean plasma thyroxine (T-4) of 1.4 μ g/dl and in thyroid-stimulating hormone (TSH) of 4 μ U/ml. Concurrent triiodothyronine (T-3) levels decrease 27 ng/dl indicating inhibited conversion of T-4 to T-3. The T-3 decrease is postulated to be a result of the increased cortisol [illegible] noted during and following each mission. The results confirm the thyroidal changes noted after shorter Apollo flights and show that these hormone levels change during spaceflight.