

Abstracts of Current Aviation Medicine Literature

ACCELERATION PHYSIOLOGY

1. Quantitative effect of linear acceleration on positional alcohol nystagmus. W. J. OSSTERVELD, G. MEINERI and G. PAOLUCCI. *Aerospace Medicine*, Vol. 45, July 1974, P. 695-700, 31 Refs.

The effect of linear accelerations on positional nystagmus was studied in human test subjects. Blood-alcohol determinations were made several times after the intake of a dosage of whisky. Eye-movements were recorded nystagmographically. By means of a human centrifuge the persons were subjected to a g-load from 1 up to 3 g. There proved to be a quantitative relationship between the g-load in the y-axis and the speed of the slow phase of the alcohol nystagmus. Even when no alcohol could be found in the blood anymore, an increase in g-loading was able to enhance a positional alcohol nystagmus. Also, after the intake of a very low dosage of alcohol an increase of the g-load was able to arouse an alcohol nystagmus. If the subjects were exactly put in supine position, alcohol nystagmus was not found, even if the g-load was brought up to 3 g.

2. Man at high sustained + Gz acceleration: A Review- R. R. BURTON, S. D. LEVERETT and E. D. MICHAELSON. *Aerospace Medicine*, Vol. 45, October, 1974 P. 1115-1136, 50 Refs.

The physiology and pathophysiology of +Gz exposure of man to 6 G and above for periods longer than 15 s—termed high sustained G (HSG)—are considered in some detail. The increase in G tolerance afforded by several (a) mechanical aids and/or (b) conscious physiologic-based countermeasures is discussed and the relative literature is reviewed. The principal limitations of human tolerance to HSG appear to be the occurrence of blackout or fatigue.

AVIATION PATHOLOGY

3. Aviation Pathology and the group system. A case breakup in the air. J. K. MASON. *Aerospace Medicine*, Vol. 45, August 1974, P. 928-930, 5 Refs.

Description of a fatal accident involving a light aircraft that lost a wing and its tail unit while flying at a height of 6,000 ft. The pilot and three passengers were killed. The investigation utilized all the sub divisions of aviation pathology. The mistakes made and the interpretation difficulties experienced are discussed. The comprehensive nature of pathology accident investigation is illustrated in the area of safety equipment appraisal.

4. Cardiac injuries resulting from ejection. S. KREFFT. *Aerospace Medicine*, Vol. 45, August 1974, P. 948-953, 52 Refs.

During ejection, the body of a pilot is exposed to impact like acceleration forces. If elasticity limits of various body tissues are exceeded, injuries result. It is reported that ejection may not only cause injuries to the spinal column but also to other inner organs, particularly to the heart. As evidence, the pathological findings on a pilot, who was fatally injured as a result of emergency ejection are presented. In order to secure evidence of traumatic cardiac damages after ejection and to commence treatment, and also for reasons of flying safety, it is recommended that these pilots not only be given a radiological, but also a thorough cardiological examination prior to resuming flying duty.

5. Myocarditis and the aircraft accident. I. M. SOPHER. *Aerospace Medicine*, Vol. 45, August 1974, P. 963-967, 7 Refs.

The entity of focal myocarditis is recognized by forensic pathologists as a cause of sudden death among asymptomatic ambulatory persons. As with

any pre-existing disease noted in aviator autopsy, final judgement in any particular case must depend upon all the circumstances surrounding the accident. The pathologist must bear in mind that this lesion has been documented as an incidental autopsy finding in 5% (and possibly more) of the population.

6. **Aircraft accident toxicology: U. K. Experience 1967-1972.** D. J. BLACKMORE. *Aerospace Medicine*, Vol. 45, August 1974, P. 987-994, 6 Refs.

During the period 1967-1972 extensive toxicological analysis has been undertaken on the victims of all accidents investigated by the department (113 aircraft involving 184 crew and 207 passengers). Tissues and body fluids from crew members have been analysed for ethanol, drugs and carbon monoxide, and that of passengers generally for carbon monoxide only. This represents an unselected series of incidents within a fixed geographical area which should illustrate the value or otherwise of routine aviation accident toxicology. As a result of this study, the value of routine aircraft accident toxicology is accentuated; in at least 35% of the incidents, the results were of direct significance to the investigating team. It is concluded that toxicological analysis is an essential feature in the investigation of any aircraft accident.

ENVIRONMENTAL PHYSIOLOGY

7. **Influence of changing time zones on air crews and passengers.** R. A. McFARLAND. *Aerospace Medicine*, Vol. 45, June 1974, P. 648-658, 30 Refs.

A brief analysis is presented of the basic physiological rhythms of the body in both men and animals. The findings are then related to aircrews and passengers. The specialized studies simulating air transport schedules are then discussed from the point of view of suggested solutions. An example is 'Project Pegasus' carried out by Christie and associates, on the effects of air travel across nine time zones. Emphasis is then placed on various factors which may influence or accentuate the effects of rapid flights across time zones. The application of in-flight studies are reviewed, and recommendations are made for air crews and passengers.

8. **Effects of hypoxia on peripheral visual responses to rapid sustained stimulation.** J. L. KOBRICK. *Journal of Applied Physiology*, Vol. 37, July 1974, P. 75-79, 6 Refs.

The response time to 48 peripherally distributed lights, which flashed in random pattern at 10-sec intervals for an entire 3.25 hour period, was measured in nine subjects exposed to hypobaric elevations of 13, 15 and 17 thousand feet. Response impairments were maximal for stimuli in the upper and lower medial periphery and increased significantly in direct relation to hypoxic severity. These results corroborated previous findings. The impairments which occurred became maximal within the first 32 min of exposure and gradually recovered thereafter. Instead of further impairing performance, the heavy task load apparently acted to maintain attention and alertness. There was no correspondence between performance impairment and the incidence and development of acute mountain sickness.

9. **Effects of prolonged stay at altitude (4000 m) on Autonomic Balance.** M. S. MALHOTRA and L. MATHEW. *Aerospace Medicine*, Vol. 45, August 1974, P. 869-872, 16 Refs.

Recording of resting heart rate, blood pressure, respiratory rate, oral temperature, skin temperature, salivary output (volume and pH), EEG (occipital leads) and cold pressor response were carried out at Delhi on two groups of subjects. One group (A) had just returned from altitude (4000 m) after staying there for a period of 2 years, and the other group (B) represented sea level residents. Results indicate that there is significant lowering of heart rate, cold pressor response, and skin temperature while there is an increase in the respiratory rate in the altitude group (A) as compared to the control group (B). No significant changes in oral temperature, blood pressure, salivary output, and EEG are however noticed. The observations suggest that there is selective hypertonus of autonomic nervous system, some components favouring sympathetic over activity while others showing predominance of the para-sympathetic system, due to the effect of prolonged stay at high altitude.

10. **Glucose-C(14)-UL metabolism in man after abrupt altitude exposure/4,300m/.** H. L. JOHNSON, G. F. CONSOLAZIO, R. K. BURK and T. A. DEWS. *Aerospace Medicine*, Vol. 45, August 1974, P. 849-854, 18 Refs.

The catabolism of infused C(14)-Glucose in sea level natives was compared during initial altitude exposure and at sea level. An increased disappearance of plasma radioactive glucose at altitude was observed in both studies, and an increased production of C(14)O₂ in the second study was observed. Fasting plasma glucose levels decreased with increased duration of altitude exposure. Altitude exposure enhanced glucagon-mediated hyperglycemia. A shorter duration of hyperglycemia and lower glucose levels at 50 min post-glucagon (below initial levels) would suggest a depletion of liver glycogen stores in the 40-hr exposed men. These data suggest that glucose catabolism was enhanced during the first few days at altitude with a concomitantly increased requirement for carbohydrate intakes, as noted in previous studies.

11. **Noninvasive study of effect of isometric exercise on left ventricular performance in normal man.** M. A. STEFADOUROS, W. FROSSMAN, M. EL. SHAHAWY, FRIEDA STEFADOUROS and A. CALHOUN WITHAM. *British Heart Journal*, Vol. 36, October 1974, P. 988, 44 Refs.

The effect of isometric skeletal muscle contraction on the performance of the normal left ventricle was studied noninvasively in 20 subjects. Studies were conducted at rest and at 3 minutes of isometric handgrip exercise at 50 per cent of maximum voluntary contraction, and consisted of simultaneous recording of left ventricular echocardiogram, external carotid pulse, phonocardiogram and electrocardiogram, while blood pressure was measured by sphygmomanometry. These data permitted evaluation of left ventricular performance in terms of left ventricular ejection fraction, mean circumferential fibre shortening velocity, and the ratio pre-ejection period/ejection time.

In relation to values at rest, isometric exercise resulted in insignificant change in all three variables. The considerable increase in blood pressure, how-

ever, indicated significant increase in left ventricular wall tension, since echocardiographic left ventricular internal dimension remained practically unchanged during exercise. Diastolic volume reserves were not utilized, and the fact that ejection fraction, mean circumferential fibre shortening velocity, and the pre-ejection period/ejection time period remained unaltered during exercise, despite considerable increase in afterload, supports the hypothesis that isometric exercise leads to enhancement of the ionotropic state of the heart.

12. **Effect of beta-adrenergic blockade on left ventricular function in exercise.** L. D. HORWITZ, JAMES M. ATKINS and S. J. LESHIN. *American Journal of Physiology*, Vol. 227, October 1974, P. 839-842 18 Refs.

The effect of beta-adrenergic blockade with propranolol on left ventricular diameter during exercise was investigated in dogs running on a treadmill. Cardiac output was substantially reduced by propranolol at all levels of exercise. Stroke volume was reduced by 22,27 and 23% for mild, moderate, and severe exercise respectively, due to elevations in left ventricular end-systolic dimensions. During mild and moderate exercise, the Frank-Starling mechanism compensated partially for the loss of the sympathetic ionotropic and chronotropic effects. However, during severe exercise there were no significant differences between intact and beta-blockade exercise in end-diastolic left ventricular diameter.

13. **Mechanism of thermal acclimation to exercise and heat.** E. R. NADEL, K. B. PANDOLF, M. F. ROBERTS and J. A. J. STOLWIJK. *Journal of Applied Physiology*, Vol. 37, October 1974, P. 515-520, 14 Refs.

Six relatively unfit (average $VO_{2max} = 38.1$ ml. min. kg^{-1}) males underwent 10 consecutive days of physical training on a bicycle ergometer for 1 h per day at between 70 and 80% of their individual VO_2 maxima. Following physical training these six subjects underwent 10 consecutive days of heat acclimation by exercising 1 h per day at 50% VO_2 max, three subjects in a 45°C dry ambient and three subjects in a 36°C humid ambient. Training provided a mean increase in VO_{2max} of 6.6 ml. min⁻¹. kg^{-1} .

Heat acclimation was accompanied by significant reductions in heart rate and internal temperature over the 10 days. From the unfit to relatively fit condition, and enhanced sweating responsiveness was achieved by an increase of 67% in the relation of local sweating rate to internal temperature, with no change in the zero point of central sweating drive. From the fit to the heat-acclimated condition, increased sweating capabilities were arrived at by a reduction, in the point of zero central drive, with no change in the relationship of local sweating rate to internal temperature. Thus a potentiation in the heat dissipation response is achieved via peripheral mechanisms during physical training and via central mechanisms during heat acclimation.

14. **Additional heart rate—an indicator of psychological activation.** ARNOLDUS SCHYTTE BLIX, SIGMUND B. STROMME and HOLGER URSIN. *Aerospace Medicine*, Vol. 45, November 1974, P. 1219-1222, 21 Refs.

Heart rate and oxygen consumption of helicopter and transport aircraft pilots were measured. During flight operations, the heart rate accelerated without a corresponding increase in oxygen consumption. This heart rate increase beyond that expected from the oxygen uptake, i.e. additional heart rate, is therefore used as an indicator of psychological activation. This activation did not depend only on the actual task, but also on the experience level of the pilot himself. The levels of heart rate (and blood pressure) recorded indicate that even routine missions may impose a hazard to pilots with unmanifested or latent heart failure. This obviously calls for frequent workload-ECG examinations of flying personnel.

15. **Oxygen transport and oxyhemoglobin dissociation during prolonged muscular work.** J. M. THOMSON, J. A. DEMPSEY, L. W. CHOSY, N. T. SHAHIDI and W. G. REDDAN. *Journal of Applied Physiology*, Vol. 37, November 1974, P. 658-664, 40 Refs.

Arterial and deep femoral venous blood was sampled simultaneously and intravascular temperatures were recorded continuously during heavy

exercise at 66% maximal $\dot{V}O_2$ to exhaustion. Factors regulating HbO_2 dissociation in femoral venous blood were quantified during in vitro replication of in vivo P_{50} (pH, 7.27; 40.7°C; PCO_2 , 54 mm Hg) and standard P_{50} (pH, 7.4; 37°C; 40 mm Hg).

O_2 delivery to working muscles was adequate throughout. Prolonged work caused a rightward shift in the dissociation curve (12 mm Hg at 50% SO_2) P_{50} in vivo) but only 5 mmHg at 15% O_2 saturation (S $\dot{V}O_2$ in vivo), due primarily to increased femoral venous temperature, but caused no consistent changes in standard P_{50} mean corpuscular Hb concentration, or erythrocyte 2,3-diphosphoglycerate concentration. No independent effect of CO_2 on HbO_2 affinity or synergistic effect of the combined in vivo changes in temperature, pH, and PCO_2 was observed. HbO_2 dissociation changed little with prolonged exercise, reflecting only the increasing blood temperature.

16. **Serum enzyme changes in unacclimatized and acclimatized men under severe heat stress.** C. H. WYNDHAM, M. G. KEW, R. KOK, I. BERSOHN and N. B. STRYDOM. *Journal of Applied Physiology*, Vol. 37, November 1974, P. 695-698, 25 Refs.

The serum enzymes, glutamic oxaloacetic and pyruvic transaminases (GOT and GPT), lactic dehydrogenase (LDH), and creatine phosphokinase (CPK), of 30 unacclimatized and 16 acclimatized volunteer miners were measured at rest and a gain after either 4 h of exercise at 1.31/min oxygen consumption at 32.2°C wet bulb 1.31/m temperature, 33.8°C dry-bulb temperature and air movement of 0.4m/s or after withdrawal from the experiment because of a rectal temperature of greater than 40°C, heat syncope, or exhaustion. A control study was done at room temperature on the acclimatized men. No increase in serum enzyme levels was found after exercise at room temperature, but both GOT and CPK increased significantly in the unacclimatized and acclimatized men after exercise in heat. GOT, GPT, LDH and CPK levels in the acclimatized men were significantly higher after exercise in heat than at room temperature. Thus exercise in heat that raised body temperatures above 39°C resulted in a significant increase in

serum enzymes. However, the increases observed were neither as consistent nor of the same order as those observed in heat stroke cases. A clear distinction thus exists between the enzyme changes which follow exercise in heat and those seen in heat stroke.

17. **Changes in resistance to hypoxia following single short-term exposures to Hypoxia.** B. R. BHATIA and R. SUBRAMANIAM. *Indian Journal of Medical Research*, Vol. 62 December 1974, P. 1928-1936, 16 Refs.

Male albino rats significantly increase their resistance to hypoxia by a single exposure to a simulated altitude of 30,000 ft for 15 Min or induced breath-holding by immersion in water one week earlier. Increased resistance to hypoxia was also observed in animals exposed to a simulated altitude of 32,000 ft. up to the point of gasping and tested two and four weeks respectively after pre-exposure. The increase in the resistance was not abolished by splenectomy. Single exposures to 20,000 ft. or 25,000 ft. for one h simulated altitude a week earlier did not significantly increase the hypoxic resistance. However, daily exposures of one h. duration to 20,000 ft. for 4 weeks significantly increase the hypoxic resistance. The increased resistance observed by single exposures appears to be due to a specific action of hypoxia possibly by alteration of enzyme systems in the brain, since a single pre-exposure a week earlier to acidemia, alkalemia, adrenaline, hydrocortisone or cold exposure, do not increase the hypoxic resistance. The resistance to hypoxia was measured in terms of the time to gasp at simulated altitude varying from 32,000 ft. to 33,500 ft. and at the thermoneutral temperature of 32.5°C in the altitude chamber.

18. **Superoxide dismutase and pulmonary oxygen toxicity.** JAMES D. GRAPO and DONALD F. TIERNEY. *American Journal of Physiology*, Vol. 226, June, 1974, P-1401-1406, 36 Refs.

Superoxide (O_2^-) is a highly reactive free radical produced by the one electron reduction of oxygen. Superoxide dismutase (SOD) dismutates this free radical to less toxic forms. After exposure to 85%

oxygen for 7 days, 250 to 350-g rats had a 50% increase of SOD activity in their lungs and became "tolerant" (survived more than 4 days) to 100% oxygen. Control rats died within 72 h in 100% oxygen. The rate of development of oxygen "tolerance" closely parallels the time course for the increase in pulmonary SOD activity. Following return to air, rats made tolerant by prior exposure to 85% oxygen show decreases in pulmonary SOD activity which parallel their progressive loss of tolerance over 30 days. Guinea pigs, hamsters and mice did not develop oxygen tolerance under similar circumstances and did not have as large a change in pulmonary SOD as did the rat.

19. **Adrenomedullary pressor responses during posterior hypothalamic stimulation.** E. ADEGO and R. D. BUNAG. *American Journal of Physiology*, Vol. 227, July 1974, P. 114-117, 10 Refs.

Electrical stimulation of the posterior hypothalamus of rats anesthetized with urethane elicited biphasic increases in blood pressure consisting of a sharp primary rise followed by a prolonged secondary elevation. Blockade of autonomic ganglia with pentolinium abolished the primary but reduced the secondary phase only partially. The primary phase alone was inhibited without significant alteration of the secondary phase when adrenergic neurones were blocked with guanethidine; conversely, the secondary but not the primary phase was inhibited following exclusion of both adrenals from the circulation. Both phases disappeared when (a) adrenergic receptors were blocked with phentolamine or when guanethidine administration was followed by adrenal ligation. These findings indicate that the primary phase is due to increased sympathetic vasomotor tone while the secondary phase is caused by circulating catecholamines coming from the adrenal medulla. Heart rate always increased during the secondary phase, and when the tachycardia was prevented by (b) adrenergic blockade with propranolol both magnitude and duration of the secondary phase were reduced. Since bilateral ligation of the renal pedicles did not affect either phase, it is considered unlikely that the renin-angiotensin system is involved in acute pressor responses to short periods of hypothalamic stimulation.

20. Right atrial receptors mediate the adrenocortical response to small hemorrhage. G. L. CRYER and DONAL S. GANN. *American Journal of Physiology*, Vol. 227, August 1974, P. 325-328, 16 Refs.

Previous experiments have shown that cardiopulmonary receptors projecting through the vagus nerves are involved in secretion of cortisol in response to hemodynamic changes. The present experiments were conducted to test the hypothesis that right atrial receptors mediate the increase in secretion of cortisol following small (5 ml/kg) hemorrhage. Twenty-four dogs were studied 1 day after adrenal vein cannulation. Twelve of these dogs also had a small inflatable balloon placed inside the right atrium. All dogs were bled 5 ml/kg per 3 min. Timed adrenal venous blood samples were collected before and after hemorrhage, with and without simultaneous balloon inflation, and were analyzed for cortisol by radioimmunoassay. Hemorrhage without inflation, leads to increased secretion of cortisol ($= 3.95 \pm 0.87$ ug/min), whereas, hemorrhage with simultaneous balloon inflation leads to a diminished response ($= 1.0 \pm 0.34$). The differences were significant ($P < 0.005$). The data indicate that right atrial receptors play an important role in the adrenocortical response to small hemorrhage.

21. Elimination of cold-induced nonshivering thermogenesis by hypercapnia. WILLIAM E. PEPELKO and GENE A. DIXON. *American Journal of Physiology*, Vol. 277, August 1974, P. 264-267, 21 Refs.

Oxygen uptake VO_2 (in ml. $kg^{-1} \cdot min^{-1}$ STPD) was used as an estimate of nonshivering thermogenesis in anesthetized paralyzed male rats, previously cold acclimated for 30 days at $5 \pm 1^\circ C$. Plasma pH, $Paco_2$, VO_2 , and rectal temperature were first observed at an ambient $24^\circ C$ and then at $0^\circ C$. Cold exposure resulted in a 50-60% increase in VO_2 . Addition of 5%, 10%, or 20% CO_2 to the breathing gas resulted in a progressive decrease in O_2 uptake at both $0^\circ C$ and $24^\circ C$. The change in O_2 uptake with $Paco_2$ at $24^\circ C$ was described by the equation $VO_2 = 0.499 - 0.55 PCO_2$, and at $0^\circ C$ by $VO_2 = 7.916 - 0.140 PCO_2$. The rate of decline of VO_2 with increasing PCO_2 was significantly greater ($P < .01$) during cold exposure. With inspira-

tion of 10% CO_2 at $0^\circ C$, VO_2 decreases to a level not significantly different from air-breathing controls at $24^\circ C$. Nonshivering thermogenesis can be completely eliminated by adding 10% or more CO_2 to a breathing mixture.

22. Effects of simulated weightlessness on responses of untrained men to $+G_x$ acceleration. LESTER B. JACOBSON, KENNETH H. HYATT and HAROLD SANDLER. *Journal of Applied Physiology*, Vol. 36, June 1974, P. 745-751, 16 Refs.

Space shuttle vehicle travel will expose crew and untrained lay personnel to headward-acting ($+G_x$) acceleration stresses which may be as high as 4 G following periods of weightlessness. Previous studies, using bed rest as an analog of weightlessness, demonstrated the orthostatic intolerance and even syncope which occurs on re-exposure to a $+1 G_x$ environment (70° passive tilt) following periods of simulated weightlessness, suggesting that postbed-rest exposure to still higher $+G_x$ acceleration stresses would exaggerate the undesirable responses. This study documents bedrest induced metabolic and physiologic changes in six untrained men exposed, following a 2-wk period of simulated weightlessness, to possible $+G_x$ acceleration profiles anticipated for space shuttle vehicle travel. All subjects demonstrated decrease $+G_x$ tolerance following simulated weightlessness. While only one of six subjects could not tolerate the $+G_x$ profile in the control phase of the study, three of the six could not complete the postbed-rest study. The use of an inflated standard Air Force cutaway G suit improved $+G_x$ tolerance in all subjects, but two of six subjects still failed to complete the profile. These findings are discussed in reference to the selection of untrained humans for space shuttle vehicle travel.

23. Specificity of cardiorespiratory adaptation to bicycle and treadmill training. GARY S. PECHAR, WILLIAM D. McARDLE, FRANK I. KATCH, JOHN R. MAGEL and JOSEPH DELUCA. *Journal of Applied Physiology*, Vol. 36, June 1974, P. 753-756, 23 Refs.

The specificity of cardiorespiratory adaptation to training was evaluated following 8 wks of bicycle

ergometer (BE) training (N = 20), treadmill (TM) training (N = 20), or no training (N = 20). Subjects exercised 20 min/day, 3 days/wk for 8 wks at 85% of maximal heart rate. Mean VO_{2max} improved with training in the TM group by 6.8% and 6.9% in the TM and BE tests, respectively, as compared with corresponding improvements of 2.6% and 7.8% in the BE group. Maximal heart rate and R after training were significantly lower in both VO_{2max} tests for the BE and TM groups ($P < 0.01$). VE_{max} increased significantly on both tests ($P < 0.05$) for the TM training group, while significant improvement in VE_{max} was observed only in the BE VO_{2max} test ($P < 0.01$) for the BE training group. No significant changes were observed in the control subjects. The mean difference between TM and BE VO_{2max} (VO_{2max}) (TM-BE) for the BE group after training was significantly less than the mean VO_{2max} (TM-BE) of the TM training ($P < 0.05$) and control groups ($P < .01$). The results strongly suggest a specificity of the VO_{2max} response to bicycle training. Furthermore, the type of VO_{2max} test used to evaluate cardiorespiratory adaptation to training is an important factor that must be considered when evaluating the quantitative effects of such training.

24. Effects of hypoxia on peripheral visual response to rapid sustained stimulation. JOHN L. KOB-RICK, *Journal of Applied Physiology*, Vol. 37, July 1974, P. 75-84, 32 Refs.

Nine subjects were exposed to hypobaric elevations of 13,000, 15,000, and 17,000 ft each and were measured for response time to 48 peripherally distributed lights which flashed in random pattern at 10-s intervals for an entire 3.25-h exposure period. Response impairments were maximal for stimuli in the upper and lower medial periphery and increased significantly in direct relation to hypoxic severity. These results corroborated previous findings. The impairments which occurred became maximal within the first 32 min. of exposure and gradually recovered thereafter. Instead of further impairing performance, the heavy task load apparently acted to maintain attention and alertness. There was no correspondence between performance impairment and the incidence and development of acute mountain sickness. These results support the position that perceptual performance impairments produced by

hypoxia in tasks not involving physical exertion are unrelated to and cannot be predicted from mountain sickness symptoms, since they occur at different times during the course of exposure.

25. Respiratory heat loss at increased core temperature. R. DE G. HANSON. *Journal of Applied Physiology*, Vol. 37, July 1974, P. 103-107, 34 Refs.

Four male subjects performed a total of 36 experiments. Their core temperatures were controlled at 37.0°C, 37.8°C. At each of these levels they breathed air at three different temperatures 10°C, 20°C, and 30°C but with a constant water vapour content, 8 mmHg, while measurements were made of their convective and evaporative respiratory heat loss. Results showed an increase in convective heat loss with decreasing ambient temperature ($P < 0.001$). The evaporative heat loss showed no alteration with the changing ambient temperature but showed an increase with increasing core temperature ($P < 0.05$). Analysis of covariance showed the increase in evaporative heat loss to be due to the increase in minute volume which accompanied the rise in core temperature. This increase in minute volume also played a major part in the increase in convective heat loss with increasing core temperature but there was no increase in expired air temperature which was a contributory factor.

26. Fatigue in FB-111 Crewmembers. BRYCE O. HARTMAN, HENRY B. HALE and WAYNE A. JOHNSON. *Aerospace Medicine*, Vol. 45, Sept., 1974, P. 1026-1029, 4 Refs.

Fifteen biomedically dedicated missions of 8 h duration were flown in the FB-111 as part of its initial operational evaluation. Each two-man crew provided data on subjective fatigue, discomfort, efficiency and pre-and post-mission sleep. In addition, urine samples obtained from one crew on an unusually demanding mission were analyzed for epinephrine, norepinephrine, 17-hydroxycorticosteroids, sodium, potassium, and urea. The data showed that the crews experienced moderate fatigue and stress, aggravated by physical discomfort, from which they recovered after one night of sleep.

27. Effects of lower body negative pressure on plasma catecholamine, plasma renin activity and the vectorcardiogram. THOMAS B. GRABOYS, ROBERT D. LILLE, BURTON J. POLANSKY and ARAM V. CHOBANIAN. *Aerospace Medicine*, Vol 45, August 1974, P. 834-838, 28 Refs.

The effects on brief periods of exposure to lower body negative pressure (LBNP) have been studied in six normal subjects. LBNP produced significant increase in plasma catecholamines (PCA) in all subjects. The stimulation of PCA appeared to be related to the level of LBNP with greater increases noted at -50mmHg than at -40mmHg LBNP. Increases in plasma renin activity occurred consistently at -50mmHg LBNP but were variable at -40mmHg. Vectocardiographic changes were noted during LBNP and involved primarily a shift of the QRS axis to the left and posteriorly. The findings were consistent with a rotation of the heart on its longitudinal axis and may have been secondary to the changes in intrathoracic volume induced by LBNP.

28. Cardiovascular response of young men to diverse stresses. JAMES. J. SMITH, MICHAEL L. BONIN, V. THOMAS WIEDMEIER, JOHN H. KALBFLEISCH and DANIEL. J. McDERMOTT. *Aerospace Medicine*, Vol. 45, June 1974, P. 583-590, 35 Refs.

A battery of eight stress tests was administered to 13 young men, 19 to 26 years of age in order to compare their responses to postural, cold pressor, valsalva, and exercise stresses. Non-invasive methods were used and the entire battery was repeated in 10 of the subjects. Both postural tests, i.e. 70° head-up tilt and free standing, induced a mean diastolic pressure (DP) of + 12 mm Hg and a mean heart rate (HR) of + 28/min. The cold pressor test elicited a mean of + 18 mm Hg in both systolic pressure (SP) and DP with a significant correlation between the SP and DP ($r = + 0.72$). During the valsalva maneuver, there were marked and consistent alterations in HR and HR increments with indications that HR analysis may be a useful index of valsalva response. Performances on the bicycle ergometer and Harvard step test were poorly correlated, mainly due to motivational factors involved

in the scoring of the more strenuous Harvard test. Under these experimental conditions and with the response variables used, there were no discernible intertest performance correlations. In the majority of tests, the intraperson variances were less than the inter-person variances indicating that such response indices were generally satisfactory. More uniform test conditions and improved scoring methods are important requirements for stress testing in the human.

29. Central nervous system toxicity with hyperbaric oxygen: Case Reports. S. KRISHNAMURTI and M. L. WADHAWAN. *Aerospace Medicine*, Vol. 45, July 1974, P. 782-784, 17 Refs.

Two patients with peripheral arterial disease developed central nervous system toxicity while being exposed to hyperbaric oxygen at 2.5 ATA as a therapeutic procedure in the Institute of Aviation Medicine. The episodes occurred during the 32nd and 29th exposures, respectively. The first patient developed epileptiform fits while the second complained of giddiness and manifested restlessness and some twitchings of the facial muscles. Neither of these patients showed any abnormal biochemical changes on investigation. There were however, some EEG changes during the follow up period in both cases; these changes were only transient in nature. Oxygen toxicity of the central nervous system normally occurs when oxygen is administered at pressures higher than 4 ATA. It is postulated that the likely mechanism in the two cases is a progressive lowering of threshold of neuronal irritability by repeated intermittent exposures to HBO at 2.5 ATA.

30. Blood sugar levels in rats exposed to varying altitude stress for different periods of time. H. K. DAS and N. C. GHOSH. *Aerospace Medicine*, Vol. 45, July 1974, P. 716-720, 26 Refs.

Blood sugar levels were measured in 24-h fasted male rats and adrenalin treated rats exposed to simulated altitudes of 12,000 ft. and 25,000 ft. for varying periods, and in female rats at 25,000 ft. exposure. It was observed that both at 12,000 ft. and 25,000 ft. the rats experienced a sharp drop in

blood sugar for 30 min after an initial rise at 5 min. Increased exposure time did not cause any further appreciable change in blood sugar values. The lowering of blood sugar in the rats exposed to 25,000 ft. however, was found to be more pronounced. The hyperglycemic response following the injection of adrenalin to the fasted rats prior to the exposure to 12,000 ft. was comparatively less than that of the controls, while in those rats exposed to 25,000 ft. the blood sugar levels never exceeded the fasting values. The female rats showed greater reduction of blood sugar when compared with males.

CLINICAL AVIATION MEDICINE

31. Sinus bradycardia, Autonomic influences and clinical assessment. DAVID H. DIGHTON. *British Heart Journal*, Vol. 36, August 1974, P. 791-797, 17 Refs.

Twenty-four patients with sinus bradycardia and 16 control subjects were investigated using various autonomic reflex manoeuvres and drug response tests.

Two groups of patients are suggested by the results: 1) Bradycardia due to atrial disease (sinoatrial disease/sick sinus) — poor autonomic responses, 16 patients. Of those with poor autonomic responses, 9 had additional AV conduction defects, and half had experienced Adams-Stokes syncope. 2) Bradycardia of physiological origin — normal or supernormal autonomic responses. a) Those with normal autonomic function, 7 cases. The dominant atrial pacemaker in this group is possibly set at a lower rate than normal. Such patients were not found to be liable to Adams-Stokes syncope, but may have vasomotor syncope. b) Vagotonia, 1 case. On the basis of one patient, it is suspected that sinus bradycardia may be due to 'vagotonia' or due to an unusual sensitivity of the atrium to vagal influence. All autonomic responses were supernormal. Such patients, though probably rare, may be especially liable to vasomotor syncope.

It is suggested that the investigations presented are useful in the routine assessment of patients presenting with syncope and sinus bradycardia. Those patients with symptoms and poor autonomic responses may require pacing while those with

physiological responses may need no treatment or may be helped by drugs.

32. Cardiovascular effects of weight reduction in obese patients with angina pectoris. B. SHARMA, U. THADANI and S. H. TAYLOR. *British Heart Journal*, Vol. 36, Sept. 1974, P. 854-858, 23 Refs.

Reduction in body weight to normal limits by dietary restriction over a period of one year did not result in any symptomatic, electrocardiographic, or haemodynamic improvement in 6 obese patients with exercise-induced angina pectoris. Over the same period there was no symptomatic or objective evidence of cardiac deterioration in 4 similar patients who failed to reduce weight.

33. New approach to assessment of cardioselectivity of beta-blocking drugs. C. R. KUMANA, G. E. MARLIN, C. M. KAYE, D. M. SMITH. *British Medical Journal*, Vol. 4, Nov. 1974, P. 444-447, 22 Refs.

Propranolol, practolol, and placebo were each given intravenously at weekly intervals to six normal subjects, and their effects on respiratory function tests and heart rates assessed. The reduction in the exercise heart rate after each of the two drugs was most comparable at six hours, indicating a similar degree of cardiac betablockade, when the plasma concentration ratio of practolol to propranolol was 28:1. The peak flow rate (PFR) was higher at all times during exercise than at rest. There were significant differences between the changes in resting and exercise PFR after placebo and the reductions after propranolol (except at 24 hours), but not after practolol and the latter's influence on PFR seemed to be intermediate to that of propranolol and placebo. At six hours, when the cardiac beta-blocking activity of the two drugs was almost the same, there was a significant difference ($P < 0.025$) between the reductions in exercise PFR associated with each drug.

Small though significant differences ($P < 0.05$) were found only between the changes in FEV after placebo and the reductions after each drug at one, two and three hours, and there was no significant difference between the effects of the two drugs.

This study supported that beta-sympathetic stimulation contributes to the bronchodilatation evident during exercise. More-over, it emphasizes the importance of assessing airway resistance both at rest and during exercise and of comparing the pulmonary effects of different drugs when their cardiac beta-blocking activity is equivalent.

34. **Prevalence of abnormalities of electrocardiogram in old people.** A. CAMPBELL, F. I. CAIRD and T. F. M. JACKSON. *British Heart Journal*, Vol. 36, Oct. 1974, P. 1005-1011, 25 Refs.

The electrocardiograms of 2254 people aged 65 or over living at home have been classified according to the Minnesota code.

62 per cent of records showed no significant abnormality. The proportion was slightly less in men than in women, and fell sharply with age.

Q/QS patterns were seen in 6 per cent, twice as commonly in men as in women. ST-T abnormalities (8%) were commoner in women, as were left ventricular hypertrophy patterns (9%)

The most frequent conduction defects were left bundle-branch block, right bundle-block, left anterior hemiblock, and incomplete right bundle-branch block, each of which was present in 1.4-2.0 per cent.

Atrial fibrillation was present in 2 per cent under the age of 75 and 5 per cent over that age.

The findings are discussed in the light of other studies of random samples of old people.

35. **Prenylamine in treatment of angina.** HELEN TUCKER, PETER CARSON, NIGEL BASS and JULIA MASSEY. *British Heart Journal*, Vol. 36, Oct. 1974, P. 1001-1004, 13 Refs.

Forty-one patients with angina completed a double-blind crossover trial in which the antianginal effects of prenylamine were compared with those of a placebo. Prenylamine produced a highly significant reduction in the frequency of anginal attacks, 32 patients reporting improvement. Prenylamine

caused a slight but significant bradycardia and a small but significant reduction in diastolic blood pressure; but these changes had no statistical correlation with improvement in angina. It is concluded that prenylamine is a useful drug in the treatment of the majority of patients with angina though it is not effective in all.

36. **Treatment of decompression illness and air embolism with hyperbaric oxygen.** GEORGE B. HART. *Aerospace Medicine*, Vol. 45, Oct. 1974, P. 1190-1193, 17 Refs.

Thirty patients were treated for air embolism, 18 from diving accidents, 11 from iatrogenic sources, and one from criminal means. A death occurred in the iatrogenic group and one in the criminal group. Four patients had permanent neurological deficit. Fourteen patients were treated for decompression illness with no failures. All patients were treated in a monoplace chamber compressed with oxygen and breathing oxygen.

VESTIBULAR PHYSIOLOGY

37. **Motion sickness incidence as a function of the frequency and acceleration of vertical sinusoidal motion.** O'HANLON, J. F. and M. E. McCAULEY. *Aerospace Medicine*, Vol. 45 Apr. 1974, P. 366-369, 15 Refs.

Fourteen experimental conditions of vertical sinusoidal motion were defined by combinations of wave frequency and acceleration level in a partial factorial design. The frequency range investigated was from 5 cycles per minute (CPM) or .083 Hz to 30 CPM (.500 Hz), and the average acceleration over each half-wave cycle ranged from about .03 to .40 g. Independent groups of 20 or more male subjects (Ss) were exposed for 2 hours or until they began to vomit, whichever came first. Motion sickness incidence (MSI), defined as the percentage of Ss experiencing vomiting, was greatest at a frequency of 10 CPM (.167 Hz). For all wave frequencies MSI increased as a monotonic function of the acceleration level. A mathematical model was derived from the data, and the implications for underlying physiological mechanism and for transportation vehicle design are discussed.

38. Comparison of five levels of motion sickness severity as the basis for grading susceptibility. EARL F. MILLAR II and ASHTON GRAY-BIEL. *Aerospace Medicine*, Vol. 45, June 1974, P. 602-609, 11 Refs.

The motion sickness susceptibility of 275 healthy male subjects was measured quantitatively by a standardized laboratory procedure using a Stille rotational chair. The results, in terms of velocity of the chair and the number of active head movements, were combined into a single numerical score that represented the total stressor stimulus sustained in reaching, in turn, each of the five specific criteria for diagnosing the severity of motion sickness; viz: frank sickness (FS), severe malaise (M III), moderate malaise (M IIA and M IIB), and mild malaise (MI). The stressor value (E factor) of a single head movement at each test rpm was adjusted to yield an equivalent susceptibility score (Coriolis (Cross-coupled angular acceleration) Sickness Susceptibility Index, or CSSI) independent of the endpoint selected. Close agreement among the CSSI scores obtained at each endpoint was found in intercorrelations, test-retest reliability coefficients, and frequency distributions, which reflected the orderliness and stability in the appearance, ramification, and intensification of the acute symptomatology evoked in progressing from MI to FS. The endpoint M IIA appeared, however, to yield the best balance between subject acceptability and test confidence and was used without exception to calibrate the motion sickness susceptibility of 250 additional subjects.

39. Observations on saccules of rats exposed to long-term hypergravity. D. J. LIM, J. A. SMITH, C. W. STOCKWELL and J. OYAMA. *Aerospace Medicine*, Vol. 45, July 1974, P. 705-710, 25 Refs.

The saccules of 15 centrifuge rats and 15 control rats were examined for morphological alterations resulting from long-term exposure to hypergravity. Minimal changes were found confined to the otolithic membrane. They were (a) a slight decrease in the overall volume of otolithic membrane, (b) a redistribution of otoconia in the direction of the gravitational force, and (c) a more pronounced

"accessory" membrane. These changes were interpreted as purely mechanical effects of hypergravity, causing accelerated displacement of otoconia and subsequent entrapment of some of them on inferior portions of the primary otolithic membrane and "accessory" membrane.

40. Proposed spatial orientation flight training concept. PATRICK J. DAVID. *Aerospace Medicine*, Vol. 45, July 1974, P. 758-765, 33 Refs.

Ground-based flight simulators that use motion, angular and/or linear displacement, to induce certain flight illusions would be an appropriate innovative segment in flight training. The man-in-the-loop trainer modifies existing passive exposure practices in demonstrators and should contribute to a more efficient and cost-effective way of training certain instrument-flight skills. Pilots relate sensory information of motion cues to attitude, and attitude with instrumentation recovery techniques to cope with unusual attitude maneuvers in flight. The proposed spatial-orientation-indoctrination training concept is that the student pilot can develop skills to cope with certain common flight disorienting maneuvers in a ground-based motion simulator.

AVIATION OTOLARYNGOLOGY

41. Hearing threshold sensitivity in airline pilots. GEORGE J. KIDERA and PAUL B. GASKILL. *Aerospace Medicine*, Vol. 45, July 1974, P. 780-781, 4 Refs.

There has been increasing emphasis on the effect of environmental pollution and the factor such pollution exerts on altering man's physiology. Hearing threshold sensitivity in the commercial pilot population compares favourably with the presbycusis of the nonpilot population. In spite of exposure to what is considered hazardous noise, the often-referred to "aviator's notch" was not present in the pilots surveyed.

42. Audiological comparison of cochlear & eighth nerve disorders. JAMES JERGER, SUSAN JERGER. *The Annals of Otolaryngology & Laryngology*, Vol. 83, May-June 1974, P. 275-285, 22 Refs.

Four new approaches to the diagnostic problem of differentiating cochlear and retrocochlear dis-

orders are described. The four procedures are: (1) the forward-backward discrepancy in the Bekeky audiogram; (2) the Bekeky Comfortable Loudness (BCL) test; (3) the rollover of the performance-intensity function for PB words; and (4) the acoustic reflex. Findings on these new auditory test procedures were contrasted in three groups of patients having either confirmed cochlear, VIII nerve or brain stem disorders. Results suggest that supra-threshold levels are a more fruitful area in which to explore VII nerve symptomatology than threshold levels.

43. Radiologic aspects in differential diagnosis of neural and sensory deafness. B. HILL BRITTON. *The Annals of Otolaryngology & Rhinology*, Vol. 83, May-June 1974, P. 286-293, 4 Refs.

The use of radiologic techniques as part of the physical examination of patients with sensory and neural deafness is reviewed. Polytomies, line drawings and a clinical discussion of the following conditions are presented: osseous dysplasia, congenital deformities of the internal auditory canal and/or the labyrinth, purulent labyrinthitis, temporal bone fractures and tumors of the temporal bone and cerebellopontine angle. It is felt that current diagnostic radiologic techniques should be utilized to their fullest extent in the diagnosis and management of temporal bone problems.

44. Asymptotic threshold shift (ATS) in man from 24 Hours exposure to continuous noise. WILLIAM MELNICK and MICHAEL MAVES. *The Annals of Otolaryngology & Rhinology*, Vol. 83, Nov. 1974, P. 820-828, 10 Refs.

Two men were exposed to a 300-600 Hz band of noise at an octave-band-level of 90 dB in a sound field for a period of 24 hours. Hearing thresholds were measured in one ear at 11 test frequencies ranging from 125 to 8000 Hz prior to exposure and at selected time intervals during and after exposure. Temporary threshold shift (TTS) appeared to reach asymptotic levels by 12 hours of exposure. Maximum TTS was approximately 11 dB and occurred at 500, 750 and 1000 Hz. TTS was appreciable at 1500 Hz amounting to 7 dB and was less than 5 dB at other frequencies. The growth pattern

of TTS was triphasic; slow development during the first two hours of exposure, a rapid increase from 2 to 8 hours, and then apparently reaching an asymptote by the twelfth hour. Recovery was prolonged for the relatively small magnitude of TTS, requiring 24 hours before most of the subjects returned to pre-exposure threshold levels. Asymptotic TTS (ATS) showed dependence on pre-exposure threshold hearing levels.

AVIATION OPHTHALMOLOGY

45. Monocular visual cues and space perception during the approach to landing. ROBERT H. RIORDAN. *Aerospace Medicine*, Vol. 45, July 1974, P. 766-771, 8 Refs.

A questionnaire survey of 360 commercial airline pilots conducted to identify which of the known monocular visual cues are visualized in determining and monitoring glide slope position during a visual approach to landing. The subtended visual angle of the runway, familiar objects along the approach terrain and motion parallax of the runway were ranked in that order. The results of the survey validate known information and suggest that the perception of depth or distance during visual approach to landing is a highly complex and integrative perceptual process involving continually changing monocular cues best described as "Runway perspective" and "Runway Motion Parallax".

46. Hereditary congenital nystagmus. LOUIS F. DELL'OSSO, JOHN T. FLYNN, ROBERT B. DAROFF. *Arch. Ophthalmology*, Vol. 92, Nov. 1974, P. 366-374, 15 Refs.

Three members of the same family with hereditary congenital nystagmus (CN) were studied. Nystagmus amplitude, frequency, and intensity functions determined the gaze angle with least nystagmus. Visual acuity was increased in all cases by the use of version of composite prisms. In both pendular and jerk forms of CN, the fovea oscillated, on alternate sides of the fixation spot and exhibited simultaneous bilateral shifts in the resulting fixation bias. The nystagmus waveforms were often complex and required velocity information for distinction of type and direction. The "attempt" to fixate was a driving stimulus for CN and ambient

illumination or eyelid position were unrelated to its genesis. Pendular and jerk nystagmus are different manifestations of the same ocular motor instability and simple classification on the basis of wave form is erroneous when used to infer etiology.

47. **Effects of aircraft altitude and speed on air-to-ground visual target acquisition.** ROBERT L. HILGENDORF, SHELTON MACLEOD and ROBERT G. SEARLE. *Aerospace Medicine*, Vol. 45, July 1974, P. 745-749, 9 Refs.

A study of the joint effects of speed and altitude on air-to-ground visual target acquisition performance was made using a 1:1000 scale circular terrain model. Subjects were required to recognize boats, trucks, and a small village while making a simulated banking turn at two altitudes (300 m and 750 m) and at three speeds (240, 360 and 480 km/h). Performance was measured in terms of errors (missed targets). Trends revealed by the data were consistent with the view that at the higher altitude, with an open view of the target, aircraft speed is a limiting factor which degrades performance through reduction in search time. At the lower altitude however, masking effects intrude as a limiting factor.

48. **Functional Organisation of the ocular motor system.** L. F. DELL'OSSO and R. B. DAROFF. *Aerospace Medicine*, Vol. 45 August 1974, P. 873-875, 20 Refs.

Various stimuli, other than a moving target, have evoked slow eye movements improperly designated "pursuit." Attempts at explaining these eye movements have provoked convoluted hypotheses. This confusion can be alleviated by conceptualization of the ocular motor control system as a synergistic interaction of the dual-mode version subsystem with the vergence subsystem which produces only three basic outputs: fast eye movements (FEM), slow eye movements (SEM), and vergence eye movements (VEM).

AVIATION PSYCHIATRY

49. **Flying decompensation syndrome and fear of flying.** TEOBALDO LLOSAROJAS. *Aerospace Medicine*, Vol. 45, Sept. 1974, P. 1078-1080, 16 Refs.

The natural history of man's acquisition of

flying activities has been presented. In this industrial society and age, man has become dependent upon his own inventions to the extent of giving over his own safety to them. In order to explain the reaction, fear of flying, the flying compensation syndrome and the flying decompensation syndrome have been proposed. It may be concluded that fear of flying may be normal or abnormal but not, as a sole symptom, indicative of psycho-pathology. The differential diagnostic characteristics between the flying decompensation syndrome and phobic neurosis have been enumerated. And new nosologic scheme for fear of flying has thus been developed.

50. **The diagnosis of hysteria: An Overview.** PAUL CHODOFF, *The American Journal of Psychiatry*, Vol. 131, Oct. 1974, P. 1073-1078, 46 Ref.

The author outlines the three predominant conceptualizations of hysteria: that described by Briquet in 1859 and revived by current researchers; hysteria as a conversion symptom; and the idea of the hysterical personality. He also reviews psycho-analytic conceptualizations of hysteria especially the idea of hysteria as the result of repressed sexuality—and presents explanatory models alternative to them. Although there is great confusion about the diagnosis of hysteria, he concludes that the term itself is valuable for psychiatry. Suggestions for clarifying the concept include separating Briquet's hysteria and what has been termed the "hysterical personality" from their identification with hysteria and using the term in the diagnosis of hysterical conversion symptoms.

51. **Catecholamine receptor function in depressed patients.** DENNIS L. MURPHY, CYNTHIA DONNELLY and JAY MOSKOWITZ, *The American Journal of Psychiatry*, Vol. 131, Dec. 1974, P. 1389-1391, 26 Refs.

The authors compared the effects of norepinephrine on catecholamine alpha receptors in platelets obtained from bipolar and unipolar depressed patients and from normal subjects. They found no differences, although reduced catecholamine receptor function has been suggested as one specific mechanism to account for a deficit in catecholamine function in depression.

52. **The Evolutionary mechanisms of neurotic behaviour.** A. D. JONAS and D. F. JONAS. *The American Journal of Psychiatry*, Vol. 131, June 1974, P. 636-640, 22 Refs.

The authors present evidence that many of the maladaptive behaviour patterns labelled as neurotic result from man's retention of archaic responses. This retention is the end produce of man's evolutionary history, which has produced a species that, in contrast to all others, requires a long period of immaturity to give the brain time for growth. Man's slow developmental process has allowed his brain the plasticity to retain the potential for responses developed along the whole evolutionary line. Actuated by such factors as genetic disposition, training and environmental conditions these responses can take the form of maladaptive behaviour patterns.

53. **Thought disorder in depression.** BENJAMIN M IANZITO, REMI J. CADORET and DANIEL D. PUGH. *The American Journal of Psychiatry*, Vol. 131, June 1974, P. 703-707, 25 Refs.

The authors investigated abnormalities in the thinking of depressed patients and present some preliminary data on the prognostic value of thought disorder in unipolar depressive illness. They conclude that both content disturbances and formal thought disorder may occur in primary depressive illness during episodes severe enough to require hospitalization. They also conclude that formal thought disorder at the time of admission seems to predict a more severe episode of depression and may help create a subdivision of depressive illness analogous to that proposed for schizophrenia.

54. **Psychiatric interventions with amnesic aircraft accident survivors.** HOFFMAN, PB and A. M. FARIS, *Aerospace Medicine* Vol. 45, Nov. 1974, P. 1286-1290, 30 Refs.

Aircraft accident survivors who later develop retrograde amnesia for the circumstances of their crashes present unique problems in terms of psychiatric treatment and valid accident investiga-

tion. The authors explore the complexities of treating such patients within the limitations of our present understanding of amnesic disorders and raise questions concerning medicolegal issues of informed consent, confidentiality, and validity of information recalled during the treatment process.

SPACE MEDICINE AND PHYSIOLOGY

55. **Medical legacy of Apollo.** BERRY CA. *Aerospace Medicine*, Vol. 45, Sept. 1974, P. 1046-1057, Refs.

The Apollo Programme answered questions raised by the Medical Legacy of Gemini and Mercury concerning whether the physiological changes seen were a result of confinement or a result of exposure to zero gravity. Since Apollo crews enjoyed freedom of movement and experienced many of the same problems as earlier crews, confinement had to be ruled out in the etiology of space flight-related changes. Apollo was a mission of physiological firsts; the first inflight illnesses were reported and a series of cardiac arrhythmias occurred. The most important physiological changes were decreased cardiovascular responsiveness, reduced red blood cell mass, and musculoskeletal deterioration. Vestibular related problems were also noted for the first time. Crew men lost weight as a result of a hypocaloric regimen inflight and a tendency to lose body tissue under hypogravic conditions. Aldosterone production increased causing some intracellular fluid loss. Very few of the crewmen experienced any psychological problems after Apollo.

56. **Apollo space crew cardiovascular evaluations.** G. W. HOFFLER, R. L. JOHNSON and R. A. WOLTHUIS. *Aerospace Medicine*, Vol. 45, Aug. 1974, P. 807-820, 20 Refs.

Cardiovascular responses associated with pre- and post-flight orthostatic tolerance evaluations of Apollo crewmen are presented with a brief historical survey and a discussion of their implications for future manned space flight. Heart rates were increased while systolic and pulse pressures were decreased during the immediate postflight orthostatic evaluation. A post-flight elevation in resting heart rate was a less frequent finding.

FLIGHT SAFETY

57. **Method of determining spinal alignment and level of probable fracture during static evaluation of ejection seats.** KAPLAN, B.H. *Aerospace Medicine*, Vol. 45, Aug. 1974, P. 942-944.

Studies indicate that a high proportion of vertebral fractures occur during ejections utilizing the Martin-Baker MK. J5 system. Modern ejection seat design criteria do not allow for torque effects during an ejection sequence. A rapid technique to evaluate this parameter in prototype and operational ejection seats is described.

58. **Alcohol-induced performance decrements assessed by two link trainer tasks using experienced pilots.** P. H. HENRY, T. Q. DAVIS, E. J. ENGELKEN, J. H. TRIBWASSER and M. C. LANCASTER. *Aerospace Medicine*, Vol. 45, Oct. 1974, P. 1180-1189, 16 Refs.

The degrading effects of ethanol (ETOH) on

performance of two separate tasks developed around the Link GAT-1 trainer was studied in 12 USAF INSTRUCTOR PILOTS. The subjects were tested at three alcohol dose-levels (0.3, 0.6 and 0.9 g ethyl alcohol/kg body weight), which resulted in indirectly measured blood alcohol levels of approximately 30, 60 and 100 mg% respectively. Statistically significant performance decrements were found for only the moderate and high alcohol doses. The magnitudes of the decrements corresponded closely to those we have reported for previous experiments using the same test conditions but with subjects who had no previous flying experience. An assessment of the operational significance of the performance measuring scales was also attempted through the use of special questionnaires and by concurrent rating of performance by flight examiners. Limits were established for decrement scores indicative of an operationally significant hazard. Only with the low alcohol dose could one be 95% confident that not over 5% of the population would exceed the established limits.