

Welcome
to the
Search Document
of the
Indian Journal of Aerospace Medicine
1964 to 1974



Search in Microsoft Word **E**dit **F**ind - and the
Required Text will be sequentially displayed.

Compiled by
Group Captain Navin Rattan VSM

Typing Assistance
Mrs M C Sudha STA DEBEL DRDO



The Society gratefully acknowledges the contribution of Gp Capt Navin Rattan VSM for his efforts in compiling this data and making this data available for use on the Society website.

RULES AND REGULATIONS OF THE AEROMEDICAL SOCIETY OF INDIA**MEDICAL RESEARCH IN THE ARMED FORCES**

C C KAPILA

DGAFMS. A talk given at the scientific session of the 8th annual meeting of the Aeromedical society of India.

OBSERVATION ON THE BLOOD PRESSURE CHANGES DURING SHORT TERM HEAT EXPOSURE (A PRELIMINARY REPORT)

K C SINHA, C A VERGHESE, C S NAIR

One of the major problems in Indian Air Force today is high heat load in the aircraft cockpit during the summer months. The aircraft are parked outside for long hours on the open sun soaked tarmac. As a result the temperatures inside the cockpit are several degrees higher than the ambient. To make the matter worse, a pilot of today has to put on many types of flying clothing as a mandatory requirement. A fully kitted pilot more often than not, is required to walk from the crew room to the parked aircraft in hot sun, over several hundred yards of concrete tarmac. After he gets into the aircraft, he is required to spend some time in preflight checks, in taxiing (after getting clearance form the control tower) and then gets airborne. Once airborne, after a time lag, cooling effects of altitude and air conditioning system of the aircraft cools down the pilot. The air conditioning system does not operate efficiently while the aircraft is on the ground. The duration of heat exposure under such conditions, varies, therefore according to the time taken in each of these drills as enumerated above. In view of the above it was considered necessary to study the heat load problems under Indian conditions, in proper scientific perspective. Trials were conducted at the Air Force School of Aviation Medicine, under different sets of experimental conditions on about 50 pilots. Results of the trials on 15 pilots who were subjected to high heat load without intermediary cooling with the aid of air ventilated suits are presented here as a preliminary report. Results of other trials have not been considered here.

NOISE AND ITS EFFECT ON HEARING

V S N MURTY

In recent years noise has attained high intensities and has turned out to be a very serious problem especially in aviation. Noise is unwanted sound and wasted energy. It performs no useful function necessary for flight. In fact, it affects both men and material adversely. In the past few years, with

the introduction of jet aircraft, the human aspect of the problem has changed considerably, in that, those most affected by noise are maintenance personnel rather than crew and passengers.

ANALYSIS OF NOISE OF SOME JET AIRCRAFT OF IAF

VSN MURTY

This survey presents in detail the overall sound pressure levels and octave band spectral analysis of the noise on the ground, of the following Jet aircraft

1. Hunter
2. Mystere

EFFECTS OF POSITIVE ACCELERATION (G FORCES) ON PLASMA ACTH LEVEL OF RATS

S L GOSWAMI, R K GUPTA, HARSHVARDHAN

From the department of Pharmacology and Therapeutics, Medical College, Jabalpur, India

INDIVIDUAL DIFFERENCES IN NOISE SUSCEPTIBILITY - A CORRELATIVE STUDY

M S PRAKASH RAO, V S N MURTY

When the human ear is exposed to noise, the auditory threshold is elevated i.e. the hearing acuity is diminished. The elevation in the auditory threshold can either be temporary or permanent. This would depend upon the noise exposure, which means the overall physical stimulus, including all the characteristics of the sound (frequency, intensity etc), and the duration of application. If the noise exposure is beyond a certain hearing limit, injury to the ear may occur, with resulting permanent loss of hearing. When it is below that limit the resulting shift in auditory threshold is temporary and returns to its previous value after a lapse of time. The degree of temporary threshold shift on exposure to noise and its recovery to normal are seen to vary from individual to individual. In other words, there is additional factor of the individual susceptibility or predisposition to acoustic trauma.

PERIODIC DISTURBANCES OF THE AUTONOMIC NERVOUS SYSTEM

K N KOTHANETH

This is a case report of a pilot with 'disorientation', which turned out to be due to autonomic imbalance.

INJURY DYNAMICS IN THE ASSESSMENT OF HUMAN ACTIVITIES DURING A CRASH

S P VERMA

Three illustrative case reports to highlight the details of human activities, as judged from the injuries, human wreckage of the aircraft, have been brought out to focus attention on the fact that even the dead have dynamic story to tell.

VOLUME 10

OCTOBER 1967

No 1

THE SCOPE OF AEROMEDICINE IN INDIA

C G PANDIT

Emeritus Scientist, PGI, Chandigarh. Guest Lecture delivered at the 9th annual meeting of ISAM.

AVIATORS VERTIGO - A CAUSE OF FATAL AIRCRAFT ACCIDENTS

M M SHRINAGESH

Nuttal reported that about 5 % of pilots experience serious disorientation with complete loss of aircraft control. Nuttal and Stafford found that about 14% of fatalities in overseas commands were attributable to spatial disorientation, which Ruffel Smith credited as being the commonest cause of fatal accidents due to human element. With greater awareness here of human factors involved in aircraft accidents, it appears that spatial disorientation is a major, if not the commonest cause of fatal accidents due to the human element in our Air Force as well. With further developments in high performance, hypersensitive aircraft, the problem will obviously continue to increase in importance. In this article, I do not propose to give a detailed account of the highly complex, yet ill understood neurophysiological basis for the occurrence of the various illusions of flying, but will describe a few accidents picked out at random, that have occurred in the IAF which pose a number of serious problems.

A HISTOPATHOLOGICAL ANALYSIS OF FATAL AIRCRAFT ACCIDENT CASES IN THE IAF

A K BASU

The value of histopathological examination of tissues obtained after fatal aircraft accidents is being increasingly realized since 1955. Although the Royal Air Force and U S Air Force utilized this method in the study of specific fatal accidents during the earlier years, it was not practiced as a routine measure. Teare was the pioneer, who attempted reconstruction of events leading to the accident, after autopsy examination of twenty-eight persons killed in a Viking accident.

EFFECTS OF ALTITUDE ON NIGHT VISION AND OCULAR MUSCLE BALANCE

T G JONES

An opportunity was taken to determine the effects of altitude on night vision and ocular muscle balance during the routine testing of pilots for high performance flying at Air Force School of Aviation Medicine. These parameters have already been explored by various other workers but with other instruments and under conditions the details of which are not fully known to us. The object, therefore, was to verify the findings of previous work and to establish norms with the instruments currently in use at Air Force School of Aviation Medicine. This paper summarizes the results and provides a comparison with the finding of other workers in the field.

INCIDENCE OF UPPER RESPIRATORY ILLNESS AMONGST FLIGHT CADETS OF A JET TRAINING BASE DURING THE YEAR 1963-64

P M SUNDARAM

Aircrew maintenance may be defined as those measures, usually of a preventive nature, employed to keep flying personnel in good health and at peak of efficiency at all times, under all circumstances especially connected with their flying. Next to injury, diseases of the upper respiratory tract account for the highest cause of non-effectiveness in the flying population of the USAF. It has been estimated that upper respiratory disease accounts for 40% of all illness and that the common cold accounts for approximately 60% of all diagnosed upper respiratory infections. A three year study of a group of pilots in the USAF indicates that common cold was responsible for nearly 80% of all non flying days due to illness. In a survey of morbidity in general practice carried out jointly by the college of general practitioners and the general register office of the UK in 1955-56 it was found that acute nasopharyngitis had the highest patient consulting rate of any disease and that upper respiratory infections of all kinds accounts for about 5 % of all consultations. As far as it is known, there has been no analysis of the problem in the IAF. The present study makes an attempt to analyze the problem amongst flight cadets at a Jet Trainer Base during 1963-64.

HUMAN ENGINEERING IN FIGHTER AIRCRAFT COCKPIT DESIGN

S P VERMA

A review paper giving extensive details on anthropometry, application of anthropometric data, the pilots seat, seat dimensions and adjustability, set pan and back design, location of foot controls, impediments to work in restricted space, crash injury survival, are covered.

ULTRASONICS IN MEDICINE

N MOHAN MURALI

For more than ten years ultrasonic echo method has been used in different fields of medical diagnosis and there have been considerable advances in the development of techniques for immediate observation and measurement of internal structures and organs as well as movements and pulsations inside the human body. This has introduced a new concept - the use of ultrasonic to create a "window" into the living body for precise physiological measurements. Some of these applications and recent developments will be discussed in this article.

UNUSUAL INJURIES IN AN UNASSISTED ESCAPE FROM AIRCRAFT

A case report of fatal injuries to a pilot in a case of unassisted escape from a vampire aircraft.

A CASE OF EJECTION INJURY (A CASE REPORT)

R P DHAWAN, K V S MANI

The introduction of high performance aircraft necessitated improved methods of escape from disabled aircraft. The development of the ejection seat was truly a milestone in the solution of the problem of escape from such aircraft. A successful ejection results from the solution of escape from such aircraft. A successful ejection results from correct sequential operations of seat man complex and implies the safe return of the aircrew for the safe return of the aircrew for the resumption of duties. But a review of the ejections so far carried out in the various Air Forces reveal that a formidable percentage of fatal and non fatal major/ minor injuries have been sustained. These are to be regarded as ejection failures. The aim of this communication is to report a recent case of ejection wherein a non-fatal injury was sustained at the level of the fifth cervical vertebra. It was interesting from the point of view of absence of symptoms, the site of the fracture and Aeromedical prognosis.

AERODONTALGIA DUE TO PERIDONTAL POCKETS

J M RAO, K RAJAN

Aerodontalgia is defined as pain in the tooth as a result of lowered barometric pressure during flight or during simulated flight. The structures that may be affected include the hard and soft tissues of teeth, the jaws and their joints, soft tissues of the oral cavity, saliva and restorative materials. Aerodontalgia is intimately related to the pre existing dental pathology and invariably represents an acute exacerbation of sub clinical symptoms. Reduction in the atmospheric pressure aggravates the impaired circulation in inflamed and diseased pulps. Low temperature, changes in the oxygen content, vibration and motion in space seem to play no role as activating factors and have no adverse

effect on normal teeth and dental restoration. Aircrew efficiency and effectiveness is reduced by Aerodontalgia because aircrews having this type of pain are usually incapable of carrying out their duties effectively and efficiently. Air Force medical officers must have sufficient knowledge of this problem in order to be able to diagnose and take corrective measures. One such case of Aerodontalgia due to periodontal pockets is described.

DETERMINATION OF HEAT SUSCEPTIBILITY INDEX AND HEAT TOLERANCE - A NEW INDEX

C A VERGHESE, K C SINHA, C S NAIR

Plot of progressive changes in mean skin temperature and oral temperature when a subject is exposed to acute thermal stress, converged after an initial phase of divergence. The progressive changes in skin and oral temperatures T_a and T_o are found and given by:

$$T_a = a + b \log t$$

and $T_o = A + B t$

where a , b , A , and B are constants and t is the time. Convergence points can be derived from the above equations. The predicted time for this convergence can be used as an index of susceptibility and tolerance. There is a very good correlation viz. 0.86 between the new index and tolerance time as measured by the subjective feeling of intolerance and the onset of symptoms of heat collapse. While all other existing indices gave correlation co-efficient less than 0.5. A new definition of acute thermal stress is also suggested on the basis of mean skin temperature increasing to a level above the oral temperature.

A NOMOGRAM FOR AIRCRAFT RUDDER PEDAL DESIGN

S P VERMA, C A VERGHESE

Optimal location of rudder pedals in an aircraft cockpit is one of the most important requirements in cockpit workspace layout. Contemporary designs of rudder pedals in transport military aircraft are of many types such as horizontal bar without brake control, S shaped with foot operated brake and the footprint type also with the foot operated brake. In certain of the designs, the whole foot is used for operation of the rudder pedals at all times. In certain other types, the whole foot is placed squarely over the pedal for operations during taxiing and landing, while rudder pedal operation is accomplished by ball of the toes with the heel resting on the floor. The reach, comfort, and effort required for the rudder pedal operation are dependent on the location of the rudder pedals.

EVALUATION OF CASES OF HEAD INJURIES IN AIRCREW

H LAKSHMINARAYAN

Head injuries have been the cause of considerable loss of flying hours in the Air Force. While it may not be possible to eradicate these types of accidents altogether, steps are necessary to be taken to see that the problems are minimized. The following is a resume of analyzed data on head injuries collected over a period of 6 years. This information is based on 154 cases, out of which 84 cases are aircrew officers, 40 ground duty officers, and 30 cases of airmen and others.

BLOOD PRESSURE FLUCTUATION IN A CASE OF MULTIPLE EXTRASYSTOLES AS OBSERVED IN TILT TABLE STUDIES

K C SINHA, C A VERGHESE, C S NAIR

Extrasystoles are of little clinical significance excepting when associated with organic heart disease, or when they are multifocal arising from different sites in both ventricles. The disposal of such cases, in flying personnel pose a problem especially when associated with a history of dizziness, fainting, breathlessness, nausea or sweating even though there may not be any evidence of heart disease. One such case, with a past history of fainting and with a diagnosis of multifocal extrasystole was referred to this institute for special investigations with a view to assess his fitness for flying duties as a pilot. The findings and disposal of this case are being reported.

**OCULAR INJURIES SUSTAINED IN A BAIL OUT FROM A VAMPIRE AIRCRAFT
(A Case Report)**

J N SINGHA

In an emergency bale out from a high speed jet aircraft ocular injuries are possible and are mainly due to landing. In the cases, reported below, sub-conjunctival hemorrhages were present in both he cases. The first case had in addition retinal damage with intraocular pressure changes and these findings are being reported probably for the first time.

**AEROMEDICAL EVALUATION OF AIRCREW FOLLOWING PARTIAL
GASTRECTOMY (A Case Report)**

S KRISHNAMURTHI, P C CHATTERJEE

While a disability does not necessarily warrant complete withdrawal from flying, it may impose restrictions on the altitude tolerance. A navigator was reviewed for incapacitation during flying at high altitude following partial gastrectomy. The natural history of the disease and the disability has been considered in the background of flying environment. Results of investigations have been reviewed and points for Aeromedical evaluation have been discussed with a view to conserve trained manpower without sacrificing flight safety.

SPATIAL DISORIENTATION IN A JET FIGHTER PILOT

V S N MURTY

In modern aviation spatial disorientation is considered as one of the major factors affecting flight safety. Nuttal reported that about 5% of pilots experience serious disorientation with complete loss of aircraft control. Nuttal and Sanford found that about 14% of fatalities in overseas commands were attributable to spatial disorientation which Ruffel Smith credited as being the commonest cause of fatal accidents due to human element. These figures pertain to pilots who are presumed to be in normal health. The following is a case report of an experienced pilot who suffered from episodes of disorientation while flying and on the ground as well later on. The pilot did not suspect any disease process producing his symptomatology and continued to fly, till his symptoms reached a fairly severe degree. It is obvious that, had he met with a fatal accident, it could easily have been attributed to spatial disorientation, but not of pathological origin. The case has presented diagnostic difficulties and posed a problem for Aeromedical evaluation.

STUDIES ON RECOVERY FROM HEAT INDUCED PHYSIOLOGICAL STRAINDR. C.A. VERGHESE, SQN LDR K.C. SINHA, SHRI K.V. MANI

Recovery from raised mean body temperature caused by thermal stress was studied in different recovery environments. Recovery pattern is found to be exponential with the value of time constant related to the effective temperature of the environment by the equation $T = a + b e^{-c t}$ where T is the effective temperature, c is the time constant, a and b are constants.

DISORDERS OF CARBOHYDRATE METABOLISM IN CASES OF HEAD INJURYSQN LDR K.C. SINHA AND WG CDR H. LAKSHMINARAYAN

55 head injury cases were studied. There was evidence of disorder of carbohydrate metabolism of varying degrees in 29% of the cases as compared to 4% in control group of similar age distribution.

The incidence of disorder of carbohydrate metabolism in head injury cases appeared to be more common (29%) than EEG abnormalities (9%). There was no correlation between the disorder of carbohydrate between the disorder of carbohydrate metabolism on the one hand and types and clinical severity of head injury on the other.

The possible mechanisms have been discussed.

NOISE AND ITS IMPLICATIONS WITH THE INDIAN AIR FORCEWG CDR V.S.N. MURTHY AND DR. C.A. VERGHESE

Noise survey of the Jet Fighter/Bomber aircraft in I.A.F. have been carried out. Overall sound pressure levels and frequency analysis during ground running for distance upto 100' for different angles were measured. Speech interference levels Perceived noise levels and Noise rating numbers for crew positions and have been calculated. The maximum safe duration of noise exposure along with the maximum permissible ground running cycles in the case of different aircraft are also given from the point of view of hearing damage. Noise rating numbers with ear defenders for different types of aircraft have been indicated. Guidelines for the location of briefing rooms and lecture rooms are submitted on the basis of limiting speech interference.

RECORDING OF TWELVE-LEAD ECG DURING EXERCISESQN LDR N. MOHAN MURALI

A wired monitoring system has been developed which will facilitate continuous recording of a 12-lead ECG before, during and after exercise virtually free from interference's, with the Electrocardiographer having the choice to select any of the leads. An unconventional electrode placement on the thorax has been found which gives a multi lead ECG identical with that obtained

with the conventional system for varying electrical axis of the heart. Such a record can thus be easily interpreted using the existing criteria for evaluation of ECG which becomes otherwise difficult with non-standard records. A lighter and a smaller floating electrode of a dome shape has been used which through smaller in size has been used which though smaller in size has an effective area twice that of a circular disc floating electrode of the same diameter thus keeping the inter-electrode impedance low.

FUNCTIONAL ASSESSMENT OF ORTHOPEDIC DISABILITIES IN AIRCREW

WG CDR S.P. VERMA AND SQN LDR P.C. SHARDA

It has been observed that a strapped pilot can achieve 8 to 9 inches of additional functional reach in the case of upper limbs. This gain is pertinent to the assessment of reduction in static reach caused by anatomical shortening or ankylosis of the elbow. Minor restrictions at shoulder have been found to have more serious effect on function than restrictions at elbow.

In the case of knee joint, it has been found that extension should always be complete, and limitations in flexion can only be accepted when the flexion movement is not less than 100⁰.

The necessity to test each case of limb disability in aircraft cockpit to assess any deficit pertaining to critical functions in flight is brought out.

USE OF TOLERANCE TESTS IN ASSESSMENT OF FITNESS AFTER CRANIO-CEREBRAL INCIDENTS

WG CDR H. LAKSHMINARAYAN (Retd.)

Apart from a thorough neurological and general examination, tests like E.E.G., E.E.G. under provocative technique, G.T.T., Thermal Stress and 'G' Stress appear to be helpful in assessment of fitness of asymptomatic aircrew (after cranio-cerebral incidents) and to provide a rational basis for periods of observation and non-effectiveness. An analysis of forty-eight cases is given.

HYPERBARIC OXYGEN THERAPY IN CHRONIC PERIPHERAL VASCULAR DISEASE.

WG CDR M.L WADHAWAN, SQN LDR P.C. CHATTERJEE AND WG CDR A.K. BASU

40 cases of chronic peripheral vascular disease of varying severity were treated with hyperbaric oxygen. The patients were exposed to 2.5 absolute atmosphere for 90 minutes daily to a total of 36 exposures. 37 cases showed improvement of varying degrees. The results are compared with the observations made on 7 control cases.

NOISE AND ITS IMPLICATIONS WITH THE INDIAN AIR FORCE

V S N MURTY, C A VERGHESE

Noise survey of the Jet fighter/ bomber aircraft in the IAF has been carried out. Overall sound pressure levels and frequency analysis during ground running for distances upto 100' for different angles were measured. Speech interference levels, perceived noise levels and noise rating numbers for crew positions have been calculated. The maximum safe duration of exposure along with maximum permissible ground running cycles in the case of different aircraft are also given from the point of view of hearing damage. Noise rating numbers with ear defenders have also been worked out. The requirements of ear defenders for different types of aircraft have also been indicated. Guidelines for the location of briefing rooms and lecture rooms are submitted on the basis of limiting speech interference.

RECORDING OF 12 LEAD ECG DURING EXERCISE

R MOHAN MURALI

A wired monitoring system has been developed which will facilitate continuous recording of a 12 lead ECG before, during and after exercise virtually free from interference, with the electrocardiographer having the choice to select any of the leads. An unconventional electrode placement on the thorax has been found which gives a multilead ECG identical with that obtained with the conventional system for varying electrical axis of the heart. Such a record can thus easily be interpreted using the existing criteria for evaluation which otherwise becomes difficult with non standard records. A lighter and a smaller floating electrode of a dome shape has been used which though smaller in size has an effective area twice that of a circular disc floating electrode of the same diameter thus keeping the inter-electrode impedance low.

ELECTROENCEPHALOGRAPHIC EXAMINATION OF HEALTHY AIRCREW

V KUMAR

It is well known that the electroencephalogram (EEG) can be of aid in the diagnosis of neurological disorders especially epilepsy. Perhaps it might be of help in assessing the fitness of a candidate for flying. Many workers like Mcfarland, Buchtal and Lennox, Picard, Tompkins, Ades, Bennet etc

have carried out work in the field of electroencephalography in relation to flying and episodes of altered consciousness in aviators. The relation between an EEG pattern and flying aptitude has not yet been established and accepted in clinical electrocardiography. The correlation between non specific EEG patterns and predisposition to epilepsy or syncope has not been well established. The electroencephalographic examination of healthy aircrew in the IAF was introduced as a part of assessment of fitness to fly high performance aircraft.

FUNCTIONAL ASSESSMENT OF ORTHOPEDIC DISABILITIES IN AIRCREW

S P VERMA, P C SHARDA

It has been observed that a strapped pilot can achieve 8 to 9 inches of additional functional reach in the case of upper limbs. This gain is pertinent to the assessment of reduction in static reach caused by anatomical shortening or ankylosis of the elbow. Minor restrictions at shoulder have been found to have more serious effect on function than restriction at the elbow. In case of the knee joint, it has been found that extension should always be complete, and limitations in flexion can only be accepted when the flexion movement is not less than 110°. The necessity to test each case of limb disability in aircraft cockpit to assess any deficit pertaining to critical functions in the flight is brought out.

USE OF TOLERANCE TESTS IN ASSESSMENT OF FITNESS AFTER CRANIO-CEREBRAL INCIDENTS

H LAKSHMINARAYAN

Apart from a thorough neurological and general examination, tests like EEG, EEG under provocative technique, GTT, Thermal stress and 'G' stress appear to be helpful in assessment of fitness of asymptomatic aircrew (after cranio-cerebral incidents) and to provide a rational basis for periods of observation and non effectiveness. An analysis of forty eight cases is given.

HYPERBARIC OXYGEN THERAPY IN CHRONIC PERIPHERAL VASCULAR DISEASE

M L WADHAWAN, P C CHATTERJEE, A K BASU

40 cases of chronic peripheral vascular disease of varying severity were treated with hyperbaric oxygen. The patients were exposed to 2.5 Absolute Atmospheres for 90 minutes daily to a total of 36 exposures. 37 cases showed improvement of varying degrees. The results are compared with the observations made on 7 control cases.

EPISODE OF UNCONSCIOUSNESS IN A JET FIGHTER PILOT - A CASE REPORT

P M SUNDARAM, P S BAJWA

Momentary loss of consciousness in a pilot of a jet aircraft could be the cause of a major flying accident. For this reason, any history suggestive of this condition merits serious consideration and thorough investigation. In most cases it is difficult to establish the exact cause of impairment of consciousness due to lack of available clinical evidence even after detailed investigation. In 88 cases of unconsciousness evaluated at the School of Aerospace Medicine (USAF) during the years, 1966-67 no abnormality was detected in over 70% cases. A young pilot who was alleged to have lost consciousness in the air, was investigated at the Institute of Aviation Medicine, IAF. Results of the laboratory investigation were correlated with the flight profile and the sequence of events as it occurred in the air. Details of the case report are being presented in the paper.

RESCUE AND EVACUATION OF CASUALITIES FROM THICK JUNGLE - A SUGGESTION

HEMRAJ GARG

A plan to rescue casualties from the Jungle has been proposed in this paper

VOLUME 14

OCTOBER 1971

No 1

EFFECTS OF POSITIVE ACCELERATION ON THE ELECTROCARDIOGRAM

P M SUNDARAM, S KRISHNAMURTHY, V SINGH

Accelerative forces resulting in inertial vectors acting from head to foot are termed positive G or + G. The cardiovascular system is more profoundly affected than any other system of the body. Although the cardiovascular reactions to + G have been studied by various workers, the electrocardiographic changes resulting from + G accelerations continue to be the subject of much discussion. The relative importance of the various factors producing such changes in the ECG are as yet not completely explained. This paper presents the results of an analysis of ECG records obtained during the centrifuge runs carried out at the Institute of Aviation Medicine.

EVALUATION OF IMPACT PROTECTION OF CRASH HELMETS

C A VERGHESE, P K GHOSH, B V S SHETTY

Protective helmet development and evaluation have received considerable attention in recent years because of an increased awareness of the role of head injury in accidents. Protective helmets being a complex system inspite of its apparently simple function and construction, requires evaluation of its various aspects. However the most important function of the helmet is impact protection. I.e. impact received during crash landing and buffeting. Study of the variables involved in evaluating the impact protection qualities of helmets have been made by Ewing and Irving. A mathematical analysis leading to the requirements of effective protection against concussion is given by Rayne and Maslen. They also give the description of the rigs constructed for the investigation of the dynamics of energy absorbing devices. The two rigs described by Rayne and Maslen and built by RAE include a pendulum rig and a vertical drop rig. The pendulum rig is similar to the one developed by the USAF. The USAF tester consists of a pendulum weighing 12.5 lbs. which acts as an impact producing device giving a known impact to an aluminum head form of 9.97 lbs. and recording equipment. Strain gauge accelerometers are mounted in the pendulum and the head. The RAE vertical rig is similar to the one originally developed by the Road Research Laboratory. We have also developed a vertical drop rig similar to the above rig for measurement of shock absorption. The details are given.

CARDIOVASCULAR RESPONSES IN PRESSURE BREATHING

M L WADHAWAN, P L N RAO

Pressure breathing is an emergency measure to bring the flyer safely down to lower altitudes in the event of loss of cabin pressurization at altitudes above 40,000 feet. At these altitudes, oxygen has to be breathed at a positive pressure to prevent the effects of hypoxia. However, pressure breathing besides causing physical discomfort, leads to various disturbances in the body mainly by its mechanical effects including cardiovascular changes. This paper discusses an experiment wherein cardiovascular responses of Indian pilots were evaluated.

SOME ASPECTS OF SPACE ECOLOGY AND PHYSIOLOGY

B K ANAND

Author is professor of Physiology, AIIMS. Lecture delivered at the 13th annual session of the Aeromedical Society of India, December 1970. A review paper which dioceses the ecology of space, physiological hazards of aerosphere, temperature ranges of the atmosphere, radiation's in atmosphere, biodynamics of space flight, ecology of space cabin, psychological stress in space flight. A report on Mercury and Gemini and Apollo flights is also incorporated.

CHALLENGE OF SPACE AND SPACE RESEARCH ACTIVITIES IN INDIA

H G S MURTHY

Author is Director Thumba Equatorial Rocket Launching Station, Trivandrum. Lecture delivered at the 13th annual session of the Aeromedical Society of India, December 1970. Discusses various aspects of space research and development in India., Thumba equatorial rocket launching station,

experimental satellite communications earth station, space science and technology, rocket manufacture in India, radio astronomy and the future plan for Indian space.

AN EPISODE OF DISORIENTATION IN FLIGHT - A CASE REPORT

V S N MURTY

In modern aviation partial disorientation is considered as one of the major factors affecting flight safety. Nuttall reported that about 5% of pilots experience serious disorientation with complete loss of aircraft control. Nuttall and Sanford (1956) in a study of over 2 years period in the USAF in Europe found that about 4% of all fatal accidents were due to spatial disorientation. RAF between 1957 and 1961 found that 2% of all major accidents and 14% of all fatal accidents were considered to be due to disorientation. Ruffel Smith blamed disorientation under instrument flight condition as being probably the most important cause of fatal accidents in the RAF not primarily due to mechanical failure. No such analysis is available at present to indicate the incidence of spatial disorientation in the IAF. Those above mentioned figures pertain to pilots who are presumed to be normal in health. In 1968 I had reported a case of spatial disorientation in a Jet fighter pilot which was proved to be due to a pathology in the vestibular system. The case presented considerable difficulties in determining the etiology and diagnosis. It was emphasized that every case of disorientation deserved a thorough and complete investigation before it can be assumed that there are no transient pathological reasons for such episodes. It has now become a practice that all aircrew who had an episode of disorientation during flying are referred to IAM for investigation. The following is the case report of a pilot who had an episode of disorientation during night flying while taking part in an exercise. The case report offers some points of interest.

RAPID DECOMPRESSION IN A SUPERSONIC TRAINER AIRCRAFT - A CASE REPORT

M B DIKSHIT

A sudden loss of cabin pressurization in a pressurized aircraft may have serious consequences. One such case of sudden failure of cabin pressurization in a supersonic trainer aircraft occurred recently at one of the fighter bases of the IAF. Even though the consequences of this accident were not serious in terms of injury to the pilots, the case has been discussed with a view to bring out the various aspects of such an episode.

VOLUME 15

OCTOBER 1972

No 1

ASSESSMENT OF DISTORTION OF WINDSHIELDS

C A VERGHESE

A method to measure distortion of aircraft windshields is described. The assessment criteria is based on distortion produced by certain specific areas corresponding to the area covered in form perception by the human eye. Since visual acuity is maximum in the fovea, the permitted deviation of objects is minimum at the center of the area. The maximum deviation permissible for different angular distances from the centre are worked out on the basis of changes in visual acuity for different angles from the fovea. Use of visibility of fringes formed by double gratings for localized distortions are also described.

REHABILITATION OF CASES OF ISCHEMIC HEART DISEASE IN ARMED FORCES

INDER SINGH

Ninety four unselected survivors from ischemic heart disease, all male service personnel, were treated within 1 to 6 months of recovery from the acute episode, by promotion of physical activity, correction of coronary risk factors and routine use of nioumalone and prenylamine lactate. The results showed that this approach was more conducive to more rewarding rehabilitation than was obtained in 89 patients who, in the past, were conventional treatment with advice regarding weight, diet, physical and mental activity. Thus out of 94 cases treated between February 1968 to October 1971, 28 (30%) were fit in medical category A active service duties in operational areas in any part of the world in any terrain, including altitudes between 10,000 ft to 18,000 ft; 39 (42%) were fit in medical category B, service duties in non operational communication zones in any part of the world including altitudes below 10,000 ft; and 26 (28%) were fit in medical category C, sedentary duties in non operational areas in India only. One patient who initially recovered from congestive heart failure died while in a state of temporary unfitness for service on account of ischemic heart disease. Against this, by the conventional approach, out of 89 patients, 81 (91%) were fit in medical category C sedentary duties in non operational areas in India only. 4 (4.5%) were released from service and 4 (4.5%) died.

CONTROL OF DIABETES

INDER SINGH

Since there is growing evidence that stricter control of diabetes helps in the prevention and treatment of diabetes complications, treatment in the armed forces is designed to obtain, as far as possible, a physiological control of diabetes, without the treatment being irksome or unacceptable to the patient in any way, or coming in the way of his retention in service and performance of duties. The patients were treated with a low fat high protein diet in order of preference with:

- (a) Tolbutamide, Tolbutamide + DBI -TD and Tolbutamide +DBI-TD + Insulin
- (b) Glybenclamide, Glybenclamide +DBI- TD, Glybenclamide +DBI- TD + Insulin.

The net results obtained in 123 adult Indian diabetics treated with regime (A) were normal preprandial and post prandial blood sugar levels under treatment in 25 cases (20.3%), normal 100g glucose tolerance test under treatment in 74 cases (60.2%) and normal cortisone glucose tolerance test under treatment in 24 cases (19.5%). In comparison results obtained in 86 cases treated with regime B were normal preprandial and post prandial blood sugar levels under treatment in 15 cases (17.5%), normal 100g glucose tolerance test under treatment in 45 cases (52.3%) and normal cortisone glucose tolerance test under treatment in 26 cases (30.2%). These results favour the view that Glybenclamide is more powerful than tolbutamide in its anti diabetic effect. All patients with normal cortisone glucose tolerance test under treatment qualified in medical category A, those with normal 100 g glucose tolerance test under treatment for medical category B and all those with normal pre and post prandial blood sugar levels under treatment qualified for medical category C.

OUR EXPERIENCES IN HYPERBARIC MEDICINE

M L WADHAWAN

Hyperbaric oxygen therapy has been employed at the Institute of Aviation Medicine, Bangalore for the last 3 years in the treatment of condition associated with poor oxygenation of tissues. Over 200 cases of peripheral artery disease, 3 of tetanus and 2 of extensive vascular injuries of limbs have been successfully treated so far with this mode of therapy. Therapy has not proven to be a success in the treatment of chronic osteomyelitis probably because of the inability to maintain antibiotic cover during the period of exposure. Two patients of peripheral artery disease, while undergoing treatment, with hyperbaric oxygen, developed involvement of the central nervous system with EEG changes. This involvement was attributed to oxygen toxicity. Another two cases developed myocardial ischemia 15 to 19 hours after exposure to hyperbaric oxygen. One of these cases, who was found dead in his bed, showed evidence of fresh thrombosis and evidence of old healed myocardial infarction. None of the patients developed toxic manifestations in the respiratory system. Besides the risks of oxygen toxicity, there are other associated problems a few of which are heat and humidity in the high pressure chamber, hearing defects in compressed air environments and likelihood of damage to the tympanic membranes due to repeated and intermittent exposures to high pressure. Some of these problems have been studied and overcome while others are being investigated.

INTERRELATIONSHIP BETWEEN RQ BLOOD SUGAR AND BLOO PYRUVATE LEVELS AFTER GLUCOSE LOADING IN YOUNG HEALTHY SUBJECTS

K C SINHA, K V MANI, E M IYER

A preliminary study conducted on 18 young healthy volunteers showed three distinct patterns of RQ changes during normal glucose tolerance test of 2 hours duration. Subjects were grouped into three categories viz. A, B and C according to their RQ pattern. When the three patterns were administered prednisolone (once only) and hypoglycemic drugs (two types) for a period of 7 days at suitable

intervals, the RQ and the blood pyruvate levels showed distinctive changes in each of the three groups following glucose loading. In contrast, the blood glucose levels of each category followed more or less a similar pattern without much variation, compared to their original GTT values. The possible causes of changes in RQ and blood pyruvate levels vis a vis blood glucose concentration, both before and after administration of pharmacological agents and their possible significance are discussed.

A PILOT STUDY OF ELECTROENCEPHALOGRAPHY UNDER BRIETAL SODIUM

K R BANERJEE, AK SEN, K PRABHA

Cases of episodic unconsciousness in aircrew pose a problem in clinical evaluation as in most of such cases there is no clearcut history or reliable witness. EEG standard and under provocative techniques, is often not helpful in such cases and also in cases of epilepsy. EEG study under Brietal Sodium has been reported by some workers to play a useful role in manifesting the latent or borderline EEG abnormality. A pilot study was therefore, undertaken to study this problem. Although the number of cases studied so far is small, preliminary assessment has indicated the usefulness of Brietal Sodium in doubtful cases. However further studies are required to assess the utility of this method.

AVIATION PATHOLOGICAL EVALUATION OF FATAL AIRCRAFT ACCIDENTS ASSOCIATED WITH FIRE

G N KUNZRU, SK ADAVAL

The necessity for investigating all aircraft accidents associated with fire, from the point of view of determining whether the fire was pre crash or post crash is impressed. The need for pathological investigations of such accidents and the methods, generally employed for such evaluation of the aircraft victims for determining the burns to be ante or post mortem are discussed. The reasons why the presence of antemortem burns should be construed as pre crash fires are mentioned. The value of pathological investigation of fire associated aircraft accidents based on circumstantial evidence especially when there is only limited human material available, is pointed out and the practical role such investigations can play is highlighted by discussing the case history of a recently investigated accident. In conclusion, the necessity for the pathologist to get more deeply involved in investigations of this type of accident is stressed.

DECOMPRESSION SICKNESS WITH NEUROCIRCULATORY MANIFESTATIONS - A CASE REPORT IN THE IAF

K S RAO

The bizarre and diverse clinical manifestations of decompression sickness syndrome, the susceptibility or otherwise of the individual to recurrent attacks, still continues to pose a problem in clinical aviation - both to the physician and to the aviation medicine specialist. It is no less puzzling to the aviation medical board taxed with the responsibility of award of appropriate category - flying status or otherwise. The multitude synonyms of the same syndrome- like altitude dysbarism, aeroembolism, air-embolic disease of the vasculature etc. added more to the confusion in the minds of the aviator and made him apprehensive, almost allergic to this condition sated to be encountered sometimes in flying and in simulated altitude experimental environment like the decompression chambers. The diverse clinical manifestations may vary from simple bends, creeps, chokes, nausea, and headache to serious neurological disturbances like hemiparesis and circulatory disturbances - some cases ending fatally. This paper presents a case of a decompression sickness syndrome with mild neurocirculatory failure manifestations, resulting from exposure to 28,000 ft in an IAF aircraft. The clinical manifestations and course conform to a classical text book description of the syndrome. Recovery of the case was, however, uneventful despite the long delay in the institution of corrective therapy due to the initial erroneous diagnosis in this case.

OTITIC BAROTRAUMA IN A HIGH PERFORMANCE AIRCRAFT PILOT

M B DIKSHIT

A case of otitic barotrauma in a fighter pilot has been discussed. The primary etiological pathology with superceded circumstantial conditions has been brought out. The importance of even mild Nassau pharyngeal pathology in combination with a pre existing quiescent chronic nasopharyngeal pathology has been shown to be a precipitating factor in causation of severe barotrauma to the ear. The prognosis has been discussed.

THROUGH CANOPY EJECTION - A CASE REPORT

S P VERMA AND P C SHARDA

A case of premeditated but complicated ejection through the canopy from a vampire T-55 aircraft is reported. Pilot B in the starboard seat was being refreshed after two years of non currency with the aircraft. He was ordered to eject through the canopy by the captain pilot A after failure to jettison the canopy. The decision was made after non-recovery of aircraft from an intentional starboard spin and aircraft losing height rapidly from 27000 ft to 14000 ft. Pilot B was found dead on the ground. The death was due to spinal shock following compression of spinal cord when preexisting separation of C7 vertebra T1 vertebra was aggravated due to R/T cord entanglement around the neck. Extensive external injuries including cervical vertebral damage had been caused due to impact of bonedome against the canopy perspex and subsequent egress through a poorly shattered canopy not designed for a through canopy ejection. Absence of ground impact injuries indicate that pelvic injuries had occurred earlier during ejection, further confirmed by bone marrow embolism in the lungs.

BIODYNAMICS OF EJECTION

C A VERGHESE

The forces developed during the firing of ejection guns are discussed based on the trajectory traced by the ejection seat and the requirement of safe clearance of the seat from the aircraft structure. Assessment of ejection characteristics of seat packs and comfort cushions assume significance in view of the high magnitude of these forces. Testing of these properties is possible by recording the damped oscillatory motion of the seat pack or cushion after an impact force. Theory and development details of a strain gauge accelerometers and anthropomorphic dummies alongwith their use in the evaluation of ejection cartridges are discussed.

A STUDY OF RESPIRATORY MODULATION OF CARDIAC INTER BEAT INTERVAL

P C CHATTERJEE

A study has been made to established complex relationship between the changes in the rate of breathing and subsequent modulation of cardiac inter beat intervals. Spectral analysis and the system function studies in complex frequency domain were effectively used with the help of digital computer to arrive at quantifiable results. Some basic assumptions have been shown to be erroneous and steps required to avoid these pitfalls have been highlighted. The study showed the possibility of correctly predicting certain change in the cardiac inter beat interval pattern under different breathing conditions.

ELECTRCARDIOGRAPHIC ABNORMALITIES IN NORMAL AND APPARENTLY NORMAL INDIVIDUALS

RUSTOM JAL VAKIL

Hon Consultant Physician KEM Hospital, Bombay. Lecture delivered on 08 December 1972, at the Institute of Aviation Medicine, Bangalore. It outlines the normal variants in the P wave, PR interval, QRS complex, Q wave, ST/T complex, T wave, u wave, exercise test and other physiological variables which have an effect on the ECG.

EFFECTS OF PROPRANOLOL ON THE ECG CHANGES DURING POSITIVE ACCELERATION

KULDIP RAI, S K DHAM

Electrocardiographic monitoring of 20 healthy subjects was carried out at + 2.5 and 3.5 Gz and one hour after oral administration of 40 mg of Propranolol, a Beta adrenergic blocking agent and the results compared. The use of propranolol resulted in a significant bradycardia and caused reversal of P and T waves changes seen on positive G exposure. It is therefore likely that the ECG changes are

mainly the result of increased sympathetic tone that occurs due to hemodynamic changes on exposure to + Gz.

CURRENT TRENDS IN DRUG ADDICTION

J K SEHGAL

A review paper, which highlights the current, trends in drug addiction, the extent of the problem, incidence in the armed forces, different drugs and their effects, drugs and sexual power, symptoms and prevention of drug abuse.

DRUG ADDICTION - ETIOLOGY, COMPLICATIONS AND MANAGEMENT

A S MAHAL

A review paper by Dr Mahal who is Prof and head of Dept of Psychiatry, All India Institute of Mental Health, Bangalore

DRUGS AND RELATED ADMINISTRATIVE PROBLEMS IN THE DEFENCE SERVICES

S K MAJUMDAR

The author is AOC, Jalahalli and the article covers various administrative aspects of Drug use and its prevention in the Defence Services.

HUMAN ENGINEERING IN COCKPIT DESIGN

I M CHOPRA

The author is Chief Test Pilot HAL, is a review article covering human engineering aspects of ergonomics of the cockpit with emphasis on the control column handgrips, and centralised warning systems.

AIRCRAFT EJECTION INJURY PATTERNS AND TRENDS IAF -1957 TO 1972

S P VERMA, A ROY CHOUDHARY

Analysis of ejection injuries for various types of aircraft in use in IAF is presented for a period of fifteen years. 28.6% of the total ejections were fatal. All the five cases of through canopy ejection were fatal. Injuries are further analyzed as spinal, non-spinal, and the data given.

WOLFF PARKINSON WHITE SYNDROME (A CASE REPORT)

SK DHAM, N R KRISHNAN, G KUPPUSWAMY

A case of WPW syndrome in a known hypertensive who developed an episode of supraventricular tachycardia simulating ventricular tachycardia is reported. Pitfalls in the diagnosis of WPW syndrome and problems of differential diagnosis of pseudoventricular arrhythmia when the patient is acutely ill is stated.

VOLUME 17

APRIL 1974

No 1

AEROMEDICAL SOCIETY AND AVIATION IN INDIA

AJIT NATH

The author is DMS (Air) and the text relates to the welcome address to the XVI annual conference of the Aeromedical society of India.

OPERATIONAL NEEDS AND AEROMEDICAL RESEARCH

O P MEHRA

The author is Air Chief Marshal O P Mehra, Chief of the Air Staff. He text relates to his inaugural address to the XVI annual conference of the Aeromedical society of India.

CURRENT RESEARCH IN AVIATION MEDICINE IN THE ROYAL AIR FORCE

PETER HOWARD

Air Marshal Subroto Memorial Oration at the XVI annual conference of the Aeromedical society of India.

ICTAL AND ENCEPHALOGRAPHIC SEQUALAE OF HEAD INJURIES

DHARAMPAL, SN PATHAK, PN TANDON, BALDEV SINGH

Ictal and electroencephalographic sequel of head injuries have been described in 60 cases. Only two parameters have been studied, the correlation of the type of clinical fits left as long term effects, to the time taken by the emergence of first fit after the head injury and the type as well as the frequency of fits and EEG findings in relation to the duration of initial unconsciousness after the brain trauma. It has been pointed out that the tentative inference drawn from these findings is that, (i) shorter the time interval between the head injury and emergence of the first fit, the higher the incidence of focal fits, (ii) if the interval is between 1 and 5 years, there is a more likelihood of generalized fits, and (iii) with longer time interval, the possibilities are greater than chance factors that temporal lobe seizures will be manifested. Finally, if more than 15 years elapse after head injury before the fits appear, the incidence of posttraumatic epilepsy becomes negligible. It was further noted that the longer the duration of initial unconsciousness the greater the variety and

frequency of fits and more complicated the epileptiform pattern. The tentative pathophysiology has been surmised on the basis concussional or contusional damage to the brain leading to regional derangement of cerebral circulation, injury to the brain stem or other neural circuits in various permutations and combinations. The effect of the neurotransmitters on the damaged brain has been emphasized.

NEUROLOGICAL SEQUELAE OF SPINAL INJURY

K S MANI

The author is Professor and Head of the Dept of Neurology All India Institute of Mental Health. Paper presented in the symposium on 'Head and Spinal injury' at the XVI annual conference of the Aeromedical society of India.

THERAPEUTIC VALUE OF HYPERBARIC OXYGEN IN PERIPHERAL VASCULAR DISEASE

P C CHATTERJEE, M K GOSH, P N BHARGAVA, N M TIKEKAR, P K HALDAR, M B DIKSHIT, N C SARKAR, J S BAINS

The use of hyperbaric oxygen (HBO) for the treatment of peripheral artery disease and its efficacy has been under controversy since its beneficial effect was first reported by illingworth. The rationale of HBO depends on the increased oxygen availability to the tissue, which is in a state of chronic ischemia due to existing pathology of the blood vessels. Koomen has also reported success in the majority of 30 subjects treated in his series. However, Slack and co-workers on the other hand, reported disappointing results on 26 cases treated with HBO. At our center a number of cases of peripheral vascular disease were treated with HBO and improvement of varying degrees were observed. Positive improvement shown in 40 cases investigated earlier justified further studies.

SCOPE AND LIMITATIONS OF HYPERBARIC OXYGEN THERAPY

R RASAMAY GANGULY

Over the past fifteen years there has been a great deal of investigations into the effect of breathing oxygen at tensions higher than normal. Most of the works have been carried out in various service institutions and space research agencies throughout the world. The other group, who have explored the possibility of hyperbaric oxygen administration and medical men, who have been trying to find new methods of treating various conditions in which hypoxia is a feature, or attempting to create an environment, which will prove inimical to the growth of pathogenic organisms.

250 kHz ELECTRICAL IMPEDENCE PNEUMOGRAPH

S P VERMA, A V RAMAN, P MATHEWS

An electrical impedance pneumograph working with a sine wave frequency of 250 kHz is described. The authors find that the chest impedance changes in the ratio of 0.0375:1 compared to D.C. skin resistance between the electrodes. The bridge arm balancing elements VR1 and C8 provide direct reading of resistive and capacitive components of chest impedance. The instrument has not been compared with a spirometer. Nevertheless, its linearity of output with change in volumetric resistance of the chest has been shown.

DIRECTION OF NORMAL REPOLARISATION IN ATRIA AND VENTRICLES - AN ANALYSIS BASED ON THEIR PUMPING ACTION

N MOHAN MURALI

Ta and T waves of the ECG indicate that depolarization and repolarization in atria progress in a similar direction while in ventricles it tends to be opposite which has been assumed to be due to pressure and temperature gradients between the epicardium and endocardium. In this paper an analysis of this phenomenon is presented based on the pumping action of atria and ventricles. In atria inlet and outlet valves are located on the opposite sides while in ventricle they are on the same side. During filling and ejection there is no change in the direction of blood flow in atria while in ventricles there is a change. Therefore sequence of contraction i.e. depolarization and relaxation i.e. repolarisation should take place in the same direction in atria and opposite direction in ventricles. As such Ta wave should be opposite to P wave and T wave same as QRS polarity. And this seen in the ECG.

EEG STUDIES IN PILOTS FLYING HIGH PERFORMANCE AIRCRAFT

K R BANERJEE, K PRABHA, PLN RAO

Electroencephalographic studies were carried out on some 583 pilots who reported to the Institute of Aviation Medicine, Indian Air Force for their assessment of fitness to fly high performance aircraft. The standard international 10-20 system was followed in fixing electrodes for recording EEG during the studies. Electroencephalograms were recorded in the 8 channel and 16 channel EEG machines both during resting and provocative conditions. The findings have been discussed.

ALCOHOL AND FLYING

G N KUNZRU

A review article which deliberates on alcohol related flying accidents their analysis and discussion alongwith a discourse on absorption, distribution, rate of alcohol metabolism and blood alcohol and flying

MEDICAL SERVICES FOR OUR AIRLINES

B B GUHA THAKURTA

The author is principal medical officer, Air India, Santa Cruz. The article is a lecture delivered in a panel discussion on medical problems of civil aviation in the 15th annual Aeromedical society meeting and relates to medical cover to be provided to air staff, ground staff, and overseas staff..