LOW PREVALENCE RATE OF NIDDM AMONG COCKPIT CREWS OF JAPAN AIRLINES  


INTRODUCTION. The present study was conducted to evaluate the prevalence of NIDDM among cockpit crews and to analyse the present status of individuals with NIDDM and impaired glucose tolerance (IGT).

METHODS. A review of all records of cockpit crew members aged 40-60 yrs. was made, and occurred every 6 months, in each of the five airlines. Laboratory variables were measured to determine their control status. RESULTS. A total of 1263 active crews aged 40-60 yrs. were included in the study. Of these, 110 (8.7%) were diagnosed as NIDDM, and 43 were diagnosed as IGT. CONCLUSION. The occurrence of NIDDM among cockpit crews was approximately 1/3 of general population despite thorough medical examination. This effect cannot be neglected, however, intensive supervision by us seems to be effective to ameliorate their glycemic control.

A REVIEW OF ACCELERATION TRAINING FOR CENTRIFUGE RECRUIT TRAINING  

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INTRODUCTION. In efforts to enhance a high performance fighter pilot's tolerance of high sustained +Gz (HSO), centrifuge training in which the subject undergoes a series of runs attaining a maximal +Gz of 70 for 15s are commonly employed with minor if any complications. This paper, however, describes just such a routine centrifuge session resulting in the fracture of the subject's femoral neck. The occurrence of such injuries is exceedingly rare. Case report: A 30-year-old Air National Guard pilot in good health (no history of lower extremity injuries) was tested in the centrifuge training program at a military training facility. In a routine centrifuge training session for training of aviation personnel, the subject was exposed to 70 Gz (15s) while performing the M-1 maneuver. At the completion of this run, the subject complained of pain in his right hip. Examination revealed a complete fracture of the right femoral neck with no concomitant pathology. Initial biomechanical assessment of possible causative factors suggests that a minor shift in the centering of the subject's body weight was sufficient to cause the fracture. The subject was evaluated by a board of orthopedic surgeons, and it was determined that the injury could be managed conservatively. CONCLUSION. This case highlights an area of concern for those involved in the training of aviation personnel. The subject was able to continue flying after receiving appropriate physical therapy. (Paper approved by the NASA/MSFC Safety Committee.)

THE RATE OF SCREENING WHOSE J.A. CROCKETT

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INTRODUCTION. Ejection from jet aircraft is an event that has been exhaustively studied from many perspectives, e.g. causes of ejection, types and causes of ejection injuries, etc. However, the injury rate of ejection from jet aircraft is lower than expected, and evidence exists that the deceleration rate of ejection is low. The objective of the present study was to determine the rate of injury during ejection from jet aircraft in a controlled environment. Methods: 48 ejections occurring from July 1977 to December 1990 involving corrective or sun lens use were retrospectively examined. There were 5 contact lens users. Most information was obtained from Naval Safety Center records and from a personal questionnaire. RESULTS. The fate of eye wear in ejection. The utility of and need for enforcement of standard operating procedures (i.e. mask on, helmet properly secured, and at lower ejection speeds). The efficacy of corrective or sun lenses in ejection. Contact lens users were too few to draw meaningful conclusions.

THE FATE OF EYEWEAR IN EJECTION. R. P. O'Connell, A. S. Marovich, Naval Aerospace Medical Institute, Pensacola, FL 32508-5600.

INTRODUCTION. The peak deceleration loading allowed for aero-braking of manned vehicles is a critical parameter in planning future excursions to Mars. However, considerable variation exists in the limits used by various investigators. The goal of this study was to determine the most appropriate level for this limit. METHODS. Since previous U.S. spaceflights have been limited to 4 g max, a duration of 8 days during, Soviet flight results were examined. Published details of Soviet entry trajectories were not available. However, personal communication with Soviet cosmonauts indicated that peak loads of 5-6 g had been encountered upon return from 8 months in orbit. Soyuz entry capsule characteristics were estimated from the capsule's aerodynamic measurements and trajectories were numerically calculated. The results confirmed a peak load of 5-6 g. RESULTS. The details of the Soviet flights were of shorter duration than expected. Conservation of angular momentum occurred, and the capsule decelerated at higher rates. The present study concluded that the deceleration experience is applicable. G tolerance has been shown to stabilize after 1-3 months in space if adequate countermeasures are used. The calculated Soyuz deceleration histories are graphically presented. The results confirm the peak load of 5-6 g.

INTRODUCTION. Most experience with ejections from modern fighter aircraft has occurred in mishaps outside of true combat operations. During the Persian Gulf War, the 601st Tactical Fighter Wing lost 4 F-16C aircraft while on combat missions. All 4 pilots ejected safely, but under varying and different parameters. A questionnaire was developed to recall and quantify their recollection of the event, any problems or injuries they encountered, and their present condition.

RESULTS. All 4 pilots were given the questionnaire that allowed them to provide answers to 12 questions pertaining to their ejections. Questions ranged from recollecting the parameters of their egress to conscious recollections of the event and their assessment of how well the system worked. RESULTS. All 4 ejections occurred under different parameters. Two were at high altitudes. All 4 pilots were able to vividly recall their egress experience and recount some part of the event that was a surprise. None suffered any significant injury and one was wearing contact lenses which remained in during the ejection. All felt the seat and survival gear performed flawlessly. CONCLUSION. This was one of the first times that experience was obtained in the F-16 ejection system under combat operations in which the reason for emergency egress might be different, e.g., frag damage, than in peacetime. In the experience of the F-16 pilot, the F-16 egress system is reliable even in combat operations.

NEW HYPOTHESIS ABOUT 4G-INDUCED UNCONSCIOUSNESS. R. Tarlow. Department of Surgery, Veterans Administration Medical Center, San Antonio, TX 78220.

Introduction. Hypotheses of the 4G-induced loss of consciousness (4G-LOC) are considered an effect of sudden reduction of cerebral blood flow as a result of blood shift to lower body. However, the physiopathogenesis mechanisms are poorly understood.

Results and conclusions. The laws of physics state that during the 4G-induced changes the cerebrospinal fluid (CSF) displaces downwards against the optical subarachnoidal space, the brain weight increases and displaces the CSF from the supratentorial basal space upward the cranial convexity. The whole brain descends and the infratentorial structures are compressed against rigid base of the skull and tentorium. The vessels of the Circle of Willis are elongated cranially and collapsed. Moreover by viscoelastic properties of the brain, distortion of the cerebral tissue can occur. The 4G mainly causes critical brain areas (inferior surfaces of temporoparietal lobes, diencephalian structures and midbrain), and explain 4G-LOC clinical picture.


INTRODUCTION. The purpose of this study was to determine the effectiveness of a helmet lift reduction concept. A manikin was used to measure pressures surrounding the parachute and helmet during the ejection sequence. METHODS. All 4 pilots were given the questionnaire that allowed them to provide answers to 12 questions pertaining to their ejections. Questions ranged from recollecting the parameters of their egress to conscious recollections of the event and their assessment of how well the system worked. RESULTS. All 4 ejections occurred under different parameters. Two were at high altitudes. All 4 pilots were able to vividly recall their egress experience and recount some part of the event that was a surprise. None suffered any significant injury and one was wearing contact lenses which remained in during the ejection. All felt the seat and survival gear performed flawlessly. CONCLUSION. This was one of the first times that experience was obtained in the F-16 ejection system under combat operations in which the reason for emergency egress might be different, e.g., frag damage, than in peacetime. In the experience of the F-16 pilot, the F-16 egress system is reliable even in combat operations.

A FIRST "RUN EFFECT" ON THE HUMAN CENTRIFUGE. A. E. Toner and A. E. F. Porst. Royal Air Force Institute of Aviation Medicine, Farnborough, UK, PO14 6SZ.

Introduction. Centrifuge subjects have previously reported that exposure to +Gz acceleration on the human centrifuge caused a greater loss in peripheral vision during the first run following five subsequent runs at the same acceleration. Initial trials showed that six out of eight subjects exhibited a "first run" effect based upon visual loss criteria. It was therefore decided to study this phenomenon in greater detail and to assess the possible cause. METHODS. Seven subjects were exposed to five successive runs on the human centrifuge at their previously determined relaxed G tolerance (12.9 ± 1.5 (±SD) G) followed by five more runs (until 16 ± 2.0 (±SD) G). The time between runs was standardised at approximately thirty seconds. Eye level blood pressure, heart rate, lower body blood volume and peripheral vision were continuously monitored during exposure to +Gz acceleration. RESULTS. Lower body blood volume and heart rate showed no significant differences as compared to subsequent runs (64mmHg/sec mean loss). Peripheral vision showed a 44% greater loss overall [p < 0.001] during the first run (430/sec mean loss) compared to subsequent runs (302/sec mean loss). Eye level blood pressure showed an overall greater loss of 23% [p < 0.001] during the first run (78mmHg/sec mean loss) compared to subsequent runs (64mmHg/sec mean loss). CONCLUSION. This study has shown that a high proportion of centrifuge subjects experience a "first run" effect. This phenomenon manifests itself as a significantly greater loss in peripheral vision and eye level blood pressure under +Gz acceleration during the first run as compared to those recorded in subsequent runs at the same acceleration. Both parameters appear to be independent of changes in lower body blood volume. The results from this study suggest that it is essential to be aware of this phenomenon when assessing relaxed G tolerances if gross errors are to be avoided. Further investigations will be necessary to determine the underlying cause.


INTRODUCTION. Left ventricular end-diastolic and end-systolic volume and weight (LV parameters) of pilots were studied with two-dimensional echocardiography and modified Devereux formulæ and were compared with those of groundcrew. METHODS. 44 pilots(mean age 28.1, Group A)and 23 male groundcrew(mean age 28.6, Group B), without any CV anomalies, were examined with systolic time interval(STI) indices and 2-dimensional echocardiography. RESULTS. A significant difference was evident with peripheral vision and eye level blood pressure. Peripheral vision showed a mean ± SEM of 0.7% difference [p < 0.001] during the first run (430/sec mean loss) compared to subsequent runs (302/sec mean loss). Eye level blood pressure showed an overall difference of 23% [p < 0.001] during the first run (78mmHg/sec mean loss) compared to subsequent runs (64mmHg/sec mean loss). CONCLUSION. This study has shown that a high proportion of centrifuge subjects experience a "first run" effect. This phenomenon manifests itself as a significantly greater loss in peripheral vision and eye level blood pressure under +Gz acceleration during the first run as compared to those recorded in subsequent runs at the same acceleration. Both parameters appear to be independent of changes in lower body blood volume. The results from this study suggest that it is essential to be aware of this phenomenon when assessing relaxed G tolerances if gross errors are to be avoided. Further investigations will be necessary to determine the underlying cause.
CARDIAC IMPEDANCE DIFFERENTIAL LOOP IN AIRCRAFT G. ZHONG, Z. ZHANG, General Hospital of Air Force, Beijing 100036 China.

INTRODUCTION. Cardiac impedance differential loop (IDL) is a plot of impedance at 4 Hz versus impedance differential of/dt (Falke 1982). It is more informative and accurate than impedance index (IM). In our previous study, 120 cases of heart disease were divided into 2 groups and each group contained 40 cases. In one group, left ventricle was dilated and the other was normal. The results showed that the area of IDL was much larger in the former group. The area of IDL in patients with left ventricular hypertrophy (LVH) was larger than that in patients with normal LV. The aim of this study was to investigate whether there are any differences in the area of IDL between aircrews and groundcrews.

METHODS. A total of 100 aircrews and 100 groundcrews were enrolled in the study. The age of aircrews and groundcrews was 22-40 and 41-52, respectively. The flight experience of aircrews was 10-20 years, while that of groundcrews was 0-10 years. The body mass index of aircrews was 20-25 and that of groundcrews was 25-30. The results showed that the area of IDL of aircrews was much shorter and II, III, IIIA/AUTD ratios and parameters were tabulated in the Table. It can be seen that the area of IDL of aircrews is larger than that of groundcrews.

RESULTS. The important and age-related parameters are tabulated in the Table. It can be seen that the area of IDL of aircrews is larger than that of groundcrews.

CONCLUSION. The area of IDL of aircrews is much larger than that of groundcrews. This may be due to the differences in the work load of aircrews and groundcrews. It is possible that the area of IDL may be a useful parameter for assessing the health status of pilots.

The area of IDL is a useful parameter for assessing the health status of pilots.
IMPlications for selection of aircrew can follow.

Patients: Military aviators (n=199) known to have mitral valve prolapse were evaluated and followed from February 1991 to February 1997.

METHODS: History, physical examination, echocardiography, Holter monitor, and other testing (including submaximally exertional exercise stress testing) were performed on an annual basis. Mitral regurgitation was considered present if there was a large systolic color jet of at least 3 cm across the annulus, accompanied by appropriate diastolic and/or color-flow/continuous wave evidence for mild-moderate mitral regurgitation on transesophageal echocardiography. RESULTS: The 198 aviators underwent 320 evaluations averaging 1.68 visits per subject. MR was noted on physical exam and/or echocardiography in 43 of these subjects. Some degree of MR (mild-severe) was noted at least once during each of the 31 aviators of these 31 aviators had anastomotic MR at 1.1 years. Only 21% of these subjects had normal echocardiograms and only 30% of the echocardiograms were considered normal.

CONCLUSION: In this group of MR aviators with MR only one patient was identified with mitral valve prolapse with MR as compared to the MR group. The patient was identified with mitral valve prolapse with MR as compared to the MR group.

ASPECIFIC NASAL HYPERREACTIVITY IN AN AIR FORCE POPULATION AND ITS RELATIONSHIP WITH BRONCHIAL HYPERREACTIVITY (BHR). A. Urbanis, R. Berti, C. De Angelis, G. Petrelli, S. Fracaccia, D. Micriacari, R. Misini, and F. Filicci, IAP, DASR, Dept. of aerospace Medicine and "ENT Clinic, University of Rome.

INTRODUCTION. Nasal function is of paramount importance for aircrew. Aspecific nasal hyperreactivity (ANR) prevalence in a young AF population was investigated and compared to the prevalence of aspecific bronchial hyperreactivity (ABH) in 150 healthy volunteers (17.7% with MR vs. 3.8% without MR, p<0.01). Ventricular pairing, ventricular premature complexes, atrial fibrillation/ventricular flutter, etc. did not show a significant association with the MR group.

CONCLUSION: In this group of MR aviators with MR only one patient was identified with mitral valve prolapse with MR as compared to the MR group. The patient was identified with mitral valve prolapse with MR as compared to the MR group.

BLOOD VOLUME AND ORTHOSTATIC RESPONSES OF MEN AND WOMEN TO A 12-DAY BEDREST. "S. Forney, T. Driscoll, L. Moczydlowski, C. Scherer, NASA Johnson Space Center, KRUG Life Sciences, and the Baylor College of Medicine."

INTRODUCTION. Changes in blood volume during space flight are thought to contribute to decrements in post-flight orthostatic function. The purpose of this study was to determine whether gender affects red cell mass and plasma volume during a short exposure to simulated microgravity, and whether gender differences in orthostatic tolerance (OT) are present in control subjects.

METHODS: Twenty-two subjects (11 men, 11 women; 31.5 ± 5.2 years, STD) underwent 13 days of 6° head-down bedrest. Plasma volume (PV) and red cell mass (RCM) were measured before bedrest and on bedrest day 13. On the same days, orthostatic tolerance (OT) was determined as the maximum pressure during a presyncopal-limited lower body negative pressure test. RESULTS. Plasma volume (PV) decreased (P<0.01) during bedrest in both groups, with a greater PV decrease (P<0.05) in men (6.3 ± 0.6 ml/kg) than in women (4.1 ± 0.6 ml/kg). Decreases in red cell mass were similar (1.7 ± 0.2 ml/kg in men and 1.7 ± 0.2 ml/kg in women). OT was similar for men and women before bedrest (-78 ± 6 mmHg in men vs. -70 ± 4 mmHg in women) and decreased by a similar degree (by an average of 11 mmHg in both groups) after bedrest. The changes in OT did not correlate with changes in plasma volume during bedrest (r = 0.02).

CONCLUSION. Thus, although female hormones may protect PV during bedrest, they do not appear to offer an advantage in terms of loss of orthostatic function.

EFFECT OF ANTIORTHOSTATIC BEDREST (BR) ON GASTROINTESTINAL MOTILITY. (GIM) OF NORMAL SUBJECTS. E. Patch, R.P. Houser, K.J. Hertel, R.M. Cintora, NASA/Johnson Space Center, Houston, TX, KRUG Life Sciences, Inc., Houston, TX, and Philadelphia College of Pharmacy and Science, Philadelphia, PA.

INTRODUCTION. The combined effect of postural changes, fluid shifts, and diuresis associated with the absence of the gravity vector may decrease GIM during space flight. GIM can be estimated from the mouth-to-coccyx transit time (MCTT) of orally administered lactoce (LAC); this test is used to assess changes in GIM in microgravity and in ground-based orthostatic stress conditions. Since BR mimics some of the physiological changes that occur during space flight, the effect of ten days of BR on GIM was evaluated from the MCTT of LAC.

METHODS. Subjects were 12 non-smoking males between the ages of 35 and 50. After an 8-10 h fast, subjects ingested Cephalin® (20g solution) with a low-fat breakfast on four different days (45, 50, 25, and 20) before and on three separate days (7, 10, and 17) during BR. Breath-H2 concentrations were measured before and at 10-min intervals for 4 h after breakfast using a Quintron breathalyzer and MCTT was determined from these data.

RESULTS. MCTT ranged between 50 and 106 min during anabullion and 80 and 210 min during BR with means of 79 and 122 min, respectively. CONCLUSIONS. Mean MCTT during BR was 54% longer than during ambulation, suggesting that absorption and availability of orally administered medications and nutrients may be delayed or impaired as a result of decreased GIM during bedrest.