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APOPROTEIN B AS A USEFUL TOOL TO FORTELL CARDIO-VASCULAR RISK IN NORMAL OR HYPERCHOLESTEROLEMIC SUBJECTS. F.Blanco Rojo, J.M.Pèrez * Sastre. Occupational Medicine Service of IBERIA airline company of Spain. Madrid

INTRODUCTION. It is generally acepted high apo B levels as a reliable predictor of cardio-vascular risk disregarding pathological antecedents. This paper presents the results of a study that measured cholesterol, apo A and apo B plasma levels in otherwise healthy ground and flight workers sample. METHODS Total cholesterol was determined by Abbott's enzimatic technic and apo A and B by Behring's Nefelometer inmunological method in 398 random workers sample. RESULTS 35.40% males and 13.48% females were hypercholesterolemic, being 75% and 68% respectively considered high cardio-vascular risk. 11% males and 4% females with normal cholesterol were also considered high risk, due both to high apo B and low apo A levels. CONCLUSIONS Apo B should be determined in Hyper and/or Normocholesterolemic workers when there are other associated factors (smoking, hypertension, diabetes) and/or safety related jobs (aircrews) in order to comply or not harsher therapies to - prevent cardio-vascular disease.

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REGULATION AND ADAPTATION PROCESSES OF HUMAN BODY IN LONG-TERM MICROGRAVITY. A.I. Grigoriev and A.D. Egorov. Institute of Biomedical Problems, Moscow 123007, USSR.

INTRODUCTION. Mechanisms of regulation and adaptation of cardiovascular, respiratory, muscular-skeletal, hematologic and immune systems in microgravity are discussed in this paper. METHODS. Space flight medical investigation results are analyzed and summarized in terms of general physiological mechanisms. RESULTS. Microgravity induced elimination of gravity-related deformation and mechanical tension of the human body structures changes afferent input and removes weight-load and hydrostatic blood pressure. As a result, regulation processes are changed and short- and long-term adaptation responses are developed. It was shown, that afferent input changes result in adaptive rearrangement of the functional state of the main human body systems. The fluid shifts are accompanied by reflex changes in regulation of circulation, water-salt metabolism and other systems. The reduction of load upon the human body weight-bearing structures results in partial loss of properties and qualities, acquired by man under influence of the Earth's gravity, and causes changes in the intensity of the oxidative processes, structure-plastic and transport support of a number of body functions. CONCULSIONS. The human body changes, which occur in microgravity result in the involving of the self control and adaptive mechanisms, which in, combination with the countermeasures complex, prevents further progress of disorders and to certain extent smooths them.

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INITIAL RESPONSE OF THE CALCIUM HOMEOSTATIC SYSTEM TO SPACEFLIGHT. C.E. Cann*, C.D. Arnaud, B.P. Halloran, M.E. Hammond, D. Matsumoto, S. Sanchez. University of California, San Francisco, CA 94143

INTRODUCTION Bone loss following spaceflight is well documented, and if left untreated by rational countermeasures could limit manned space exploration. Many consider the loss of bone to occur over long periods, months to years, but the relationship between bone and blood calcium homeostasis allows us to study this problem within the first 48 hours of spaceflight. We hypothesized that the initial response of bone to unloading will be a release of calcium, through increased bone resorption, into the extracellular calcium fluid compartment including blood. If this is correct, the serum parathyroid hormone (PTH) level will decrease in an adaptive response, leading to other observed effects such as increased urinary calcium. We tested this hypothesis in the payload crew of the SLS-1mission. METHODS Serum samples were obtained from four crew (2 male, 2 female) on days L-15,7, 2,FD2,FD6,R+1 and R+6. We measured serum ionized calcium (Ca^{++}, magnesium, phosphorus, intact PTH (IRMA, with measurement of PTH in > 95% of normal subjects) and 1,25 dihydroxyvitamin D using microtechniques developed in our laboratory. RESULTS Serum Ca^{++} showed the expected negative correlation with PTH for all samples, confirming biological validity of our data. An unexpected finding was a much stronger correlation for the male crew ($r=-0.8$, $p<0.001$) than for the female crew ($r= 0.3$, N.S.). Ca^{++}increased markedly (26%) by FD2 and remained elevated (19%) through FD6, with recovery by R+6. PTH decreased by FD2, was low through FD6, and also recovered by R+6. Mg and P did not change. CONCLUSION The hypercalcemia is clinically significant, and could be responsible for some symptoms of space adaptation syndrome. The early Ca homeostatic response to spaceflight is consistent with increased bone resorption, but this is not proved. Antiresorptive drugs such as those in research trials in osteoporosis and metastatic bone disease may be useful in preventing bone loss in spaceflight.

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MAGNETIC RESONANCE IMAGING (MRI) OF SKELETAL MUSCLES IN ASTRONAUTS AFTER 9 DAYS OF SPACE FLIGHT. M. Jaweed[1*], P. Narayana[2], J. Slopis[2], I. Butler[2], V. Schneider[1], A. LeBlanc[3], L. Fotedar[4] and D. Bacon[5]. [1]NASA Johnson Space Center, [2]Univ. of Texas Health Science Center, [3]Baylor College of Medicine, [4]KRUG Life Sciences, [5]Humana Hospital, Houston, TX.

INTRODUCTION: Skylab data indicated that prolonged exposure of human subjects to microgravity environment causes significant muscle atrophy accompanied by reduced muscle strength and fatigue resistance. The objective of this study was to determine decrements in muscle size, if any, in the soleus and gastrocnemius muscles of male and female astronauts after 9 days of space flights. METHODS: Eight astronauts, one female and seven male, between the ages of 31 and 59 years, 59-84 Kg in body weight were examined by MRI 2-3 times preflight within 16 days before launch; and 2 days (n=8) and seven days (n=3) after landing. The right leg muscles (gastroc-soleus) were imaged with a lower extremity coil in magnets operating at 1.0 or 1.5 Telsa. The imaging protocol consisted of spin echo with a Tr of 0.70 - 1.5 sec. Thirty to forty 3-5 mm thick slices were acquired in 256 x 128 or 256 x 256 matrices. Acquisition time lasted 20-40 minutes. Multiple slices were measured by computerized planimetry. RESULTS: Compared to the preflight, the cross-sectional areas (CSA) of the soleus, gastrocnemius and the leg, at 2 days after landing were reduced (at least $P<0.05$) 8.9 percent, 13.2 percent and 9.5 percent, respectively. The soleus and the leg of three astronauts evaluated at 7 days postflight, did not show full recovery compared to the preflight values. CONCLUSIONS: It is concluded that 9-days of space flight may cause significant decrease in CSA of the leg muscles. The factors responsible for this loss need further delineation.

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THE METHODOLOGICAL PRINCIPLES OF MEDICAL CONTROL SYSTEMS (MCS) DESIGN FOR LONG DURATION SPACE FLIGHTS (LDSF).

E.S. Berezhnov, A.I. Grigoriev*, V.S. Bednenko. Air Force, Aerospace Medicine Service, Institute of Biomedical Problems, Institute of Aerospace Medicine, Moscow, USSR.

INTRODUCTION. The USSR experience, having been accumulated in LDSF medical support, has shown the necessity of the definite correction and specification of methodology of MCS design. METHODS. By use of systemic analysis, the generalized estimation of the results of MC in space has been performed. There have been analyzed the results of examination of 19 Soviet cosmonauts, who performed LDSF, lasting from 2 to 12 months, in 1980-90. Moreover the analogous estimation has been carried out in 556 experiments with volunteers during the modelling of zero-gravity environment. Results. The systemic analysis has shown, that in addition to 3 well-known methodological principles (i.e. pathogenesis, "MC by stages" and succession's ones), 4 new principles must be formulated and taken into account. They are the systemic-structural approach, the determinism of the infrastructure of the basic physiologic methods, the notion of the total "image" of MCS, the search of "organ-targets". CONCLUSION. The realization of all the above-named methodological principles leads to the significant improvement of the informative and diagnostic possibilities of on-board MCS in LDSF.

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RESULTS OF AN INTERNATIONAL SPACE CREW DEBRIEF. P.A. Santy*, A.W. Holland*, L. Looper, and R. Marcondes-North*. UTMB, Galveston, TX 77550; and Johnson Space Center Biobehavioral Laboratory, Houston, TX 77058.

INTRODUCTION. In order to identify potential multicultural and multinational problems for future International Space Station Freedom crew, a crew debrief questionnaire (called an "International Crew Debrief") was developed for U.S. astronauts who flew on Shuttle missions with one or more crewmembers from other countries. METHODS. From 1981-90, a total of 20 U.S. astronauts flew on International space missions. Debriefs were mailed to all twenty with instructions not to identify themselves or their specific mission. The debrief focused primarily on preflight training; and postflight incidents of misunderstanding, miscommunication and interpersonal friction among crewmembers. Astronauts were also asked to rate the impact of the incident to the mission (low, medium or high). RESULTS. Ten astronauts responded, but only nine responses were able to be scored; for a return rate of 45%. 42 incidents were reported: 9 in the preflight period; 26 inflight; and 7 in the postflight period. Most of these incidents were rated at a low or medium impact, but 5 of the inflight incidents were rated at a "high" mission impact. A number of causes for the problems were listed, and are discussed. CONCLUSIONS. The Debrief respondents provide useful and timely recommendations on preflight training which might help facilitate the integration of multinational crews and prevent multicultural or multinational factors from interfering with mission operations.

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AEROMEDICAL HAZARDS OF HIGH TERRESTRIAL ELEVATION: EFFECTS OF 4300 M, AMS, AND OXYGEN ON COGNITION AND MOOD. J. Crowley*, N. Wesensten, E. Iwanyk, G. Kamimori, P. Amoroso, N. Pearson, T. Balkin. *U.S. Army Aeromedical Research Laboratory, Fort Rucker, AL 36362.

INTRODUCTION. Sustained exposure to high terrestrial altitudes is associated with physical and psychological decrement; relevant aeromedical guidelines for aircrew management are lacking. METHODS. Thirteen male subjects ascended in 10 minutes from SL to 4300 m (simulated), and remained there for 2 1/2 days. Four times per day subjects completed 9 cognitive tests, a mood scale, and an acute mountain sickness (AMS) questionnaire. During one test session per day, subjects breathed 35% oxygen instead of ambient air. RESULTS. Transient deficits were seen on altitude day 1 for 3 cognitive tasks. Most tasks displayed a strong and persistent learning effect. Subjects reporting AMS demonstrated consistently slower rates of learning and negative changes in mood compared to well subjects. On altitude day 1, oxygen administration improved performance on two cognitive tests and one mood scale. CONCLUSIONS. Following rapid ascent to 4300 m, performance is most affected during the first several hours. After a period of acclimatization, supplemental oxygen may not be necessary for ground duties. However, the cognitive and mood effects of AMS, combined with the well-known physical symptoms, suggest that afflicted aircrew should not fly.

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A TAXONOMY OF FLYING STRESS RESPONSE SYNDROMES IN MILITARY STUDENT PILOTS. J.J. Picano* and H.F. Edwards. Letterman U.S. Army Hospital, PSF, CA 94129.

INTRODUCTION. We sought to develop a taxonomy of stress response syndromes among student pilots referred for psychiatric evaluation during flight training based upon prominent symptom patterns, and to evaluate their relationship to subject variables and eventual completion of flight training. METHOD. Two aeromedical psychologists retrospectively reviewed consecutive student pilot referrals over a two-year period to the mental health clinic at the Army Aviation Training Center. Data on elimination from flight training was later obtained. RESULTS. Out of 155 referrals, 99 manifested maladaptive responses to flying stress. Prominent syndromes (and prevalences) were: Anxiety (26%); Marital Conflict (22%); Somatization (15%); Emotional Exhaustion (13%); Phobic Reactions (12%); and Misconduct (11%). Phobic reactions presented early in training, whereas marital conflicts were more prevalent in later phases ($p<.02$). All phobic students were eliminated; 45% of all others completed training. Completion was significantly more likely for students presenting later in flight training, but especially for those with anxiety reactions and marital conflicts ($p<.03$). CONCLUSIONS. The taxonomy developed provides a useful framework for describing maladaptive stress responses during flight training and differentiates eventual completion. Despite high overall elimination rates, completion of training was most likely for students with anxiety reactions and marital conflicts which occurred later in training.

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STRESS REACTION INDUCED BY FLIGHT ACTIVITY : QUANTIFICATION OF THE STRESS LEVEL BY EVALUATING THE HORMONAL RESPONSE. S. Farrace*, C. De Angelis, L. Urbani*, R. Biscili and R. D' Amelio ItAF, D.A.S.R.S., Aerospace Medical Dept.

INTRODUCTION. The quantitative evaluation of flight-induced stress may be useful to monitor the level of "adaptation to fly" of student pilots. The aim of this study has been the analysis of the hormonal response to flight activity to establish whether or not the hormonal changes induced by flight are a reliable tool to quantify the flight-induced stress level. METHODS. The hormonal responses of growth hormone (GH), cortisol and prolactin (PRL) to flight activity were evaluated in one group of student pilots (n=11; group A) and another of instructors (n=11; group B) of an Italian Air Force flight school. Blood samples were obtained one hour before and just after a standardized training flight session. RESULTS. Hormonal determination by RIA technique after flight showed a significant increase of plasma levels of GH ($p<0.005$ vs pre-flight baseline values), cortisol ($p<0.025$ vs pre-flight baseline values) and a fair but not significant increase in PRL concentration in group A. Conversely none or a very little increase in post-flight hormonal concentrations compared to pre-flight values was found in group B. Moreover, pre-flight plasma levels of GH and PRL were significantly higher in group A compared to the same values in group B. CONCLUSIONS. The data lead to establish a close correlation between the hormonal response to flight activity and the development of tolerance and adaptation to flight-induced stress.

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COMPARISON IN THE RECOVERY OF CIRCADIAN RHYTHM OF PLASMA CORTISOL LEVELS AFTER A THREE DAY TRIP TO DIFFERENT DIRECTIONS. N.Tajima*, Y. Fujita, T.Yanagisawa, I.Masuda, H.Yamamoto, N.Takasaki, T.Tamura, M.Kaji, I.Asukata, K.Yamamoto, M.Sasaki, M.Hokari, K.Uchino and T.Sakai. Flight Crew Medical Service Department. Japan Airlines, Tokyo, Japan.

INTRODUCTION. The objective of the present study is to compare the change in the circadian rhythm of plasma cortisol levels following a 3 day stay and an West-, East- and Southbound return flight from Paris, San Francisco (SFO) and Sydney to Tokyo. METHODS. Six healthy male students aged 19-13 yrs volunteered for the project. Plasma cortisol levels were monitored 4 times (3am, 7am, 15pm and 23pm) daily for 13 days during the experimental period. RESULTS. In Tokyo, the baseline pattern of cortisol concentrations showed the classical diurnal profile with the values ranged from 2.3 ug/dl (3am) to 12.2 ug/dl (7am). During the 3 day stay after transmeridian flight, disappearance of circadian rhythm (Paris) or phase advancement of 8 hours (SFO) were observed. After returning to Tokyo, the subjects exhibited the original diurnal pattern beginning Day 1, however, complete resynchronization was not apparnent until Day 2 (Paris) or Day 4 (SFO). In contrast, circadian rhythm was not disturbed by the Southbound flight to Sydney with one hour time difference. CONCLUSION. The data demonstrated that the recovery of circadian rhythm was faster in Westbound than in Eastbound flight. It also provided valuable insights as to how to optimize flight schedule for cockpit crews in order to minimize jet jag.

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EFFECTS OF TIME DIFFERENCE AFTER TRANSMERIDIAN FLIGHTS ON THE NUMBER OF LYMPHOCYTES AND NATURAL KILLER CELL ACTIVITIES H. Ohkoshi, I.Asukata*, M.Uematsu, Y.Fujita, M.Kaji, Y.Okuaki, F.Watanabe, H.Ando, T.Takahashi, K.Yamamoto, M.Sasaki, M.Hokari, K.Uchino and T.Sakai. Flight Crew Medical Service Department, Japan Airlines, Tokyo, Japan.

INTRODUCTIN. We presented that lymphocytes increased in number and Natural killer (NK) cell activities increased after the transmeridian flight. There may be two factors involved in its mechanism; time difference caused by the flight and unusual physical condition during the flight. This study aims to clarify the involvment of time difference in the lymphocyte changes. METHODS. Eighteen subjects were devided into 3 group. After the baseline study in Tokyo, the first group flew to San Francisco, the second to Paris and the third to Sydney. After staying two nights at each destination, they returned to Tokyo and spent 6 days to observe the recovery. The number of lymphocytes and its subsets were measured in peripheral blood at 3:00, 7:00, 15:00 and 23:00. NK cell activity was measured in a standard Cr release assay. RESULTS. After east and westbound round trip, the number of lymphocytes and NK activities increased and its circadian rhythm had been disturbed by Day 5. In case of southbound round trip with 1 hour time difference, however, these factors were little affected. CONCLUSION. These results indicated that time difference after transmeridian flights induced the increased number of lymphocytes, the disturbance of circadian rhythm and the enhancement of NK cell activities.

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THE SURGICAL PATHOLOGIST: A RESOURCE IN THE FLIGHT SURGEON'S MANAGEMENT OF FLYING PERSONNEL WITH NEOPLASMS. DM Drehner* Wilford Hall USAF Medical Center, Lackland AFB, TX 78236-5300.

Major gains in rates of cure and/or long term survival of patients with neoplasms have been made in the past 20 years. Increasing numbers of Air Force flying personnel are requesting waivers to return to flying status after treatment for a large variety of neoplasms. The surgical pathologist, by his role in diagnosing neoplasms and assessing response to therapy, is an important source of information for flight surgeons managing patients with neoplasms. Wilford Hall USAF Medical Center is a major referral center for flying personnel with neoplasms. Several recent, challenging cases are presented. These include the case of a pilot diagnosed with renal cell carcinoma treated with nephrectomy, a pilot treated with allogeneic bone marrow transplantation for chronic myelogenous leukemia and a pilot with dermatofibrosarcoma protuberans. The utility of consultation with the surgical pathologist will be discussed. Insights gained from analysis from the Wilford Hall Tumor Registry files involving flying personnel will be reviewed.

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AIRPORT DISASTER PLAN IN TOKYO INTERNATIONAL AIRPORT.
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INTRODUCTION. It has been already reported in number of studies that about 85% of aircraft accidents occured within 5 miles from airport. For this reason it is described in the Airport Emergency Planning of the Airport Service Manual ICAO 1980 that all airport must have definite plan to the airport accident to cope with such disaster. At the Tokyo International Airport (HANEDA) there has been serious accidents in the past: In 1982 we had crassing of JAL DC8 with 42 dead and 148 injured at offshore Haneda. At this time the disaster plan was not established yet, we had many trouble on the site, since then we have made effort in preparing airport disaster plan in cooperation with the various organizations concerned referring to ICAO manual or to the study of Dr. Star(JFK) and Dr. Bergot(ORLEY) and it was completed in April 1991. RESULT. First report: This should be transmitted to various organizations and agencies concerned by cascade system. Emergency medical care should be devided to: (1) Cordination Headquater(in building) (2) Cordination station (at site of accident). Accident site should be performed: Rescue--Collecting area--Triage area--Emergency Treatment area--Transportation(ambulance car and helicopter). Especially important is: (1) Establishment of disaster agreement with local self government body. (2) Establishment of disaster compensation plan for the participants in rescue and medical care service. CONCLUSION. It is necessary that all person concerned should trained to help and save as many victims as possible through quick rescue and medical care when accident occurs. Fortunately we have hospitals with up-to-date equipment near the airport so that casualties shuold be transported to such hospitals only after treated for resuscitation at the site of accident.

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THE EFFICACY OF BIOGRAPHICAL INVENTORY DATA IN PREDICTING EARLY ATTRITION IN NAVAL AVIATION OFFICER CANDIDATE TRAINING. D. R. Street and D. L. Dolgin*. Naval Aerospace Medical Research Laboratory Naval Air Station, Pensacola, Florida 32508-5700

INTRODUCTION. Early attrition in the training of U. S. Naval aviation Officer candidates presents a historic problem with increasing implications in a time of service drawdown and budgetary constraints. This investigation assesses the value of Biographical Information in a sample of Aviation Officer Candidates and Naval Aviation Cadets in predicting early attrition at the indoctrination level of Naval Aviation Officer training. METHODS. A sample of 1659 Aviation Officer Candidates and Naval Aviation Cadets who took the revised Aviation Qualification Test/Flight Aptitude Rating (AQT/FAR) between 1987 and 1991 was selected for analysis. A principal component factor analysis of Biographical Inventory items was conducted with those individuals who passed (N = 1258) basic Aviation Indoctrination and also with those who attrited (N = 403) during the same training. The resultant factors were then forced into a discriminant function analysis. RESULTS. The principal component analysis was limited to 10 factors based on eigenvalues greater than one. The resultant item factor groupings were essentially the same for both the attrites and passes. The results of a discriminant function analysis indicated that five of the item factor groupings were statistically different ($p < .05$) based on Wilk's Lambda (U-statistic) and univariate F-ratios with one and 1659 degrees of freedom for those who attrited during early training. DISCUSSION. A biographical inventory implemented as an adjunct to paper and pencil/performance-based testing may further facilitate aviation selection screening and the retention of quality personnel. Continued research will further elucidate the importance of biographical inventory data in aviation selection.

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PERFORMANCE OF TERMINAL AIR TRAFFIC CONTROL SPECIALISTS IN FIELD QUALIFICATION TRAINING. C. A. Manning* and Wayne L. McMillin. FAA Civil Aeromedical Institute, Oklahoma City, OK 73125.

INTRODUCTION. Most studies of the Federal Aviation Administration's (FAA's) Air Traffic Control Specialists (ATCSs) focused on the en route option. Training of terminal ATCSs differs from en route training. Depending on the type of facility to which the trainee is assigned, pass rates and time to complete training are often lower than for en route controllers and may also differ among terminal facilities. This study was conducted to assess differences in training programs for terminal ATCSs, using available training performance measures. A secondary purpose was to assess the effects of previous experience on success in training at facilities controlling different amounts and types of air traffic. METHODS. Training records, updated in August 1991, were obtained for 4929 ATCSs who graduated from the FAA Academy and entered terminal field training between August 1981 and December 1988. Demographic and biographical data and measures of training performance were extracted. Statistical analyses were conducted to compare performance of students assigned to different facility types, and assess the effect of different types of experience. RESULTS. Overall, about 78% of terminal trainees successfully completed training at their first assigned facility. Another 8% switched to other terminal facilities before completing training. However, success rates differed by facility type. About 87% of those assigned to towers not using radar procedures were successful in their first assigned facility (2% were reassigned to other terminal facilities) while only 58% of those assigned to level 4 or 5 radar facilities were successful (23% were reassigned to other terminal facilities). CONCLUSIONS. Terminal trainees have historically been classified as successful if they remain in training at any terminal facility. This way of classifying training status does not fully reflect the loss rates in the terminal option, especially at certain facilities. FAA's ongoing improvements in ATCS training could benefit by increased attention to training for terminal ATCSs.

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REDUCING THE ATTRITION RATE IN NAVY ADVANCED FLIGHT TRAINING. D.J. Blower. Naval Aerospace Medical Research Laboratory, Pensacola, Florida 32508-5700.

INTRODUCTION. The selection of naval aviators can be improved by using tests that sample some of the information processing and psychomotor skills thought to underlie successful performance in flight training. Predicting students who have a higher probability of failure in the advanced phase of flight training is important because a failure at this stage can reach costs approaching $1M per student. METHODS. Discriminant analysis was applied to the scores from all the tests in our battery to determine which linear combination of scores resulted in the best separation of those students who failed advanced and those students who passed. RESULTS. The weighted linear combination of scores from a tracking task performed in conjunction with a short term memory task proved to be superior in predicting advanced attritions. A Bayesian approach was used to derive a distribution of the success rate parameter when this test was used to screen students. A comparison with the success rate under the present method of selection illustrated the increased probability of identifying attritions. CONCLUSIONS. There is an increased probability of reducing attritions in the costly phase of advanced flight training. Before these savings can be realized, however, it must be shown that small deltas in attrition rate can be translated into training infrastructure cost reductions.

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EXPECTATION AND PERFORMANCE EVALUATION OF STUDENT PILOTS AND INSTRUCTORS DURING INTRODUCTION TO THE F-5 AND THE F-16. L.Lian and H.T.Andersen*. RNoAF Institute of Aviation Medicine, P.O. Box 14, 0313 Oslo, Norway.

INTRODUCTION: Young fighter-rated pilots, flying experience averaging 285 hours, are trained to achieve operational standards at the air force tactical school, first in the F-5, later on in the F-16. Trainees as well as instructors frequently express some degree of frustration during this period. Interviews with both groups of participants indicated that discrepancies between expectations, performances and achievements might explain their dissatisfaction. METHODS: A total of 87 standard flights with 15 students and 25 instructors were selected from the training program. After briefing, immediately before leaving for flight line, students and instructors were asked to predict performance by putting a mark to a line 100 mm long. Likewise, on return before debrief, they were similarly asked to give their impressions of actual performance in the same way. RESULTS: Students and instructors alike on the initial course flying the F-5 exhibited too great expectations as compared to instructors final evaluation of performance. In the secondary course on the F-16 instructors still tended to overestimate the flying capabilities of their students, the latter group now showing rather modest expectations. Both instructor groups were consistent in their evaluations. However, instructors used a much wider range of the scale than did the students.All of the results are significant ($p<0.02$ or less) by statistical analyses. CONCLUSION: Frustration in early training may be due to discrepancies between expectations and performance among students and instructors.

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NEUROPSYCHOLOGICAL ASSESSMENT OF AVIATORS: A COMPARISON OF TRADITIONAL AND COMPUTER-BASED APPROACHES. G. Kay,* Georgetown University School of Medicine, Washington, D.C.; * J.R. Hordinsky, B. Pakull, Federal Aviation Administration, Washington, D.C.

INTRODUCTION. Aviators generally require neuropsychological assessment when there is evidence of neurological or psychiatric conditions, or when there is evidence of deterioration in their performance of aviation related skills. COGSCREEN, a computerized cognitive screening test in development by FAA, is being selectively applied as an adjunct tool during such aviator referrals. METHODS. Nine commercial aviators (7 Pilots and 2 Flight Engineers) who had been referred for neuropsychological assessment were administered a traditional Halstead-Reitan based test battery (5-6 hours) as well as the (Phase C - Research Edition) COGSCREEN computerized test battery (45 minutes). Results from COGSCREEN were analyzed using the commercial pilot normative database (N=400). RESULTS. Two of the 3 pilots who were referred for failed transition training scored below the 5th percentile on multiple measures from COGSCREEN. Only one of these two individuals performed in the impaired range on traditional testing. The three head injured pilots all performed very poorly (i.e., below the 1st percentile) on multiple COGSCREEN measures. In contrast, they showed only mild and isolated difficulties on the traditional test battery. Two of the three pilots who had failed at least 2 demonstrated distinct COGSCREEN deficits; only the pilot with an alcoholic history performed well on both COGSCREEN and the traditional set. CONCLUSION. In the 9 described cases, COGSCREEN'S sensitivity appears to be equal to or better than traditional neuropsychological testing; this relative insensity of traditional instruments is probably due to the lack of adequate pilot norms.

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VERY LOW PREVALENCE RATE OF NIDDM AMONG COCKPIT CREWS OF JAPAN AIRLINES. Y.Shibata, C.Yamada, N.Tajima*, Y.Sakuramoto, T.Okamoto, K.Sakai, M.Yuzawa, N.Takeda, E.Maeda, J.Yokoyama, M.Ohno, Y.Noguchi, M.Hokari. Flight Crew Medical Service Department, Japan Airlines, Tokyo, Japan.

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 total of 1263 active crews age ranging 40-60 yrs are included in the study. All received aviation medical examination every 6 month since employment and those who showed urine glucose > trace and/or fasting plasma glucose (FPG) > 100mg/dl took 75gOGTT. Diagnosis of NIDDM was made by WHO's criteria. As of 3-31-'91, laboratory variables were measured to determine their control status. RESULTS. Of 1263, 43 were diagnosed as NIDDM, 192 as IGT, 10 as renal glucose uria and the remaining 1018 were normal. Prevalence rate of NIDDM was 3.4.%. A cross sectional study demonstrated that present age (52.8, 49.2 vs 46.8 yrs), FPG (107, 104 vs 92 mg/dl), HbAlc (6.1, 5.8 vs 5.5%) were higher in NIDDM and IGT than in normals, however, BMI, T.chol and uric acid levels were identical among three groups. None of them were grounded due to poor control of diabetes. CONCLUSION. The occurrence of NIDDM among cockpit crews was approximately 1/3 of general population despite their irregular and stressful life style. Healthy worker's effect cannot be neglected, however, intensive supervision by us seems to be effective to ameliorate their glycemic control.

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FRACTURE OF THE FEMORAL NECK SUSTAINED DURING ROUTINE CENTRIFUGE TRAINING M.E. Reid, M.D., Maj.* J.S. Han, Ph.D. William Beaumont Army Medical Center, Orthopaedics, El Paso, TX 79920. Texas Tech University Health Sciences Center, Biomechanics Laboratory, El Paso, TX 79905.

INTRODUCTION. In efforts to enhance a high performance fighter pilot's tolerance of high sustained +Gz (HSG), centrifuge training in which the subject undergoes a series of runs attaining a maximum of 7G 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. Thorough search of the literature revealed no similar mechanism of injury. CASE REPORT. A 30-year-old Air National Guard pilot in good health (no history of lower extremity injury or pathology or change in activity) was approved for centrifuge training at a military training facility. In a rapid onset run (ROR) of high +Gz, he was accelerated from 1.2G to 7.0G at a rate of +2.0 G.s-1, sustaining 7.0Gz for an additional 15s while performing the M-1 maneuver. At the completion of this run, the patient reported marked 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 seating during the rapid onset of G's may have channeled enough force through the hip to exceed bone strength. IMPLICATIONS. With thorough biomechanical analysis, the possible etiologic factors of this unique case will be demarked, furthering our understanding of human function under high-G stress, and hopefully preventing future occurrence of such injury.

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A REVIEW OF ACCELERATION INJURIES ON HUMAN CENTRIFUGES IN THE UNITED STATES AND CANADA SINCE 1985. **D. McGowan*, J. Whinnery*, ACME Labs, Naval Air Development Center, Warminster, PA 18974-5000; K.K. Gillingham*, Armstrong Labs, Brooks AFB, TX, 78235-5301; F.J. Maggio*, G.W. Gray*, Defense and Civil Institute of Environmental Medicine, North York, Ontario, Canada, M3M 3B9; J. Green*, R.D. Vanderbeek*, USAF TAC HQ, Langley AFB, VA 23665.**

INTRODUCTION. As tactical aviation moves farther into the high-G environment, research exposures above 10 +Gz make critical the proper selection of experimental subjects, yet the extent and cost of screening has expanded without a clear correlation to benefits. METHODS. A review of all centrifuge related injuries was conducted combining human experience in the U.S. and Canada. Consideration was given to the G profile flown, the subject's previous G-exposure experience, and the selection process or screening criteria utilized before the exposure was authorized. RESULTS. Injuries were infrequent, unpredictable, generally minor, and occurred to both screened and unscreened subjects. CONCLUSION. The injuries experienced by training subjects (not prescreened other than being on flight status) would not have been avoided by use of current screening criteria. Experimental subjects may be over screened, with resulting unnecessary expense of selection and exclusion of many subjects. Careful review of screening requirements and selection criteria for high-G exposure should be explored along with a careful expansion of the G envelope.

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RETROSPECTIVE REVIEW OF CENTRIFUGE MORBIDITY. P. M. Giovanetti*. HQ TAC/SGPA, Langley AFB, VA 23665.

From September 1988 through June 1991, 6,078 Tactical Air Command (TAC) aircrew members have undergone G tolerance training at the Holloman Air Force Base, NM centrifuge. In May 1989, Headquarters TAC surveyed experienced aircrew members to assess morbidity associated with the centrifuge training program. A broader-based follow-up survey was conducted in August 1990 and was interrupted by Operation Desert Shield. Results of these surveys indicate that significant morbidity associated with centrifuge training is low--Duties Not Including Flying (DNIF) rate of 4% in the initial survey, 0.8% in the follow-up. However, the duration of DNIF is long - mean 3.1 weeks in the initial survey; 30 days in the follow-up. Seven cases of significant morbidity temporally related to centrifuge training are presented.

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

INTRODUCTION. Ejection from jet aircraft is an area that has been exhaustively studied from many perspectives, e.g. causes of ejection, types and causes of ejection injuries, etc. Curiously, no study was found concerning the fate of eyewear in ejections. Many pilots are required to wear corrective lenses during flight ops and many wear sunglasses. What happens to these during ejection? What injuries are caused? What factors can be identified that influence retention rate and severity of related injury? Do contact lenses provide significant advantage? METHODS. 48 ejections occurring from '77 to '90 involving corrective or sun lens use were retrospectively examined. 5 were contact lens wearers. Most information was obtained from Naval Safety Center records and some from personal questionnaires. Injury and retention rates were examined as functions of several variables. RESULTS. Though 37 of 46 lost all lenses every single instance of retention occurred with visor down, 02 mask on, helmet properly secured, and at lower ejection speeds. Related injuries were minor and occurred in only 20%. CONCLUSION. The utility of and need for enforcement of standard operating procedures (i.e. mask on, helmet secured, and visor down) was clearly demonstrated. Only 19 of 46 clearly met all three criteria. Contact lens users were too few to draw meaningful conclusions.

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PHYSIOLOGICAL CONSTRAINTS ON DECELERATION DURING THE AEROCAPTURE OF MANNED VEHICLES. J.E. Lyne.* NASA Ames Research Center, Moffett Field, CA 94035.

INTRODUCTION. The peak deceleration load allowed for aerobraking 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 84 days duration, Soviet flight results were examined. Published details of Soviet entry trajectories were not available. However, personal communication with Soviet cosmonauts suggested that peak entry loads of 5-6 g had been encountered upon return from 8 months in orbit. Soyuz entry capsule characteristics were estimated, and the capsule's entry trajectory was numerically calculated. The results confirmed a peak load of 5 to 6 g. RESULTS. Although the Soviet flights were of shorter duration than expected Mars missions, evidence exists that the deceleration experience is applicable. G tolerance has been shown to stabilize after 1 to 3 months in space if adequate countermeasures are used. The calculated Soyuz deceleration histories are graphically compared with those expected for Mars aerobrakes. CONCLUSIONS Previous spaceflight experience supports the use of a 5 g limit for the aerocapture of a manned vehicle at Mars.