RESULTS. Injuries screened in the study were recorded in the medical chart every 6 months since employment and those who showed urine glucose > trace and/or fasting plasma glucose (FPG) > 100 mg/dl took 75gOGTT of glucose and were withdrawn from the study. Of 31-31.91, laboratory variables were measured to determine their control status.

RESULTS. Of 1263, 43 were diagnosed as NIDDM, 192 as IGT, 10 as renal glucoseuria, 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), HbA1c (6.1, 5.8 vs 5.5%) were higher in NIDDM and IGT than in normals, however, BMI, TChol and uric acid levels were identical among three groups. None of them were found 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.

A REVIEW OF ACCELERATION INJURIES ON HUMAN CENTRIFUGES IN THE UNITED STATES AND CANADA SINCE 1965. R. McDonow, J. Whynry, Ames Lab, Naval Air Development Center, Warminster, PA 18974-5000; V.K. Chhabra, Armament Lab, Hanscom AF, MA 01731-5030; F.J. Waddell, G.W. Craig, Defense and Civil Institute of Environmental Medicine, North York, Ontario, Canada, WM 3501; D. Greent, R.D. Vanderspek, NAF TAC HQ, Langley AFB, VA 23665.

INTRODUCTION. In efforts to enhance a high performance fighter pilot's tolerance of high sustained G+ (HSG), centrifuge training in which the subject undergoes a series of runs attaining a maximum 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. 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 (RON) of high Gx, he was accelerated from 1.2G to 7.0G at a rate of +2.0 Gs-l, sustaining 7.0Gs 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 concurrent 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. INDICATIONS. With thorough biomechanical analysis, the possible etiologic factors of this unique case will be dissected, furthering our understanding of human function under high-G stress, and hopefully preventing future occurrence of such injury.
INVESTIGATION OF A WINDBLAST DEFLECTOR CONCEPT FOR IMPROVED WINDBLAST PROTECTION DURING EMERGENCY ESCAPE. J. L. Speck, B. J. Wilhite, J. A. Plaqua, and D. E. McGirt, Armstrong Laboratory, Wright-Patterson AFB, Ohio 45433-6573.

Introduction. The present study investigated the effectiveness of open ejection seats in reducing the effects of windblast for an egressing aircrew member. A manikin study was conducted to determine the ability of different windblast deflector configurations to reduce the aerodynamic loading upon a helmeted occupant. Two separate wind tunnel tests were conducted; one ejection seat mounted windblast deflector configurations were tested. Deflector size and orientation were varied. RESULTS. Head/neck loading was reduced for some deflector configurations; furthermore, total aerodynamic seat man coefficients were also reduced. Load reductions for helmet and head were achieved, along with ejection seat egressiness and head orientation with respect to the airstream. CONCLUSION. Aircrew subjected to emergency ejection undergo potentially injurious aerodynamic loading upon entering the airstream. The windblast deflector concept provides a lightweight, easily deployable alternative for improving egressiness and reducing the probability of windblast related injuries.

A FIRST "RUN EFFECT" ON THE HUMAN CENTRIFUGE. A. E. Torer and A. J. Fenn, Royal Air Force Institute of Aviation Medicine, Farnborough, UK, GU14 6SZ.

Introduction. Centrifuge subjects have previously reported that exposure to +Gz acceleration on this human centrifuge caused a greater loss in peripheral vision during the first run as compared to the 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 tolerances at 20+/-2Gz and subsequent runs at 250 seconds at peak G). The time between runs was standardized at approximately thirty seconds, eye level blood pressure, heart rate, lower body blood volume and peripheral vision were continuously monitored during exposure and after completion of the 15 second run. RESULTS. Lower body blood volume and heart rate showed no significant differences between runs. A significant difference was clearly evident with peripheral vision and eye level blood pressure. Peripheral vision showed a 44% greater loss overall [p<0.001] during the first run (430 sec. mean loss) compared with subsequent runs (30 sec. mean loss). Eye level blood pressure showed an overall greater loss of 23% [p<0.001] during the first run (765 mmHg/sec mean loss) compared with subsequent runs (641 mmHg/sec mean loss).

Conclusion. This study has established 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 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 FLIGHT SURGEON'S WORK QUALITY. S. S. Sun, J. Z. Dou, W. Sun, Z. L. Sun. An Institute of Aviation Medicine, Air Force, Beijing 100016, P. R. CHINA.

INTRODUCTION. The assessment of work in health maintenance is almost traditionally qualitative because of the difficulty involved in its quantification. In order to improve the work quality of Flight Surgeons, this study is to work out a quantitative method for medical fitness assessment of Flight Surgeon quantitatively. METHODS. According to concepts of management, Total Quality Control and investigation in basic units, we first work out a comprehensive indices system on work quality. The second step was to attach each index with a weight factor thru Delphi method and Analytic Hierarchy Process method. The third step was to establish the grade demand of each index based on investigation in 17 basic units. RESULTS. solving the three problems mentioned above, we arrived at a quantitative evaluation procedure of Flight Surgeon's work composed of 38 items, grouped into 4 categories (Flight Surgeon's quality, Flight Surgeon's work, application and management of equipments, the health condition of pilots). CONCLUSIONS. This quantitative evaluation procedure of Flight Surgeon's work is practicable and reliable in actual application.


We evaluated 1,386 air line pilots (all males: age range 26-65, mean 44) to determine whether these pilots represent about 70% of all Italian air line pilots, and can therefore be regarded as a representative of the all pilot population. Three hundred ninety six (29.6%) of subjects had presence of a disease state not satisfying the requirements for first class certification. Among these subjects 310(21%) were assessed to have only minimal clinical and/or laboratory findings compatible with first class certification. The most frequently involved systems and apparatus were: a) metabolism, b) cardiovascular, c) joints and joint, d) ear, nose, throat. This (1,386) had eye, abdominal and respiratory disorders. Medical advice, possibly coupled with pharmacological therapy were able to consistently prevent worsening of the clinical situation. In fact, only in 5 (0.4%) pilots the disorders caused denial. It is concluded that:

- it is important to perform periodical medical examination at the Flight Surgeon's center to obtain consistent and reliable data and,
- an individually tailored medical counseling is able to reduce denial rate.

HYPERTENSION MANAGEMENT IN AVIATORS OF A COMMERCIAL AIRLINE. L. G. B. Simonsen, G. V. Manfrin, G. Stahlhagen, Helsinki Air Force Aerospace Medical Centre, Helsinki, FINLAND.

INTRODUCTION. Effective control of arterial hypertension in aviators still remains a problem. Diuretics and β-blockers, adequately tested so far, are known to cause unfavourable effects on lipid and glucose metabolism. Yet diuretics cause electrolyte disturbances and β-blockers may restrain exercise capability and have sedative effects. Newer classes of antihypertensive agents such as Ca-antagonists and ACE inhibitors have been proved clinically safe and effective. They present no adverse metabolic effect, they do not cause orthostatic hypotension or sedative effects. On the contrary ACE inhibitors may increase alertness. Based on these considerations, these classes of drugs have been recently introduced in the treatment of hypertension in commercial aviators in Greece. The experience gained is presented in this paper. METHODS. By law, all commercial aviators in Greece are examined every 6 months in a specialized Medical Center to detect and treat hypertension. Whenever hypertension is detected the aviator is grounded. After clinical and laboratory investigation, a stepped care treatment of hypertension is started. RESULTS. Out of 450 aviators 10 were found hypertensive (100/150/95). Of them 7 succeeded adequate control of BP only by salt restriction and life style modification. The remaining 7 received successfully drug therapy: β-blockers, Ca-antagonists, ACE inhibitors or diuretics as monotherapy or in combination. In the last five years 5 pilots were permanently disqualified because of uncontrolled hypertension. CONCLUSIONS. New classes of antihypertensive drugs such as ACE inhibitors and Ca-antagonists have been effectively and safely used in civilian aviators.
BLOOD VOLUME AND ORTHOSTATIC RESPONSES OF MEN AND WOMEN TO A 13-DAY BEDREST. *S. Forney, T. Driscoll, L. Kadrmas, J. Munson, W. ref. s., 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 cardiovascular output and 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 observed on Earth were seen in space flight. METHODS. Ten men (31.5 ± 5.2 yrs, STD) and eleven normally-menstruating women (33.6 ± 6.0 yrs, STD) underwent 13 days of 6° head-down bedrest. Plasma volume (%Hb-hematocrit) and red cell mass (%Hb-labelled red blood cells) were measured before bedrest and on bedrest day 13. On the same days, orthostatic tolerance (OT) was determined as the maximal pressure during a presyncopal-limited lower body negative pressure test. RESULTS. Plasma volume (%Hb) and red cell mass (RCM) 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.

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THE EFFECTS OF LYPRESSIN ON HEMODYNAMIC RESPONSES TO HEAD-DOWN TILT AND ORTHOSTATIC STRESS. D. F. Deat* and R.W. Goetzal*, Wright State University School of Medicine, Dayton, OH 45401.

INTRODUCTION. This study was conducted to evaluate the effects of the synthetic drug lysine-8-vasopressin (lypressin) on specific hemodynamic variables during nascent (4 hours) head-down tilt (HDT) and subsequent orthostatic stress. METHOIDS. Seven healthy male subjects, ages 23–27, were studied in a blinded, cross-over study of lypressin versus the control, normal saline nasal spray, administered intranasally immediately before and two hours after beginning a 6 degrees head-down tilt. Plasma volume and cardiovascular dynamics were assessed by venous hemoglobin/hematocrit, blood volume, arterial oxygen saturation, heart rate, electrocardiography, impedance cardiography and plethysmography measurements before, during, after tilt, and in response to a 45 minute stand test. RESULTS. In the lypressin trial, stroke volume, cardiac output and index, and pulse pressure were significantly decreased (P < 0.05) while total peripheral resistance was increased at the end of tilt. Plasma volume changes showed a significant increase of 5.9% by the end of the tilt in the lypressin trial (p < 0.001) while the control trial showed no significant change. Clinical observations included pre-syncopal symptoms in three of the seven control subjects versus none of the lypressin trial subjects during post-tilt standing test. Post-tilt plasma volume decrease was greater in the control group than in the lypressin group. Conclusions. These findings suggest that lypressin may have beneficial effects on pre-tilt with lypressin subjects. CONCLUSIONS. The cardiovascular system adapts to a new steady-state during 4 hours HDT that is maladaptive when provoked with orthostatic stressors. Exogenous vasopressin analogue ameliorates deterioration effects of post-tilt standing test by maintaining the intravascular volume at greater than pre-tilt values and increasing mean arterial pressure via peripheral resistance.