COMPARISON OF SIMULATOR SICKNESS SYMPTOMATOLOGY IN TWO FIXED-WING AND TWO ROTARY-WING SIMULATORS. Michael G. Ljungblad, PhD,* Naval Air Systems Command; Robert S. Kennedy, PhD,* Essex Corporation; Sherri A. Jones, M.S., Naval Training Systems Center.

INTRODUCTION. Studies have found that moving-base simulators of rotary-wing aircraft produce higher levels of simulator sickness than fixed-base simulators. To better understand the nature of simulator sickness, as measured by self-report, postural, and visual tests. A standardized scoring technique was developed which facilitates comparison between simulators and a factor analysis revealed three distinct factor clusters corresponding to oculomotor, visual-vestibular, and neurovegetative systems. METHOD. Four simulators were examined in the present experiment. Two "fast" moving-base simulators (F2114 and F2143) for the HH60 helicopter and two fixed-wing simulators (2F114 and 2F143) for the A-7 and E/A-6B aircraft. The helicopter simulator employs CFT infinity optics and the other two were dome projection systems. The 2F114 was a fixed base. Approximately 100 aircraft were observed in each simulator.

RESULTS. Simulator sickness was found in all simulators when total scores were taken into account, with the highest incidence in the helicopter simulators. When the symptomatology was scored according to the three factor clusters, it was found that the CFT-based helicopter simulators had the highest reports of eyestrain and the fixed-base simulator had the highest reports of disorientation. Nausea was reported about equally in all three of the motion-base simulators. CONCLUSION. Different symptom clusters occur in specific simulators with significant regularities and suggest using this method of analysis in an attempt to identify specific equipment features that relate to simulator sickness.

NUTRITION AND ACCELERATION TOLERANCE: CURRENT UNDERSTANDING. G. H. Evans and L. P. Knott, Valparaiso University, Valparaiso, IN 46383 and Armstrong Laboratories, Brooks AFB, TX 78235-5000.

INTRODUCTION. Nutritional status and the influence of diet on individual ability to perform in the increased acceleration environment is an important aeromedical concern. Although a relatively more rigorous investigation has been generated regarding the nutritional needs of the infant soldier, little data is available for the special case of the high performance pilot (HPP). METHODS. Approximately 5 decades of observational studies, current data on relationships between diet and G tolerance, and data from 1977 to 1981 by the HPP under operational conditions were reviewed. Interviews, computer data base searches, and multiple searches of the aeromedical literature provided sources for this review. RESULTS. Within the limits of the data, the major intervention assessed was the effect of pre-flight meals on symptoms. No significant differences were noted when comparing the fixed-base helicopter a F-16, but the food eaten had an obvious effect on symptoms. It seems that the fixed-base helicopter has a lower incidence of postflight effects than the F-16, but more data are needed. Future investigations should address the effect of pre-flight meals and long-term nutritional status on HPP performance. CONCLUSIONS. More research is needed to determine optimum composition, size and timing of pre-flight meals, suitable composition of meal substitutes during operational conditions when time is short, and the effect of longer-term dietary intake on acceleration tolerance.

SKELETAL MUSCLE RESPONSES TO UNLOADING IN HUMANS. D. W. Burns,* Bionetics Corp, Kennedy Space Center, FL 32899, and K. A. Jones, *Johns Hopkins University Applied Physics Laboratory, Silver Spring, MD 20910.

INTRODUCTION. The hindlimb suspension model has been used to study the response of skeletal muscle to a simulated "microgravity" environment. The purpose of this study was to determine the influence of strength training (electrical stimulation) and aerobic exercise (treadmill running) on the response of the slow and fast muscles to hindlimb suspension. METHODS. Female Wistar rats (275g) were randomly assigned to suspending (S, n=30) and non-suspended (NS, n=30) groups. Both groups were subdivided into sedentary, aerobic and strength-trained groups. Training was terminated 3 weeks after the offset of hindlimb suspension. RESULTS. In S rats, soleus peak twitch tension (Po, N/g), tetanic tension (Po, N/g), and mean cross-sectional area (CSA, um2) of type II fibres were reduced, respectively to 82%, 89% and 44% of NS values. In NS group, type II fibres CSA was reduced to 91% of NS value. Within S and NS groups, respectively, sedentary values (mean+sd) for plantaris Pt (2.2+0.7,g, 2.6+0.9 N/g), type II fibres CSA (169+240, 137+45 um2) and type I fibres CSA (171+236, 224+34 um2) were not significantly changed by either strength or aerobic training. Compared to sedentary activity, strength training increased plantaris Pt by 23% in S and 29% in NS groups(p<0.05). CONCLUSION. Intermittent aerobic or strength training during prolonged hindlimb suspension may be ineffective in reducing the amount of muscle wasting due to simulated "microgravity" exposure.