RESULTS: In the first three phases the following comparisons of mean vector st 1 or 3 pitch axis, backward in the -30 ° and -45 ° positions and head at 0 °. Results of instrument-rated pilots during five experiments maneuvers (straight and level, 30° banked turn, steep turn, level-off from descent, and recovery) under four conditions (instrument hood, hood + AUI, blind, and blind + AUI) was measured with respect to absolute vertical velocity and bank angle deviations (mean, IHS, and variance). ANOVA and post-hoc statistical comparisons of the four conditions were accomplished. Results. In all maneuvers the blind + AUI condition resulted in significantly better (p<0.05) bank angle control than was obtained in the blind-only condition, and bank angle control in the blind + AUI condition was not significantly different from that obtained under either hood condition. Although vertical velocity control tended to be better in the blind + AUI than in the blind-only condition, statistical significance was reached only in straight and level flight. CONCLUSION: The AUI enables a pilot to maintain bank angle control in the absence of vision. Its potential utility in vertical velocity control is also evident, but the vertical velocity display needs to be improved.

DYNAMICS OF THE G-EXCESS ILLUSION. J. A. Baylor*1, M. Reschke*2, F. E. Goodrich1, B. B. McGrath1, and A. H. Rupert1. 1. Naval Aerospace Medical Research Laboratory, Pensacola, FL 32508-5707; 2. NASA, Johnson Space Center, Houston, TX 77058. 3. University of Florida, Gainesville, FL 32611.

INTRODUCTION. The G-excess illusion is increasingly recognized as a cause of aviation mishaps especially when pilots perform high-speed, steeply banked turns at low altitudes. Centrifuge studies of this illusion have evoked symptoms of nausea in most subjects with 1.8 G for 3-rain periods. Results. Fourteen subjects flew on the NASA KC-135 were exposed to resultant gravitational force vectors of 1.1, 1.4, and 1.8 G for 2-min periods. On command, seated subjects made controlled head movements in roll, pitch, and yaw, and at 30-s intervals both in the dark and with faint lights at a distance of about 10 ft. RESULTS. Head movements produced transient perception of target displacement and velocity at levels as low as 1.1 G. Reports of target velocity without appropriate corresponding displacement were common. At 1.8 G when head movements were made under conditions of forward, eyes-closed, and eyes-opened conditions, a rotational target displacement with fast and slow alternating components was observable. Hand movements in hypergravity generate nausea by mechanisms distinct from cross-coupled Coriolis effects.


INTRODUCTION: Aeromedical evacuation is on the brink of some extraordinary advances in patient care technology. With the explosion of biomedical technology over the past 15 years, a plethora of computer based patient assessment technologies have emerged. Some of these technologies include the flight nurse corps with endless research opportunities in the area of advanced medical equipment applications in the aircraft environment. METHODS: Some of the current off-the-shelf items which may apply to in flight patient care include: 1) pulse oximetry, for non-invasive arterial oxygen saturation measurement, 2) automatic blood pressure monitoring and monitoring of multiparameter cardiac monitoring, 3) transcranial Doppler, for measuring cerebral blood flow. Research in the application of these devices will require the development of experimental protocols, in flight test and evaluation, data collection and analysis, and plans for implementing patient care devices. The equipment and training requirements. RESULTS: An increase in the quality of in flight patient care will be the major benefit derived from this process. CONCLUSION: The result of these efforts will culminate in the transformation of aeromedical patient care into the 21st century.
The final design configuration to date will be discussed with future space program evaluations, and parabolic flight and underwater Weightless Environmental Test Facility demonstrations for various medical contingencies will be given. Also, parabolic flight and underwater evaluations from SSF to a definitive medical care facility on earth.

Functional within the STS delivery systems, and personnel (patient and crew medical officers). It must be restructured. This restructuring activity has affected the capabilities for providing medical care on board the station. This presentation addresses the health care facility to be built and used on the orbiting space station. This unit, named the Health Maintenance Facility (HMF), is based on and modeled after remote, terrestrial medical facilities. It will provide a phased approach to health care for the crew of SSF. Beginning with a stabilization and transport phase, HMF will expand to provide the most advanced state of the art therapeutic and diagnostic capabilities. This presentation details the capabilities of such a phased HMF. As Freedom takes form over the next decade there will be ever-increasing engineering and scientific developmental activities. The HMF will evolve with this process until it eventually reaches a mature, complete, stand-alone health care facility that provides a foundation to support interplanetary travel. As man’s experience in space continues to grow so will the ability to provide advanced health care for Earth-orbital and exploratory missions as well.


The CMRS is a prototype system designed and developed for use as a universally deployable medical restraint/workstation on Space Station Freedom (SSF), the Shuttle Transportation System (STS), and the Assured Crew Rescue Vehicle (ACRV) for support of an ill or injured crewmember requiring stabilization and transportation to Earth. The CMRS will support all medical capabilities of the Health Maintenance Facility (HMF) by providing a restraint/interface system for all equipment (Advanced Life Support packs, defibrillator, ventilator, portable oxygen supply, IV pump, transport monitor, transport aspirator, and intravenous fluids delivery systems), and personnel (patient and crew medical officers). It must be functional within the STS, ACRV, and all SSF habitable volumes. The CMRS will allow for medical capabilities within CPR, ACLS, and ALS standards of care. This must all be accomplished for a worst case transport time scenario of 24 hours from SSF to a definitive medical care facility on earth.

A prototype of the above design configuration with its subsequent one year SSF/ST/SRCV life cycle and ground based simulations testing will be given. Also, parabolic flight and underwater Weightless Environmental Test Facility evaluations will be demonstrated for various medical contingencies. The final design configuration to date will be discussed with future space program impact considerations.

DEVELOPMENT OF CARDIOPULMONARY RESUSCITATION IN THE MICROGRAVITY ENVIRONMENT. M. R. Barrand*, R. D. Billica*. KRUG Life Sciences and Medical Operations, NASA Johnson Space Center, Houston, TX.

INTRODUCTION. The microgravity environment presents several challenges for delivering effective cardiopulmonary resuscitation (CPR). Chest compressions must be driven by muscular force rather than by the weight of the rescuer's upper torso. Airway stabilization is influenced by the neutral body postures. Rescuers will consist of crewmembers of varying sizes and degrees of physical deconditioning from space-flight. Several ACLS CPR designed to accommodate these factors were tested in the one g environment in parabolic flight, and on a recent shuttle flight. METHODS. Utilizing study participants of varying sizes, different techniques of CPR delivery were evaluated using a recording CPR manikin to assess adequacy of compressive force and frequency. Under conditions of parabolic flight, methods tested included conventional positioning of rescuer and victim, free-floating "aircraft." The hardware planned for use during the MTC phase of the space station was utilized to increase the fidelity of the scenario and evaluate the prototype equipment. Based on initial KC-135 testing of CPR and ACLS, changes were made to the ventilator/fibrillation algorithm to accommodate the microgravity environment. Other constraints to delivery of ACLS onboard the space station were identified for inclusion in the protocol including immediate restraint of the patient and early intubation to insure airway. External cardiac compressions of adequate force and frequency were administered using various methods. The most significant limiting factors appear to be crew training, crew size, and limited supplies. CONCLUSIONS. Although the delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were assessed. REINITIALTS.