
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, 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 ATLS 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 presentation of the above design prototype with its subsequent one year SSF/HMF and STS/ACRV high fidelity mock-up 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.


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 posture. The rescuer will consist of crewmembers of varying sizes and degrees of physical deconditioning from space-flight. Several ACLS devices were designed to accommodate these factors in a zero-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 over 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" and free-floating CPR. RESULTS. Delivery of effective CPR was inadequate but rapidly fatigueing. The CCAD was able to provide adequate compressive force, however positioning was problematic. CONCLUSIONS. Delivery of effective CPR in microgravity will be dependent on adequate rescuer and patient restraint, tolerance, and rescuer size and preference. Free-floating CPR may be employed as a stop-gap method until patient restraint is available. Development of an adequate CCAD would be desirable to compensate for the effects of deconditioning.

ADVANCED CARDIAC LIFE SUPPORT (ACLS) UTILIZING MAN-TENDED CAPABILITY (MTC) HARDWARE ONBOARD SPACE STATION FREEDOM. M. Smith, M. Barratt, C. Lloyd, NASA and KRUG Life Sciences, Inc. Medical Operations Branch, Johnson Space Center, Houston, Texas 77058.

INTRODUCTION. Because the time and crew size constraints involved returning a patient from space to a definitive medical care facility, the capability for Advanced Cardiac Life Support (ACLS) onboard Space Station Freedom was considered. In order to evaluate the effectiveness of terrestrial ACLS equipment, a medical team conducted simulations during parabolic flight onboard the KC-135 aircraft. The hardware planned for use during the MTC phase of the space station development was evaluated. RESULTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity were identified for inclusion in the protocol including immediate restraint of the patient and early intubation in case of airway problems. Conclusions. Results of preflight and flight investigations presented here will be used to finalize the design of medical hardware, determination of crew training, and medical operations for space station and beyond.