DELIVERY OF CARDIOPULMONARY RESUSCITATION IN THE MICROGRAVITY ENVIRONMENT. M. R. Barratt* and R. D. Billica*. KRUG Life Sciences and Medical Operations, NASA Johnson Space Center, Houston, Texas. INTRODUCTION. The microgravity environment presents several challenges for delivering effective cardiopulmonary resuscitation (CPR). Cerebral circulation is driven by muscular force rather than by the weight of the rescuer's upper torso. Airway stabilization is influenced by the neutral body posture. Rescuers will consist of crewmembers of varying sizes and degrees of physical deconditioning from spaceflight. Several ACLS CPR designs were evaluated to accommodate these factors. The aim was to provide effective CPR delivery under conditions that have been used for 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 the rescuer and victim, free-floating "aircraft." The BLS procedures, straddling the patient with active and passive restraints, and utilizing a mechanical cardiac compression assist device (CCAD). Multiple restraint systems and ventilation techniques were also assessed. RESULTS. Delivery of effective CPR was dependent on adequate restraint. In a high g environment, free-floating CPR was adequate but rapidly fatiguing. The CCAD was able to provide adequate compressive force, but positioning was problematic. CONCLUSIONS. Delivery of effective CPR in microgravity will be dependent on adequate restraint and patient restraint techniques. Medical officer 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 (MTT) 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 distance involved returning a patient from space to a definitive medical care facility, the capability for Advanced Cardiac Life Support (ACLS) onboard Space Station Freedom is required. In order to evaluate the effectiveness of terrestrial ACLS techniques in microgravity, a phased approach was implemented. 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 was utilized to increase the fidelity of the simulation environment. Other constraints to delivery of ACLS onboard the space station were tested in the one g environment, in parabolic flight, and on a recent shuttle flight. RESULTS. The procedures and prototype hardware, which include a medical restraint system, a surgical overhead isolation canopy, a mechanical cardiac compression assist device (CCAD), and a surgical overhead isolation canopy, 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 the rescuer and victim, free-floating "aircraft." The BLS procedures, straddling the patient with active and passive restraints, and utilizing a mechanical cardiac compression assist device (CCAD). Multiple restraint systems and ventilation techniques were also assessed. RESULTS. Delivery of effective CPR was dependent on adequate restraint. In a high g environment, free-floating CPR was adequate but rapidly fatiguing. The CCAD was able to provide adequate compressive force, but positioning was problematic. CONCLUSIONS. Delivery of effective CPR in microgravity will be dependent on adequate restraint and patient restraint techniques. Medical officer restraint is available. Development of an adequate CCAD would be desirable to compensate for the effects of deconditioning.

A PROTOTYPE CREW MEDICAL RESTRAINT SYSTEM (CMRS) FOR SPACE STATION FREEDOM. S.L. Johnston*, F.T. Eichstadt, and R.D. Billica*. KRUG Life Sciences and Medical Operations, NASA Johnson Space Center, Houston, Texas. 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, venoxygen 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/SCC 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.