DELIVERY OF CARDIOPULMONARY RESUSCITATION IN THE MICRO-GRAVITY ENVIRONMENT. M. R. Barratt* and R. D. Billica*. KRUG Life Sciences and Medical Operations, NASA Johnson Space Center, Houston, TX.

INTRODUCTION. The microgravity environment poses 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 postural position. Researchers will consist of crewmembers of varying sizes and degrees of physical deconditioning from space-flight. Several ACLS protocols were developed to accommodate these factors and were tested in the one g environment, on 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 was engineered to provide for easy adjustments. Reliance on muscular force alone was quickly fatiguing to the rescuer. The CCAD was able to provide adequate compressive force, but positioning was problematic. CONCLUSIONS. Delivery of effective CPR in microgravity will be dependent on appropriate rescuer and patient restraint, techniques, and the size and preference of free-floating CPR may be employed as a stop-gap method, until patient restraint is available. Development of an acceptable 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 critical. In order to evaluate the effectiveness of terrestrial ACLS and CCAD equipment, a medical team conducted simulations during parabolic flight onboard the KC-135 aircraft. The CAPABILITIES of delivering effective CPR during parabolic flight will be discussed. METHODS. Several methods of CPR were tested in the one g environment, parabolic flight, and on a recent shuttle flight. RESULTS. The delivery of ACLS in microgravity is hindered by the environment, but should be adequate. Factors specific to microgravity include the conditioning and size of the rescuer and patient. CONCLUSIONS. Delivery of ACLS in microgravity will be dependent on appropriate restraint, techniques, and the size and preference of free-floating CPR may be employed as a stop-gap method until patient restraint is available.


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 the Earth. The CMRS will support all medical capabilities of the on Station Health Maintenance Facility (HMF) by providing a restraint/user 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 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 prototype of the above design concept with its subsequent one year SEEHPM testing in the one g environment 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. Surgical techniques in microgravity are being developed for the Health Maintenance Facility (HMF) on Space Station Freedom (SSF). This will be the first evaluation of the proposed surgical capabilities developed for hardware and procedural investigations. METHODS. Procedures and prototype hardware, which include a medical restraint system, a surgical overhead isolation canopy, a surgical device, and a regional handpiece were evaluated. This was accomplished by realistic sterile surgical simulations involving both mannequins and animals during KC-135 parabolic flight and in a high fidelity ground based HMF mock-up. RESULTS. Surgical procedures and prototype hardware tested provided valuable information and should be investigated and developed further. The use of standard surgical techniques are possible in microgravity if the principles of personnel and supply restraint and operational field containment are adhered to.