SPACE STATION FREEDOM: EVOLUTION OF MEDICAL CAPABILITIES. R.D. Billica M.D.* and C.W. Lloyd, Pharm.D.

PANEL OVERVIEW: In the past year the Space Station Freedom program has advanced towards a major restructuring effort resulting in several important milestones. The efforts to baseline medical functions have evolved through a phased approach to providing new technologies and capabilities. This panel will present the results of these efforts to solidify new health care planning and provisions for the Space Station Freedom system. Included in the discussion are reports from clinical studies performed on Space Shuttle, KC-135 zero-gravity, and ground-based laboratories.

DELIVERY OF CARDIOPULMONARY RESUSCITATION IN THE MICROGRAVITY ENVIRONMENT. M. R. Barratt* and R. D. Billica*.

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, thus rescuers will consist of crewmembers of varying sizes and degrees of physical deconditioning from spaceflight. Several CPR devices were 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 types of CPR devices were evaluated using a recording CPR manikin to assess adequacy of compressive force and frequency. RESULTS: Conditions of parabolic flight, methods tested included conventional positioning of rescuer and victim, free-floating “aircraft.” The CPC-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 resuscitation equipment and training, effectiveness and comfort of the rescuer, and pretreatment size and preference. The CPC-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.

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 equipment onboard the space station and beyond, 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 program has advanced through a major restructuring effort and passed significant design milestones. The efforts to baseline medical functions have evolved through a phased approach to providing new technologies and capabilities. This panel will present the results of these efforts to solidify new health care planning and provisions for the Space Station Freedom system. Included in the discussion are reports from clinical studies performed on Space Shuttle, KC-135 zero-gravity, and ground-based laboratories.


The CMRS is a prototype system designed and developed for use as a universally deployable medical restraint/workstation on Space Station Freedom (SSF). The system incorporates 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 Space Station Freedom (SSF) medical team. The hardware planned for use during the MTC phase of the space station program has advanced through a major restructuring effort and passed significant design milestones. The efforts to baseline medical functions have evolved through a phased approach to providing new technologies and capabilities. This panel will present the results of these efforts to solidify new health care planning and provisions for the Space Station Freedom system. Included in the discussion are reports from clinical studies performed on Space Shuttle, KC-135 zero-gravity, and ground-based laboratories.


INTRODUCTION: Surgical techniques in microgravity are being developed for the Health Maintenance Facility (HMF) on Space Station Freedom (SSF). They will be presented as the result of ongoing surgical capabilities and 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 lumbar surgery device, 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 mockup. RESULTS: Animal surgery in the environment of microgravity allowed the observation of unique arterial and venous bleeding characteristics for the first time. The ability to control bleeding was evaluated and the use of surgical techniques 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 operative field containment are adhered to.