MEDICAL CONSIDERATIONS FOR SUBORBITAL SPACEFLIGHT

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My Background

- Board Certified Emergency Physician
- Extensive Level 1 Trauma experience
- UF-Shands Hospital Space Shuttle Support Physician NASA KSC 1995-1999
- Research in KC-135 Parabolic Flights
Mitigation of Medical Risk

Preparedness
Response
Recovery
Continuum of Medical Care

- Screening
- Preflight
- Flight Operations
- Recovery

Emergency Response
Different Perspectives

Aerospace Medicine
Preventive

Extreme Environment Medicine

Emergency Medicine
Responsive
Different Populations, Different Risks

- Government Astronauts
- Commercial Flight Crew
- Researchers
- Tourists
Not your average astronaut...

- 57 year old spaceflight participant
- Moderate bullous emphysema
- Previous pneumothorax and talc pleurodesis
- Lung mass
- Ventricular and atriallectopy

- Successful 10 day orbital flight

Aviat Space Environ Med. 2006 May;77(5):475-84.
Mitigation of Medical Risk

- Prescreening of spaceflight participants
  - Medical history
  - Informed consent of the risks of spaceflight
  - Physical exam and evaluation not required by the FAA
  - Flight crew require a second class airman certificate within 12 months prior to flight
Response
Flight Operations

- Extreme Environment
- Off-nominal events
- Individual response factors
- Vehicle specific impacts
Spaceflight Medical Risks

- Acceleration
- Barometric pressure
- Microgravity
- Radiation
- Noise
- Vibration
- Temperature
- Life support systems
- Behavioral issues
- Communication
- Traumatic injury
- Fatigue
Mercury Redstone 4
Flight Profile

- Variable acceleration profile
- Acceleration can produce arrhythmias in healthy subjects
- Rapid deceleration can cause traumatic injury
Response Preparedness

- Identification of vehicle specific risks
- Development of a response plan
- Recovery
- Treatment
- Evacuation
Recovery
Recovery Operations

- Emergency response (if required)
- Recovery of crew
- Evacuation
- Transport
- Evaluation
- Release
Emergency Operations Plans

Identify predictable disruptions and develop plans to minimize functional (operational) disruptions
Worst case scenario planning
Emergency Response

- Responsibilities should be assigned to positions not persons
- Limit responder responsibilities
  - Prevents overextension
- Prioritize issues and response
- Incident command management system
Emergency Procedures
Medical Response Planning

- Establish an advisory committee
- Conduct a vulnerability assessment
- Identify hazards and causes of disruption
- Identify resources
- Create a risk index
- Construct potential scenarios
Life Science Research Opportunities
Opportunities for Knowledge

- Physiologic adaptation
- Transition phase changes
- Disease state specific response

Allows application of the classic scientific paradigm, measuring an effect by removing it.
GRAVITY
ONE GALLON

WARNING: CONTAINS GRAVITONS.
A GRAVITON IS A HYPOTHETICAL ELEMENTARY
PARTICLE THAT MEDIATES THE FORCE OF GRAVITY IN
THE FRAMEWORK OF QUANTUM FIELD THEORY. THE
GRAVITON IS MASSLESS AND, AS A SECOND-RAI
TENSOR, MUST HAVE A SPIN OF TWO.

TO BE USED ONLY IN GRAVITY
MANIPULATION EXPERIMENTS.
IF INGESTED, CONTACT A PHYSICIST IMMEDIATELY.

NET WEIGHT
1 GALLON

9.00
Questions?