<table>
<thead>
<tr>
<th>Event</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Station</td>
<td>1997-2003</td>
</tr>
<tr>
<td>Humans Return to the Moon</td>
<td>2004</td>
</tr>
<tr>
<td>Lunar Presence</td>
<td>2005</td>
</tr>
<tr>
<td>Lunar Habitat</td>
<td>2007-2009</td>
</tr>
<tr>
<td>Humans Land on Mars</td>
<td>2018</td>
</tr>
</tbody>
</table>

* Schedule currently under scrutiny by various outside Advisory Committees*
Biomedical Programs

Goals

- Develop an understanding of the physiological, psychological and behavioral adaptation to space
- Ensure the health, well-being, and performance of humans in space and on return to Earth’s gravity
- Promote the application of biomedical research to improve the quality of life on Earth

Objectives

- Determine the acute and long-term physiological and behavioral adaptation to space
- Determine the psychological and sociological implications of space flight
- Determine the crew performance and mission consequences of the physiological, psychological and behavioral adaptation to space
- Develop adequate monitoring techniques and countermeasures
- Verify adequate models and/or analogs for space
INFLIGHT VALIDATION

Training Protocols  Design Requirements  Procedures  Selection Criteria  Other Procedures

Requirements

Undersea Habitat Model
- Contained Link w/Outside
- EVA-Type Activity
  - Crew Coordination
  - Group Dynamics
  - Selection & Training
  - Immunology Studies*
  - Environmental Monitoring

Antarctic Model
- Isolation
- Self-Sufficiency
- Very Long-Duration
  - Psychological
  - Crew Coordination
  - Group Dynamics
  - Selection & Training
  - Immunology Studies
  - Circadian Rhythms
  - Stress Related
  - Endocrinology
  - Advanced HMF
  - Testing
  - Environmental
  - Monitoring
  - Instrument Testing
  - Galactic Cosmic Radiation

Requirements

Simulations/Aviation

HYPOTHESIS TESTING

Computer Modelling

BASIC RESEARCH

* If longer than 2 weeks
Justification for Using the Antarctic as an Analog

- Similarities Between Extended Duration Space Missions and Antarctica Conditions
  - Long Duration
  - Extreme Environments
  - Isolated Location
  - Delayed Communications
  - Confinement
  - Small Group Dynamics
  - Diverse skill mix
  - Various Nationalities
NASA Proposed Biomedical Research in the Antarctic

Goal

- To use the Antarctic as an analog for space exploration to study human behavior and performance, physiology under stress, and environmental health.

Areas of Research Interest

- Space Human Factors
- Human Physiology
- Environmental Health
NASA Proposed Biomedical Research in the Antarctic (Continued)

• Space Human Factors
  — Crew Selection and Training
  — Isolation
  — Psychological Support/Countermeasures
  — Human-Machine Interactions
  — Work Station/Habitability Requirements
  — Workload
  — Small Group Dynamics
  — Command and Control Structure
  — Crew Composition: Gender, Nationality, Skill Mix

• Human Physiology
  — Stress-Related Endocrinology/Immunity issues
  — Circadian Rhythms and Sleep Disorders
  — Sedentary Issues Related to General Fitness/Motivational Aspects of Exercise

• Environmental Health
  — Microbiology and Toxicology Issues
  — Epidemiology of Infectious Diseases
<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Meeting of the Science Working Group</td>
<td>October 11-12, 1990</td>
</tr>
<tr>
<td>NASA/NSF Research Announcement Release</td>
<td>March 1, 1991</td>
</tr>
<tr>
<td>Proposal Submission Deadline</td>
<td>June 1, 1991</td>
</tr>
<tr>
<td>Investigation Selection</td>
<td>Summer 1991</td>
</tr>
<tr>
<td>Investigation Initiation</td>
<td>Fall 1991 (FY92)</td>
</tr>
</tbody>
</table>
Charge to the Committee

The NASA/NSF Science Working Group is charged with defining specific science requirements and priorities for biomedical research to be conducted using the Antarctic as an analog for space exploration.
Attachment 9