# NASA ADVISORY COUNCIL

## Exploration Committee

## July 16, 2009

# Progress On 2009 Exploration and *ad hoc* Biomedical Committees' Operations Plan (1 of 2)

| 2009 Work Plan Elements | Feb | Apr | Jul | Oct | Comments |
|---|---|---|---|---|---|
| **Review and advise regarding SE&I (Systems Engineering and Integration) process and implementation.** | | | | | ***Will continue to monitor periodically*** |
| **Review and advise regarding NASA's plans for a new Space Communication Architecture.** | | | | | ***Participated with Science and Space Ops to draft recommendation approved by Council for an independent study.*** |
| **Review and advise regarding how to best preserve the Lunar Phase of the program given budget pressures.** | | | | | • ***Review budget implications and evaluate options for Lunar (July)***<br>• ***Lunar Mission Architecture (July)*** |
| **Evaluate key technical and management areas of the Constellation Program and its projects.** | | | | | • ***Monitor Shuttle - Constellation transition (Feb)***<br>• ***LOC/LOM vulnerability characteristics (April)***<br>• ***SR&QA requirements (April)***<br>• ***Operability (April)***<br>• ***Lunar Surface Systems (Oct)***<br>• ***Budget Impacts (July)***<br>• ***Analog Utilization (July)*** |
| **Monitor progress against objectives critical to the "feed forward" goals of long duration Lunar habitation, transit to and from Mars, and Mars surface exploration.** | | | | | ***ad hoc Biomedical Committee***<br>•***OSEWG (Feb)***<br>•***Monitor key medical issues (Anthropometric Regmts - July)***<br>•***Goals and performance of NSBRI (July)***<br>•***Lunar Science Institute – ongoing***<br>•***Monitor interagency MOUs for research – ongoing*** |

# Progress On 2009 Exploration and *ad hoc* Biomedical Committees' Operations Plan (2 of 2)

| 2009 Work Plan Elements | Feb | Apr | Jul | Oct | Comments |
|---|---|---|---|---|---|
| The EC with SOC will continue to examine administrative and technical organizational structure for ISS Utilization. | | | | | *Will continue to monitor periodically* |
| Assess strategy and progress in developing international and commercial collaborations | | | | | *Council Plenary will continue to monitor periodically* |
| Work with SC on science enabled by or enabling human exploration | | | | | *Joint session with SC & AC on EDL* |
| Review Planetary Protection policies, guidelines, and regulations | | | | | *Joint session with SC* |
| Form and coordinate a new subcommittee on Avionics, Software, and Cybersecurity | | | | | *Committee formed and starting operations* |
| With SOC examine Decision for Land vs Water Recovery | | | | | |
| With SOC examine Constellation plans for operations beyond Moon (e.g., NEO) | | | | | |

# Exploration and *ad hoc* Biomedical Committees Agenda (1 of 2)

## July 14, 2009 - Fact-finding

- Review ESMD Budget Implications and Options (Joint with Science Committee)

- Impressions of Probabilistic Risk Assessment Activities

Joint with Space Operations Committee:

- Constellation Land vs. Water Recovery Decision
- Lunar Mission Architecture
- Constellation Plans for Operations Beyond Moon

# Exploration and *ad hoc* Biomedical Committees Agenda (2 of 2)

## July 15, 2009 – FACA

- ESMD Analog Utilization
- NSBRI Goals and Performance
- Status of Decadal Study of Life and Physical Sciences
- Anthropometric Requirements and Implementation

# *ad hoc* Biomedical Committee

- The Committee received briefings on various elements of NASA's biomedical research efforts, including
  - National Space Biomedical Research Institute
  - Space Studies Board Decadal Survey of Microgravity Sciences
  - Anthropometric Requirements and Implementation
- These briefings demonstrated the progress NASA is making in various biomedical aspects of exploration planning, and their relevance to Earth-oriented applications

# Analog Utilization

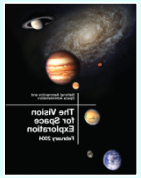
- The Committee also was briefed on NASA's use of various Earth analogs for lunar activities.
- To date, the use of these analog environments appear to have focused on the development of exploration technologies.
- These efforts are appropriate, necessary, and well-planned.
- Eventually, however, efforts in analog environments should be extended to deal with human factor elements such as diet, waste management, crew isolation, communications, and similar factors.

# ESMD Analog Mission and Field Tests Overview Briefing to the NASA Advisory Council – Exploration Committee

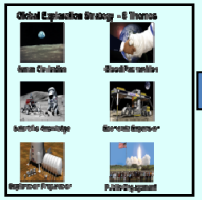
July 15, 2009

# Analog and Field Test Results Documented and Feed Back Into Architecture Refinement Process

## Agency Goals



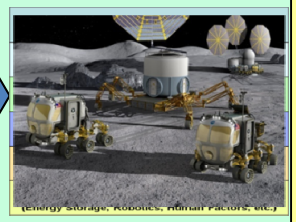
U.S. Space Policy



Exploration and Science Themes and Objectives

## Strategic Analysis and Architecture Requirements and Concept Development

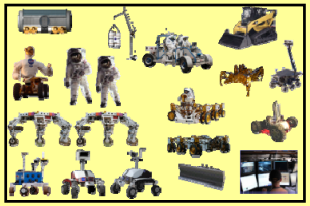
Exploration Architecture and Science Systems and Operations Concept Development



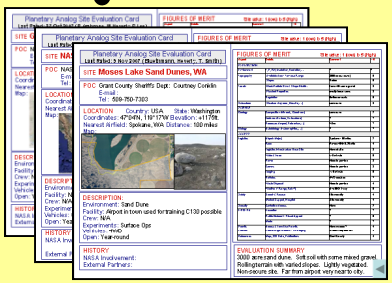
Integrated Architecture Concept Validation

## Concept Validation Test Plan Development

Concept Validation Test Plan



Agents



Site Locations

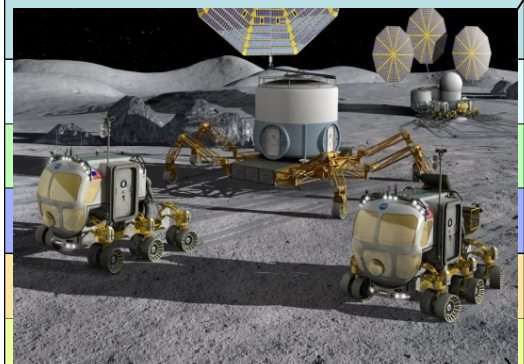
## Concept Testing and Validation

Systems and Operations Concept Field Tests

Test Results

# Integrated Lunar Architecture Requirements Validation

**Partner Infusion**
International, Commercial, Other Government Agencies



**Analog Field Tests Used to Validate Driving Integrated Architecture Requirements and Concepts**

**Architecture Element Concept**
(Rover, Habitat, Robotic Assistants, Power,

**Lunar Science Concepts**
(Site Survey's, Geological Sampling/Curation, etc.)

**Surface Operations Concepts**
(Outpost Maintenance, Exploration, etc.)

**Crew Training**
(Outpost Maintenance, Science, Exploration, etc.)

**Participatory Exploration**
(Web 2.0, Virtual Reality, Simulations, etc.)

**Technology Development**
(Energy Storage, Robotics, Human Factors, etc.)

# Overview

- **National Space Biomedical Research Institute (NSBRI) selected in 1997 through an open competition**
- **Institute partnership with NASA managed through Cooperative Agreement NCC 9-58 with Johnson Space Center**
- **Cooperative Agreement spans 20 years, with support in 5 year increments based on performance**
- **NSBRI is a non-profit organization competitively engaging 60 U.S. universities, companies and government labs in 24 states**

http://www.nsbri.org

# Mission

- **To lead a national effort for accomplishing the integrated biomedical research necessary to support long-term human presence and exploration of space**

- **To enhance life on Earth by applying the resultant advances in human knowledge and technology**

# Value

- **Intellectual and institutional resources, leveraging the nation's investment in biomedical research and development, are brought to bear on solving problems for NASA**
  - **High caliber and productivity of investigators**
  - **Strength of the consortium and non-consortium institutions**

Consortium Members

Baylor College of Medicine
Brookhaven National Laboratory
Harvard Medical School
The Johns Hopkins University
Massachusetts Institute of Technology
Morehouse School of Medicine
Mount Sinai School of Medicine
Rice University
Texas A&M University
University of Arkansas for Medical Sciences
University of Pennsylvania Health System
University of Washington

# Goal 1 – Lead a national biomedical research effort to support human space exploration

## *Sub-goal 1A – Sustain a national science and technology program aligned with NASA priorities*

- **Effective implementation of NSBRI expert groups**
  - **Board of Scientific Counselors**
  - **External Advisory Council**
  - **User Panel**
- **53 projects in current portfolio**
  - **Program projects (2)**
  - **Research grants (42)**
  - **Small grants (2)**
  - **Fellowships (7)**
  - **180 investigators**
  - **60 institutions**
  - **24 states**

Leroy Chiao, Ph.D.
*ISS Expedition 10 Commander*
*Chair, NSBRI User Panel*

# SUMMARY

**No observations or recommendations at this point**

**Awaiting the outcome of the U.S. Human Spaceflight  Plans Committee**