



Jeff Volosin

NASA Exploration Systems Mission Directorate

Jeff Volosin is an aerospace engineer with over 20 years of experience in the design, development, and operations of both robotic and crewed spacecraft. Mr. Volosin is currently leading the NASA effort to develop and integrate a global exploration strategy which reflects the lunar exploration interests of international space agencies, academia and commercial stakeholders. Prior to joining NASA as a member of the Exploration Systems Mission Directorate in 2004, Jeff was an aerospace contractor, serving in a number of leadership positions including: Operations Manager for the NASA Communications Network and Flight Operations Manager for the Advanced Composition Explorer, Tropical Rainfall Measuring Mission, and the NOAA Polar and Geostationary satellite constellations. Earlier in his career, Jeff spent 4 years as a system engineer supporting the Space Exploration Initiative studies on human voyages to the Moon and Mars and also supported the Space Station program as an advanced life support engineer.





**Dawn of a New Space Age:
Developing a Global Exploration Strategy**

Jeff Volosin
Strategy Development Lead
NASA Exploration Systems Mission Directorate
August 16, 2006

A Bold Vision for Space Exploration, Authorized by Congress

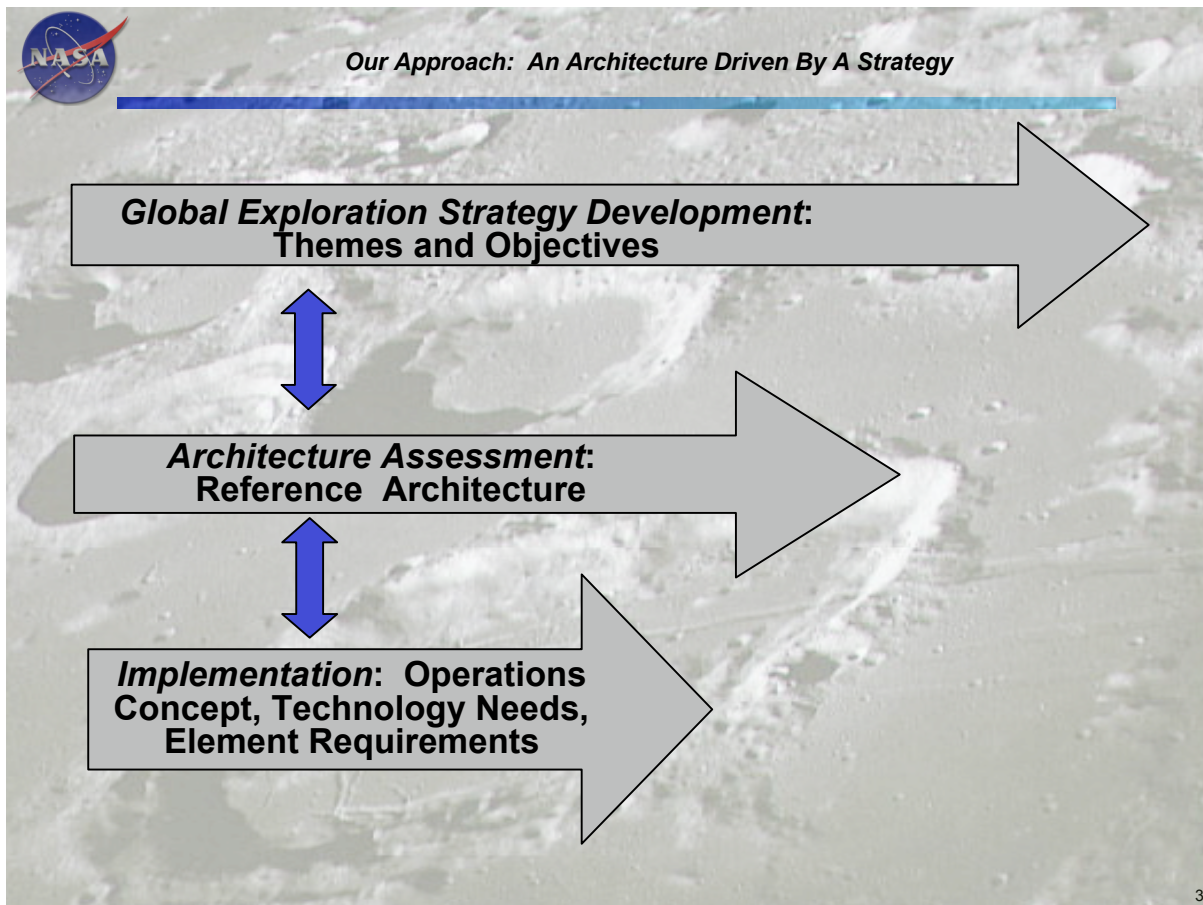
- ◆ Complete the International Space Station
- ◆ Safely fly the Space Shuttle until 2010
- ◆ Develop and fly the Crew Exploration Vehicle no later than 2014 (goal of 2012)
- ◆ Return to the Moon no later than 2020
- ◆ Extend human presence across the solar system and beyond
- ◆ Implement a sustained and affordable human and robotic program
- ◆ Develop supporting innovative technologies, knowledge, and infrastructures
- ◆ Promote international and commercial participation in exploration

NASA Authorization Act of 2005

"It is time for America to take the next steps.

The Administrator shall establish a program to develop a sustained human presence on the Moon, including a robust precursor program to promote exploration, science, commerce and U.S. preeminence in space, and as a stepping stone to future exploration of Mars and other destinations.

*President George W. Bush –
January 14, 2004*



What is a 'Global Exploration Strategy'?

- ◆ **The compelling answer to the following questions:**
 - “Why” we are going back to the moon and
 - “What” we hope to accomplish when we get there
- ◆ **Not a definition of ‘how’ we will explore (operations & architecture)**
- ◆ **Global - refers to the inclusion of all stakeholders in the strategy development process - to ensure that as NASA moves forward in planning for future exploration missions - we understand the interests of:**
 - International Space Agencies
 - Academia
 - Commercial Investors
- ◆ **Includes the moon, Mars, and beyond as potential destination for exploration:**
 - Initially focused on human and robotic exploration of the moon
 - An evolving plan that will expand to include Mars and other destinations

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What is a 'Global Exploration Strategy'?

- ◆ A blueprint of exploration objectives that will serve as a starting point for:
 - **Collaboration:** discussions between participants regarding areas of potential collaboration
 - **Coordination:** coordination among participants to maximize what can be accomplished
 - **Mission Design:** detailed technical analyses that address,
 - **Time Phasing** of activities and identification of dependencies between objectives
 - **Prioritization** based on inputs from various stakeholders
 - **Operational and Architecture Impacts** of implementation of the strategy

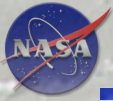
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Components of Exploration Strategy

- ◆ **Themes:** Address the question: **Why should we return to the moon?**
- ◆ **Objectives:** Address the question: **What are we going to do when we get there?**

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Components of Exploration Strategy

◆ Themes

- Provide the high level rationale for exploring the Moon
- Provide a framework for capturing the many objectives across multiple disciplines
- Divided into two types – **core** and **crosscutting**
 - **Core** themes address the primary reasons for conducting activities on the Moon
 - **Crosscutting** themes address ways to maximize the benefit of the core themes

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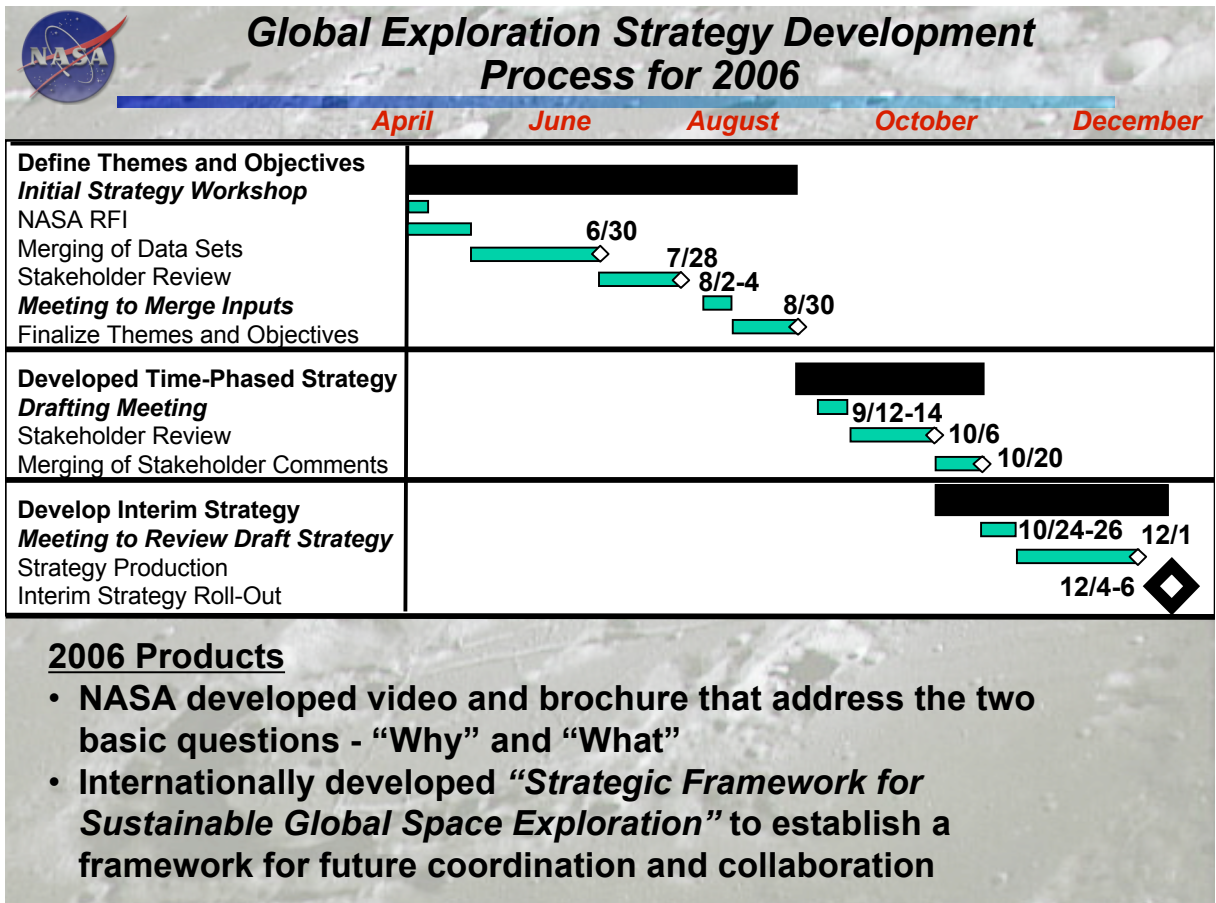


Components of Exploration Strategy

◆ Objectives

- Describe the discrete set of activities that the global community has defined as important in supporting the exploration themes
- For example, the theme of using lunar exploration to prepare for future human missions to more distant destinations can be described by a set of associated objectives, such as scientific measurements, mission simulations, and technology and operations validation.
- Serve as a means for breaking down the theme areas into achievable parcels of work that can be time-phased and prioritized – while still being at a strategic level

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Current Draft: Overarching Themes

The following three Core Themes address the primary activities to be conducted on the Moon:

- ◆ Use the Moon to prepare for future human and robotic missions to Mars and other destinations
- ◆ Pursue scientific activities to address fundamental questions about the solar system, the universe, and our place in them
- ◆ Extend sustained human presence to the Moon to enable eventual settlement

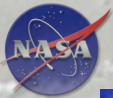


Current Draft: Overarching Themes

The following three Crosscutting Themes address ways to maximize the benefit of the core themes:

- ◆ Expand Earth's economic sphere to encompass the Moon and pursue lunar activities with direct benefits to life on Earth
- ◆ Strengthen existing and create new global partnerships
- ◆ Engage, inspire, and educate the public

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Current Draft Exploration Strategy Objectives

Objectives collected from the workshop and RFI were grouped into 23 categories:

- | | |
|---------------------------------------|---|
| 1. Astronomy & Astrophysics | 13. Surface Mobility |
| 2. Earth Observation | 14. Transportation |
| 3. Geology | 15. Operational
Environmental Monitoring |
| 4. Materials Science | 16. General Infrastructure |
| 5. Human Health | 17. Operations Test &
Verification |
| 6. Environmental
Characterization | 18. Lunar Resource
Utilization |
| 7. Operational Support | 19. Historic Preservation |
| 8. Life Support & Habitat | 20. Development of Lunar
Commerce |
| 9. Environmental Hazard
Mitigation | 21. Global Partnership |
| 10. Power | 22. Public Engagement |
| 11. Communication | 23. Program Execution |
| 12. Guidance, Navigation &
Control | |

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Current Draft Exploration Strategy Objectives (Example)

Geology

- ◆ **Objective: Determine the diversity of crustal rocks to better understand planetary differentiation processes**
 - **Value: The Moon presents the best opportunity to geochemically characterize early fundamental processes of a planetary body of substantial size. Much of the first billion years of planetary geochemical evolution is not available on Earth. In this regard the Moon and Earth represent end-member bodies in that the Moon reveals early geochemical processes, whereas the Earth is a continually active planet. Mars probably represents an intermediate case**

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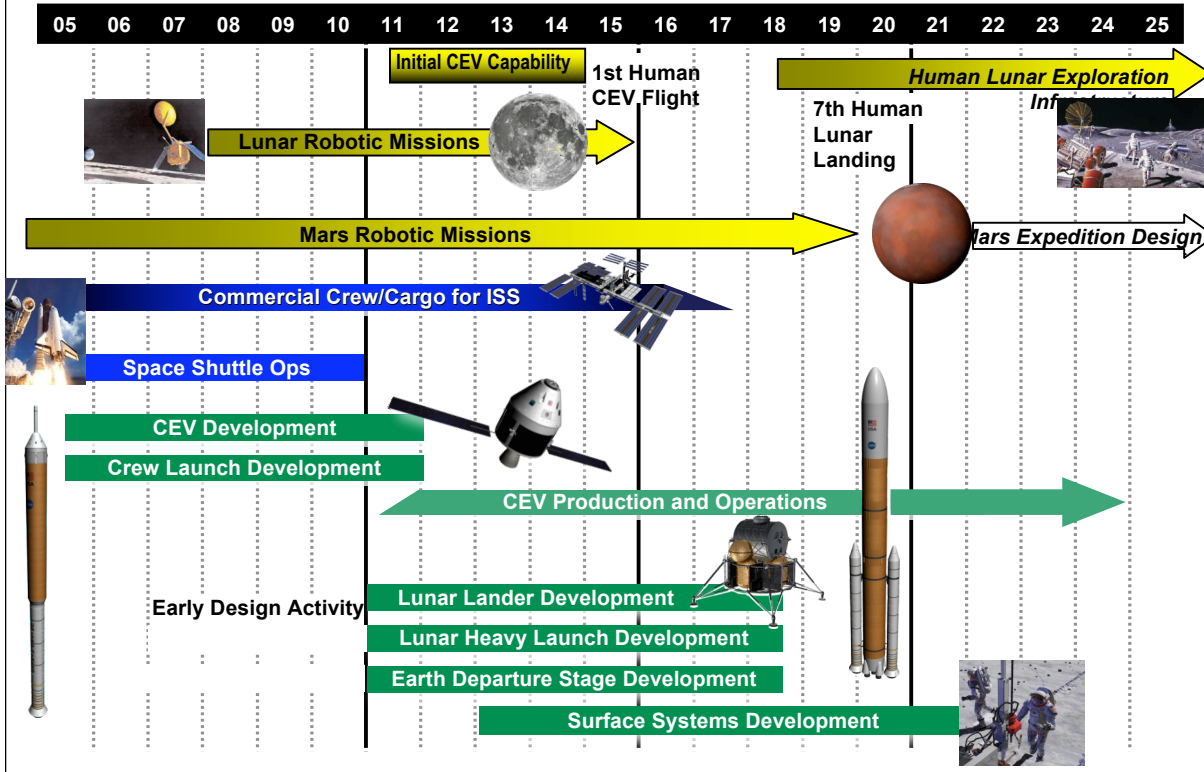


Using Strategy to Drive Architecture Design: NASA's Lunar Architecture Study

- ◆ **Study Objectives**
 - **Define a series of lunar missions constituting NASA's lunar campaign to fulfill the Lunar Exploration elements of the Vision for Space Exploration**
 - Multiple human and robotic missions
 - **Develop process for future Architecture updates**
 - **Drive architecture studies from exploration strategy objectives**
- ◆ **Two Phase Process**
 - **Phase I (Initial Internal NASA Studies)**
 - **Understand architecture and operational impacts associated with the implementation of the key objectives that NASA is interested in achieving based on the Vision**
 - **Phase II (Maturation and Discussion With International Space Agencies)**
 - **Provide sufficient definition and supporting rationale for near term missions to enable commitment to these missions**
 - **Define areas of potential coordination and collaboration**

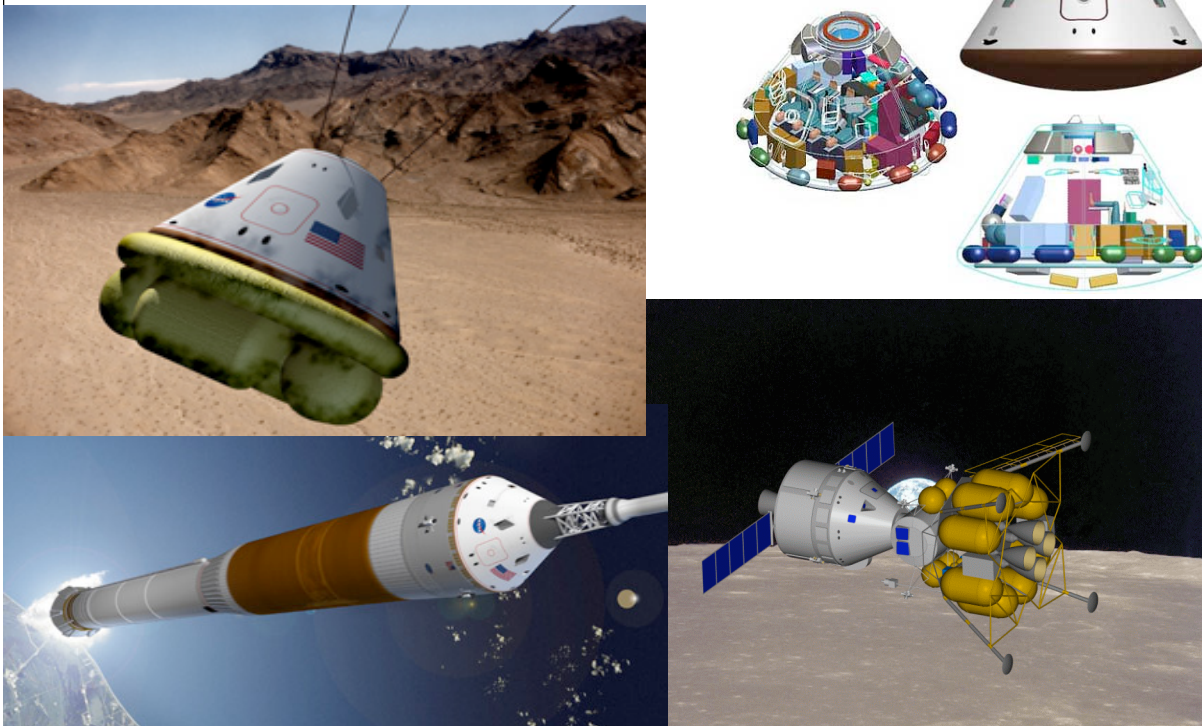
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Using an Overarching Architecture to Drive Element/Operations Requirements

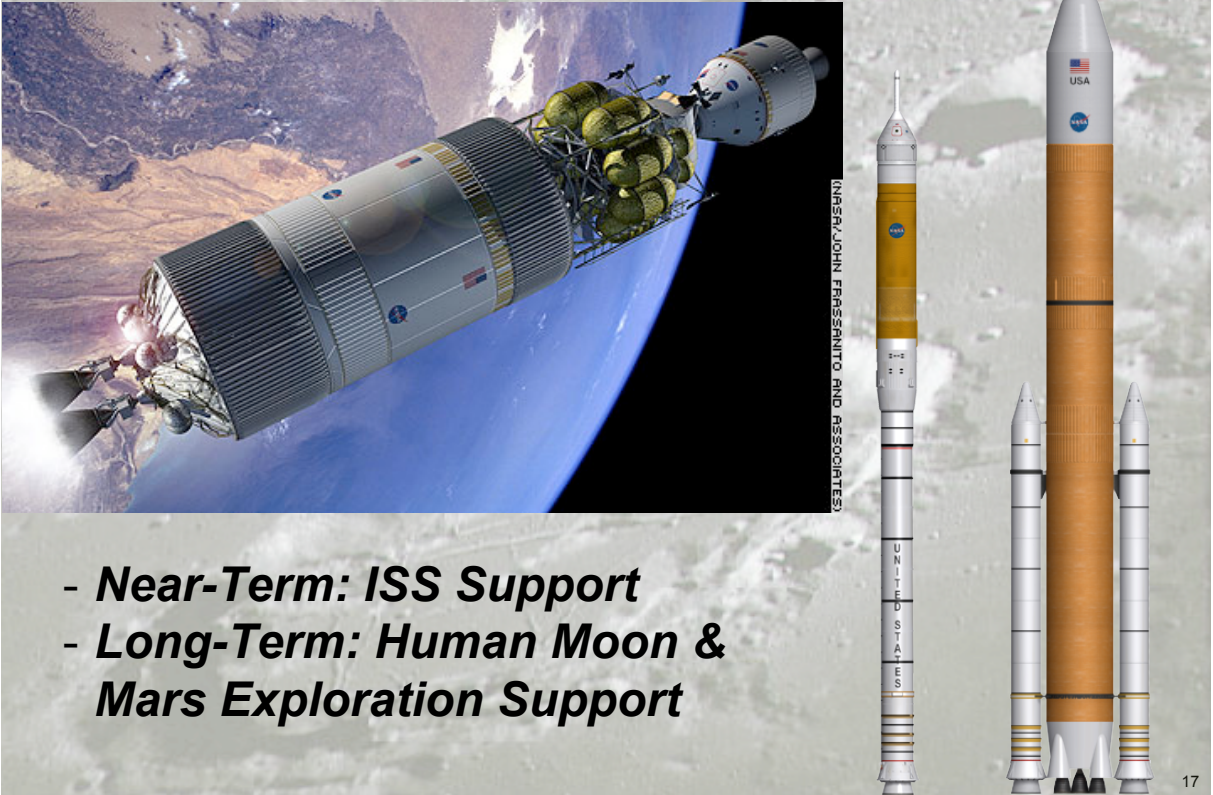


Looking Beyond the Shuttle - Focus on Ensuring Crew Safety During Transition In/Out of Earth's Atmosphere

Crew Exploration Vehicle (CEV)




 **Designing Launch Vehicles for the Long-Haul**

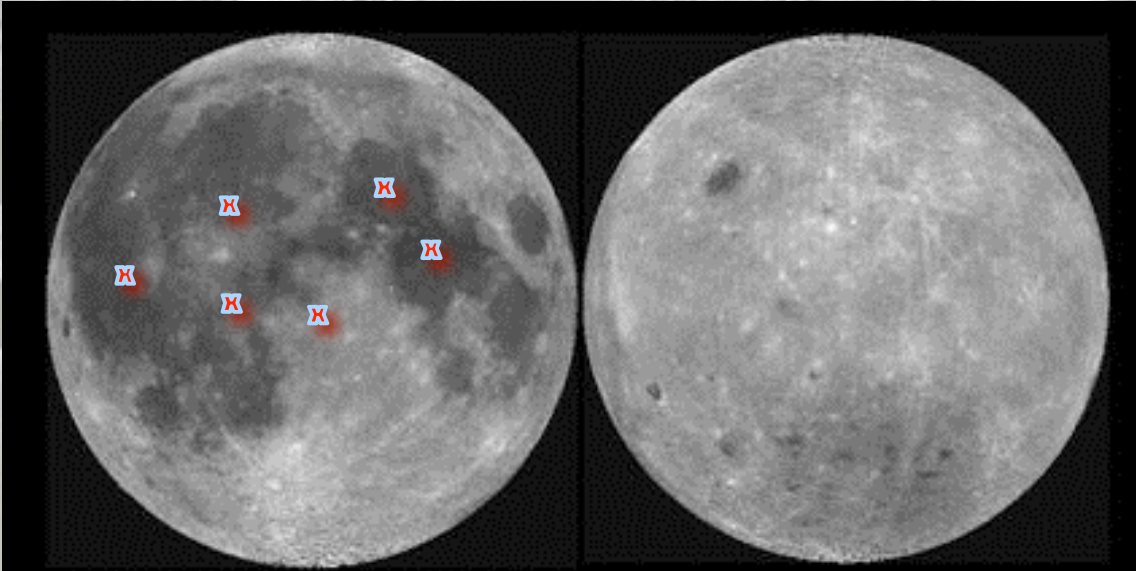


(NASA/JOHN FRASINATO AND ASSOCIATES)

- **Near-Term: ISS Support**
- **Long-Term: Human Moon & Mars Exploration Support**

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 **Where Will We Go When We Return?
Many Exciting Places Remain to Visit**

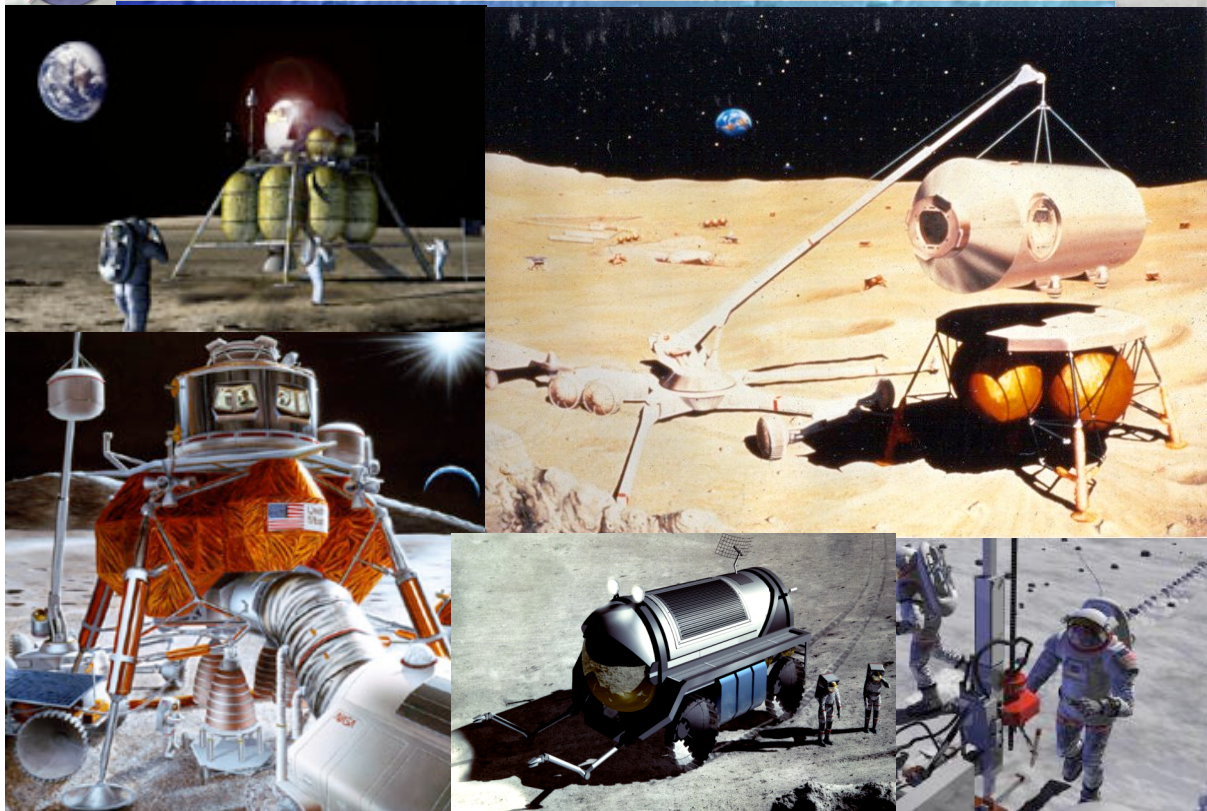


Near Side Far Side

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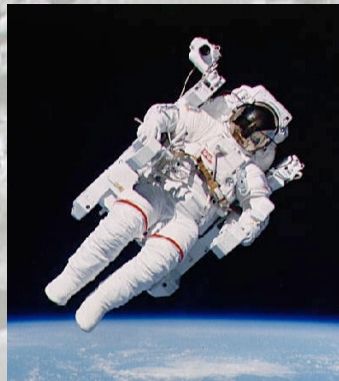
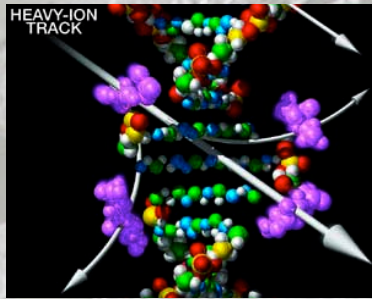
Studying What We Will Do On The Surface - Understanding The Design Requirements For Surface Landers and Equipment



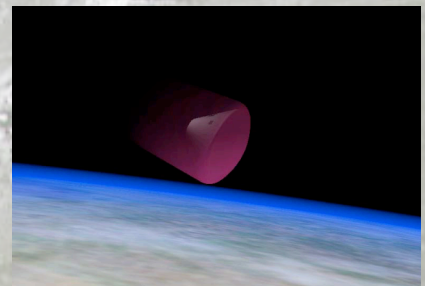
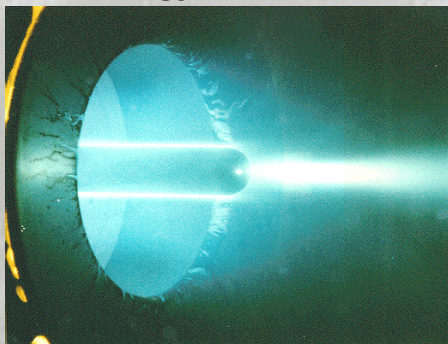


Building the Future Will Involve More Than Just Exploring The Lunar Surface

Human Research



Technology Development



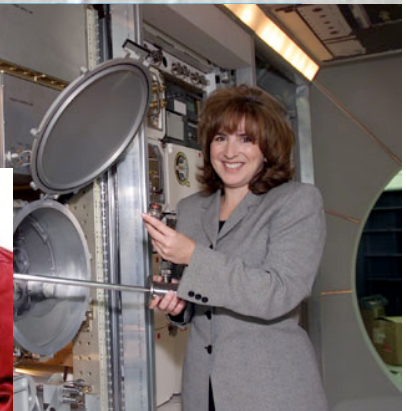
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Why Do We Explore Space?

To Benefit Mankind Through

- ◆ Discovery
- ◆ Invention
- ◆ Expansion of Our Horizons
- ◆ Inspiration



*Well - What Might the Distance Future Look Like?
There Are Many Different Possibilities*

