NASA Exploration Systems Mission Directorate

Mars Society Conference

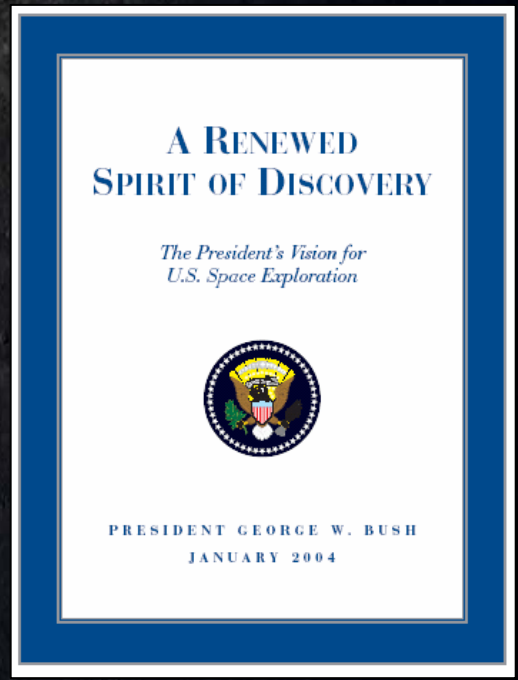
Scott “Doc” Horowitz

August 4, 2006

A Bold Vision for Space Exploration

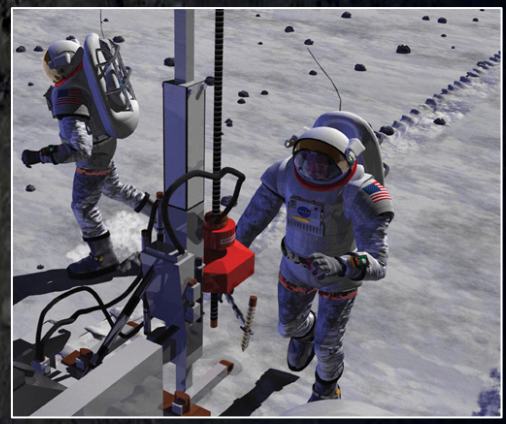
The Fundamental Goal of This Vision is to Advance U.S. Scientific, Security, and Economic Interest Through a Robust Space Exploration Program

- Implement a sustained and affordable human and robotic program to explore the solar system and beyond
- Extend human presence across the solar system, starting with a human return to the Moon by the year 2020, in preparation for human exploration of Mars and other destinations;
- Develop the innovative technologies, knowledge, and infrastructures both to explore and to support decisions about the destinations for human exploration; and
- Promote international and commercial participation in exploration to further U.S. scientific, security, and economic interests.



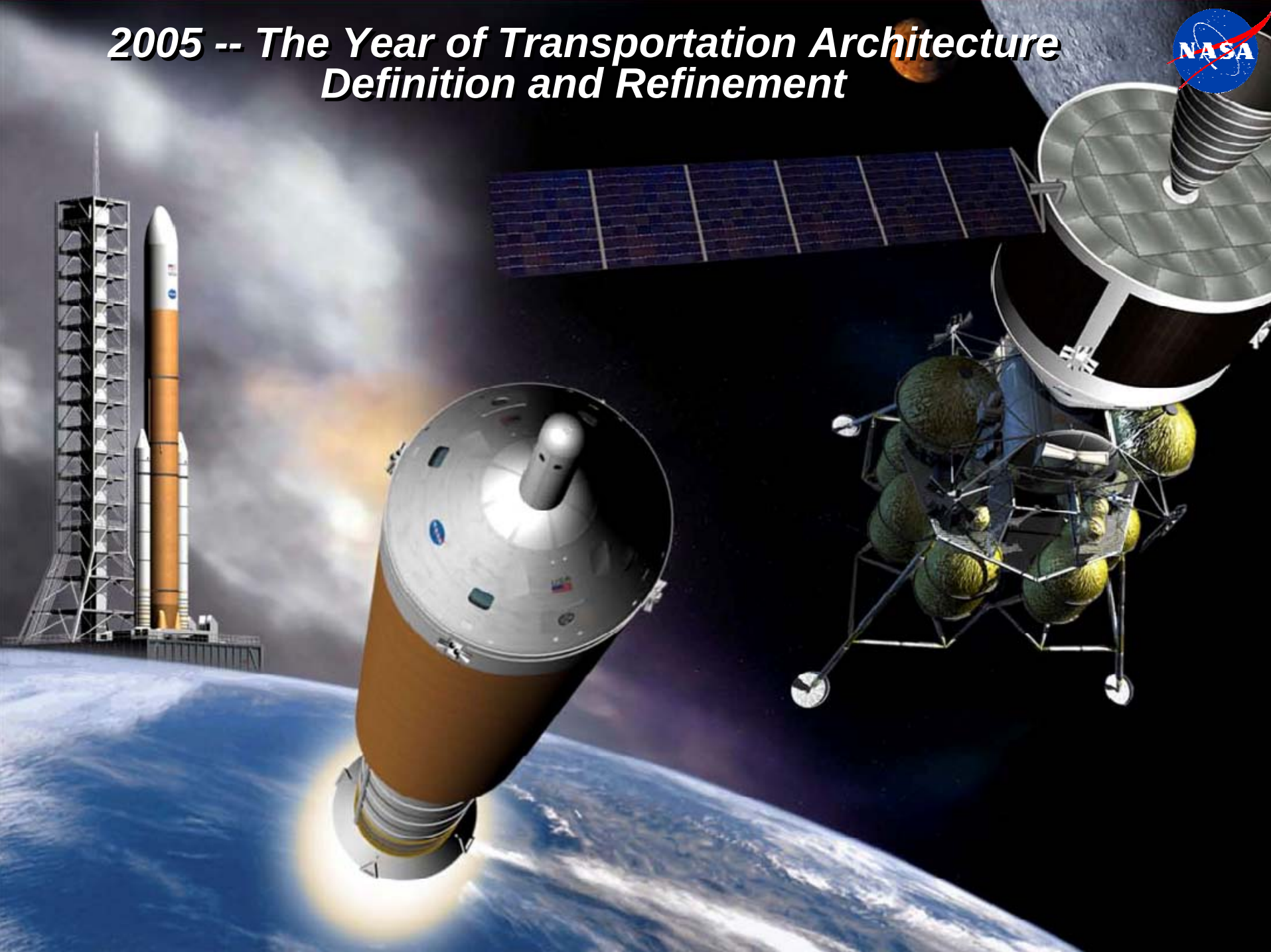
The Moon - the 1st Step to Mars and Beyond….

- **Extending operational experience in a hostile planetary environment**
- **Developing capabilities needed for opening the space frontier**
- **Preparing for human exploration of Mars**
- **Science operations and discovery**
- **Enabling international, commercial and scientific goals for the development and use of the moon**



Next Step in Fulfilling Our Destiny As Explorers

2005 -- The Year of Transportation Architecture Definition and Refinement



Crew Exploration Vehicle (CEV)

- **Command Module**
- **Service Module**
- **Launch Abort System**
- **Ongoing Analysis**

Human Missions to Mars – consideration in the CEV architecture

Launch Vehicles

- **Crew Launch Vehicle (CLV) – ARES I**
- **Cargo Launch Vehicle (CaLV) – ARES V**
- **Earth Departure Stage**

Human Mission to Mars – consideration as part of the decision to use HLLV

2006 -- What We Do When We Get There

What is a 'Global Exploration Strategy'?

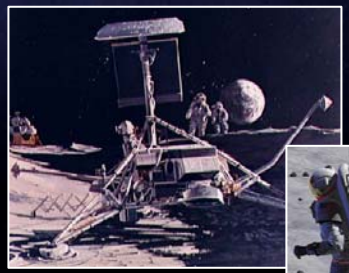
- **Kicked off in April 06 with a workshop**
- **A strategy for exploration with an initial focus on the Moon, that encompasses the interests of many participants including International space agencies, academia, and commercial investors**
- **Not a definition of 'how' we will explore - but "what" and "why".**
- **A blueprint of exploration objectives.**
- **A plan that identifies the time-phasing of the accomplishment of enabling and interdependent objectives**

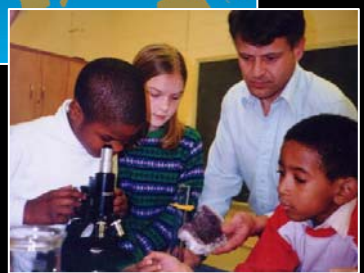
Breadth of Review

Participants conducting a review of the global exploration strategy include:

- **International Space Agencies (14)**
- **Lunar Exploration Analysis Group (LEAG) Special Action Team led by Jeff Taylor and Steve Mackwell**
- **Lunar Commerce Roundtable**
- **NASA Field Centers**
- **ESMD Lunar Architecture Team**
- **Space Enterprise Council**
- **Mars Exploration Planning and Analysis Group (MEPAG)**
- **Other**

Exploration Strategy Themes





Core Themes **:**

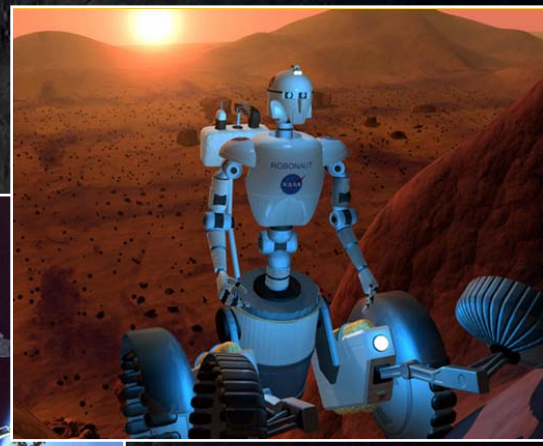
- **Use the Moon to prepare for future human and robotic missions to Mars and other destinations**
- **Pursue scientific activities to address fundamental questions about the solar system, the universe, and our place in them**
- **Extend sustained human presence to the moon to enable eventual settlement**

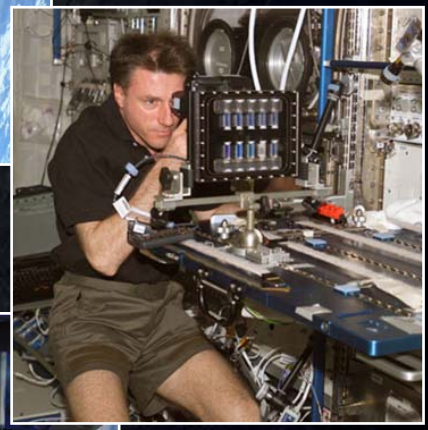
Crosscutting Themes **:**

- **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**

Getting Ready for Mars

- **The lunar program will help prepare for human missions to Mars**
  - **Life Support**
  - **Human Health Hazards**
  - **Infrastructure**
  - **Space/Surface Operations**





Getting Ready for Mars

- Closed Loop Life Support Systems will be required to reduce the mass of consumables needed for a Mars mission.
- Currently on ISS, only condensate is recycled, with urine being discarded.
- Future systems on ISS will recover water from urine, closing the ECLS loop more completely, demonstrating this vital capability

Getting Ready for Mars: Human Research Program

- **Reduce spaceflight risks to humans, focused on the highest risks to crew health and performance during exploration missions**
- **Enable development of human spaceflight medical and human factors standards**
- **Development and validation of technologies that serve to reduce medical risks associated with human spaceflight.**

Getting Ready for Mars

NASA is developing and testing new surface EVA suit technologies and investigating how robotic systems can interact with humans to increase EVA productivity

Desert Rats testing

Getting Ready for Mars

- **Energy is key to the exploration of the Moon and Mars**
- **While some goals can be accomplished on the Moon using solar power, Mars would require the high-power and reliability of nuclear fission to support human exploration**
- **In the near-term, NASA is focusing on retiring technical risks related to development of fission surface power systems, and program reformulation including development of program strategies and draft technology plans**
- **In the longer-term, nuclear powered propulsion system development to support the human exploration of Mars will become more of a priority**

Summary

- **The Vision for Space Exploration provides clear objectives for NASA:**
  - Complete ISS
  - Retire Shuttle by 2010
  - Fly new vehicle by 2014
  - Return to the Moon by 2020
  - Prepare for Mars and Beyond
- **The Earth to LEO part of the transportation architecture is complete**
  - Ares I, Ares V, CEV
  - 1st Advanced Development Flight Test of the Ares 1 in 33 months
- **The first draft of the Global Strategy and Lunar architecture will be completed this December**