

NASA
Risk Management Conference
2005

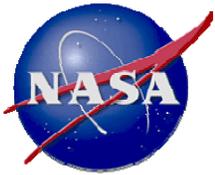


William H. Gerstenmaier
Associate Administrator
Space Operations Mission Directorate



Agenda

- Vision for Space Exploration
- Relevance of current human space flight programs as initial steps
- Risk management approaches



Vision for Space Exploration

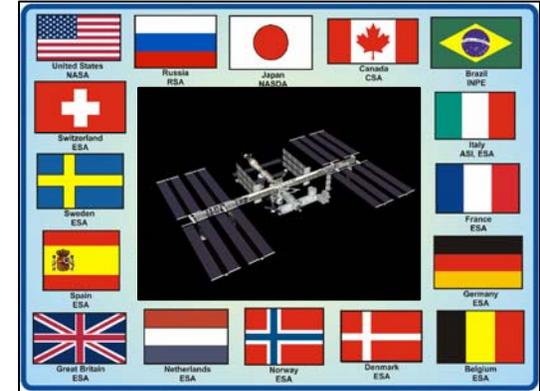
- Space Shuttle
 - Return the Space Shuttle to flight as soon as practical
 - Focus use of the Space Shuttle to complete assembly of the International Space Station
 - Retire the Space Shuttle as soon as assembly of the ISS is completed
- International Space Station
 - Complete assembly of the ISS, including the U.S. components that support U.S. space exploration goals and those provided by foreign partners
 - Focus U.S. research and use of the ISS on supporting space exploration goals with emphasis on understanding how the space environment affects astronaut health and capabilities and developing countermeasures
 - Conduct ISS activities in a manner consistent with U.S. commitments contained in agreements between the U.S. and other partners in the ISS





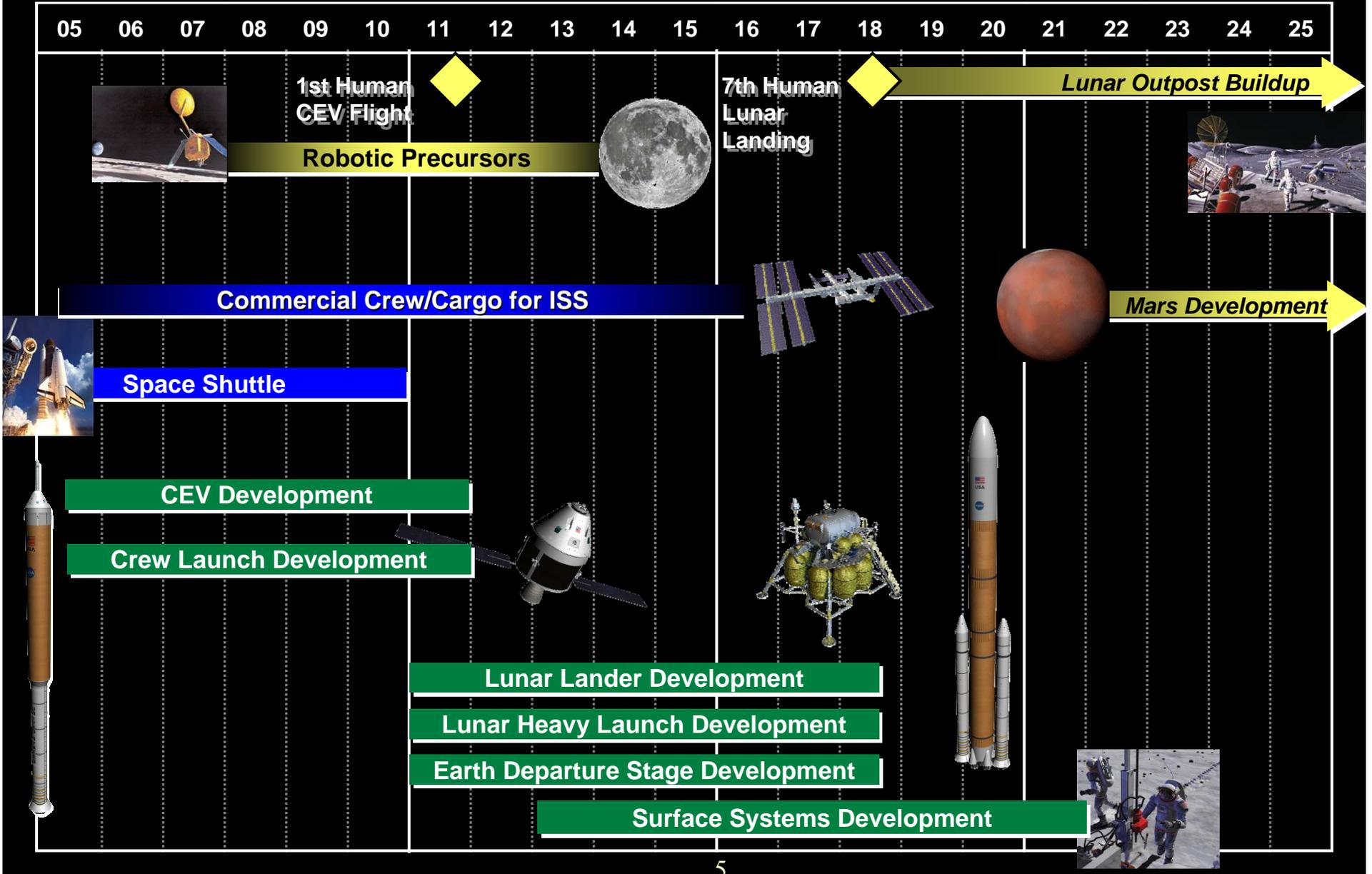
Exploration Challenges

- Multi-Dimensional
 - International partnerships
 - Continuous space operations
 - Current and future capabilities
 - Management and technical excellence
 - People, organization, budget, facilities
- Multi-Decade
 - Major changes and complex transitions
 - Strategic flexibility to accommodate “unknown unknowns”
 - Strategizing will not be a one time or infrequent event
 - Ongoing proof of investment value





Exploration Roadmap





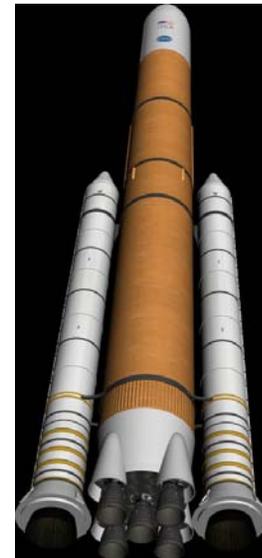
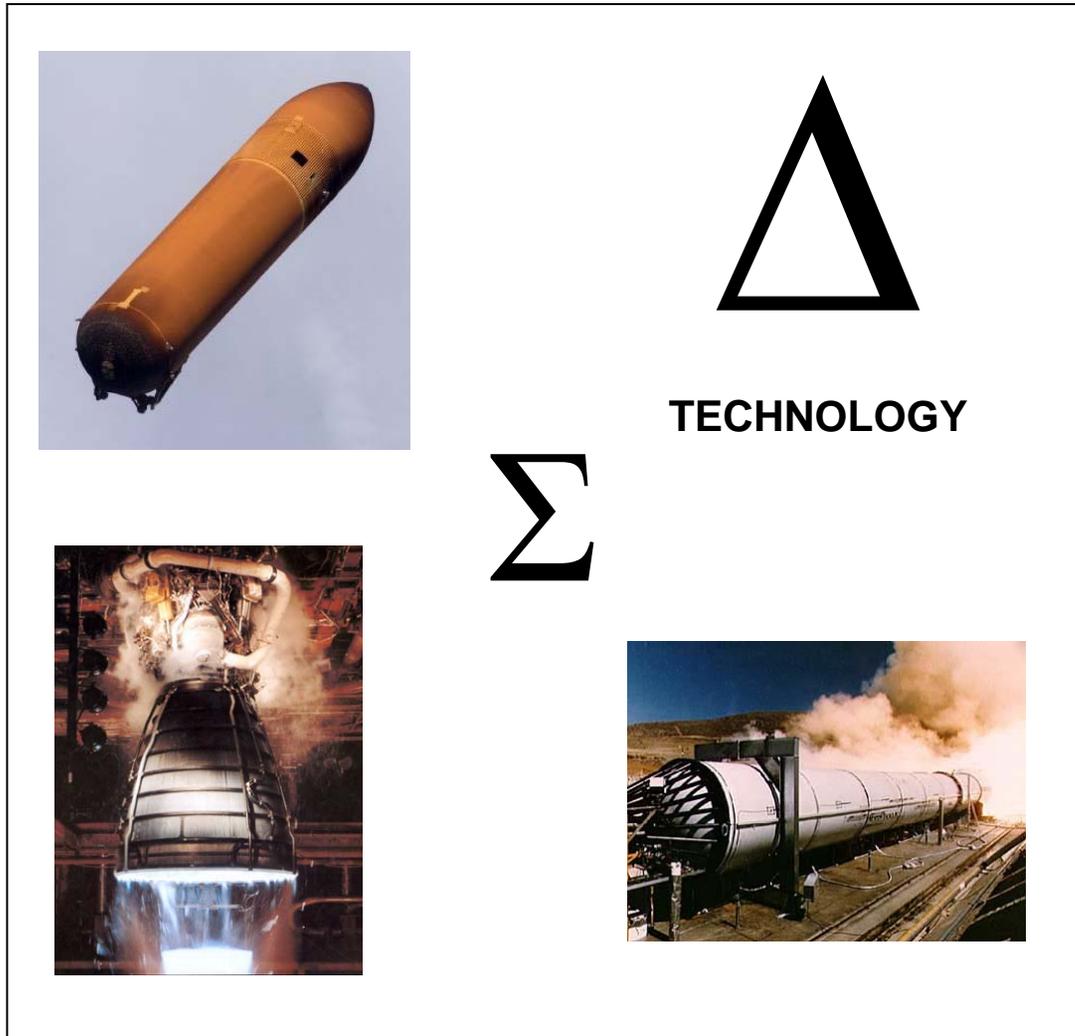
Extending Space Shuttle Into the Future

- Space Transportation Capabilities Supporting Exploration
 - Separate crew from cargo transportation to the ISS
 - Acquire crew transportation to and from the ISS after Shuttle retirement
- International and Commercial Participation
 - Pursue opportunities for international participation to support U.S. space exploration goals
 - Pursue commercial opportunities for providing transportation and other services supporting ISS and exploration missions beyond Earth orbit ⁶





Crew and Heavy Cargo Launch Vehicle Heritage





Leveraging ISS as a Test Bed

Exploration



Extravehicular Activity (EVA) & Crew Systems

Advanced Life Support Systems

Advanced Habitation Systems

Materials & Environmental Effects

Automation and Robotics

Energy Storage

Biological Research and Countermeasures

Crew Transportation and Re-supply

Communication Systems and Networks

Advanced Power Generation

Advanced Propulsion



Design And Ops Risk Trades

- Consider Design and Operations Factors
 - Mass, Volume, Power, Stowage
 - Cost
 - Complexity vs simplicity
 - Reliability and maintainability
 - Redundancy vs maintenance
 - Level of repair/replacement
 - Manual and automated controls
 - Logistics delivery and return
 - Crew training for skills vs details
- ISS Example:
 - Russian – simple, robust, mechanical, frequent crew interaction for maintenance and operation, regular change out of disposable components
 - U.S. – high degree of automation, ground control/servicing, requires computer to operate, change out “system” instead of components



Basic Approach to Risk

- Environment and vehicles demand risk management
- Treat human rated vehicles as developmental and not operational
- Effective risk management is behavior/attitude based
 - Priority for all workforce and leadership levels
 - Clear, implementable requirements
 - Clear responsibility/ownership
 - Identification/tracking tools must be widely accepted, practical and used routinely
 - Continuous and evolutionary
 - Open communication and information access
 - Provide multiple checks and balances



Risk Management Methodology



A program “risk” is any circumstance that poses a threat to crew or vehicle safety, costs, schedule or major objectives.

A good risk system allows structured visibility, management and resolution of risk.





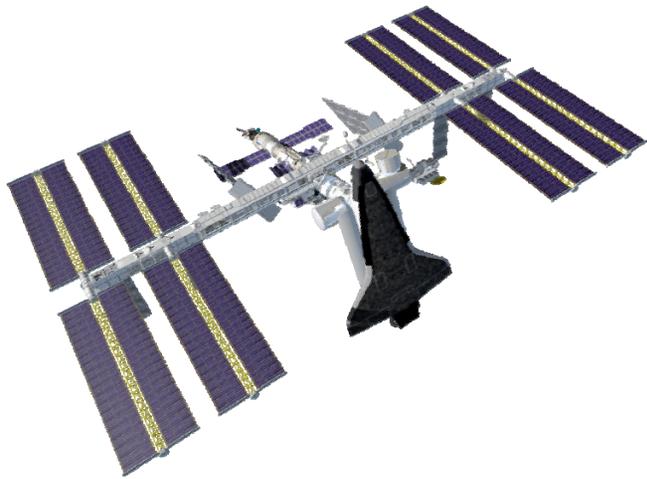
Build on Heritage

- Start early in program development
- Leverage past successes and lessons learned
 - Shuttle and ISS are key first steps in exploration
 - Hardware
 - Workforce
 - Expertise
 - Processes
- Embed risk management philosophy in exploration development
- Learn from existing capabilities/programs to test and validate potential exploration systems



Leveraging Existing Risk Mitigation Processes

- Shuttle and Station are actively demonstrating risk mitigation tools for exploration



- Probabilistic Risk Analysis
- Quantitative Risk Analysis
- Failure Mode and Effects Analyses/Critical Items List
- Hazard Reports
- ISS Risk Management Application
- Program Risk Advisory Board
- Design Reviews
- Mission Readiness Reviews
- One NASA Management Information System



The Next Exploration Steps

- Space Operations and Exploration Systems are allied to ensure effective implementation
- Space Shuttle is an excellent beginning for future derived launch vehicles
- ISS is an ideal platform for risk mitigation as a test bed in the space environment for new technology and operations
- Extending and evolving communications infrastructure is critical for meeting the requirements of future missions



Summary

- Risk management is mandatory, because the spacecraft and environment are not tolerant of mistakes or failures
- Risk management tools and processes, in various forms for Shuttle and Station, will evolve for exploration use
- Risk management is an ongoing process embedded and valued by all organizational levels