NASA Status

INTERNATIONAL MULTIDISCIPLINARY ARTIFICIAL GRAVITY (IMAG) PROJECT

Senior Management Steering Committee Meeting
March 7, 2007

Kathy Laurini
Program Manager,
Human Research Program
281-244-8516

Contents

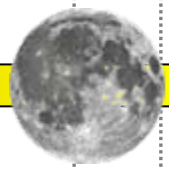
- NASA Exploration Planning Status
  - NASA Exploration Roadmap
  - Status of Planning for the Moon
  - Mars Planning
- Reference health maintenance scenario
- The Human Research Program

NASA's Exploration Roadmap

05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Initial Orion Capability

Lunar Robotic Missions

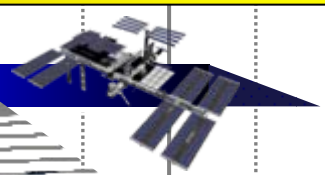


Lunar Outpost Buildup

7th Human Lunar Landing

Science Robotic Missions

Commercial Crew/Cargo for ISS

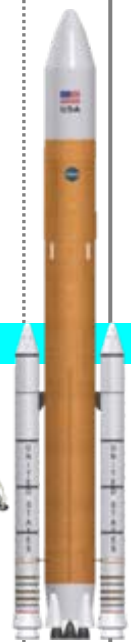


Space Shuttle Ops

Orion Development

Ares I Development

Orion Production and Operations



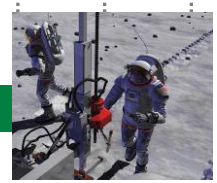
Early Design Activity

Lunar Lander Development

Ares V Development

Earth Departure Stage Development

Surface Systems Development

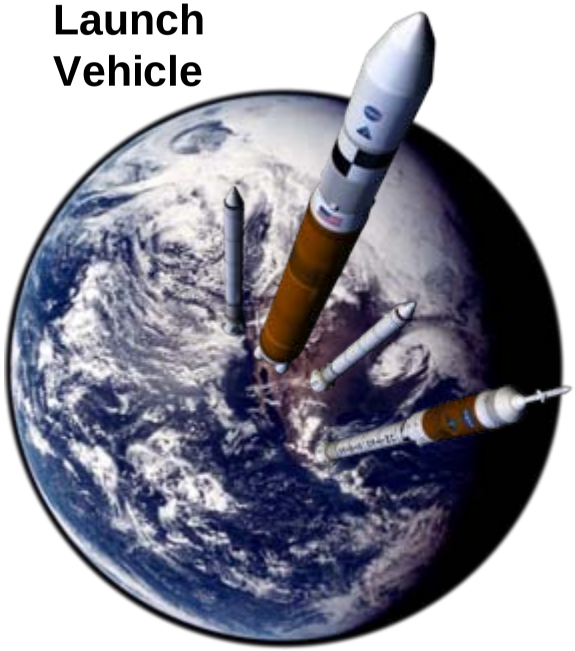


Components of Program Constellation

Earth Departure Stage

Orion - Crew Exploration Vehicle

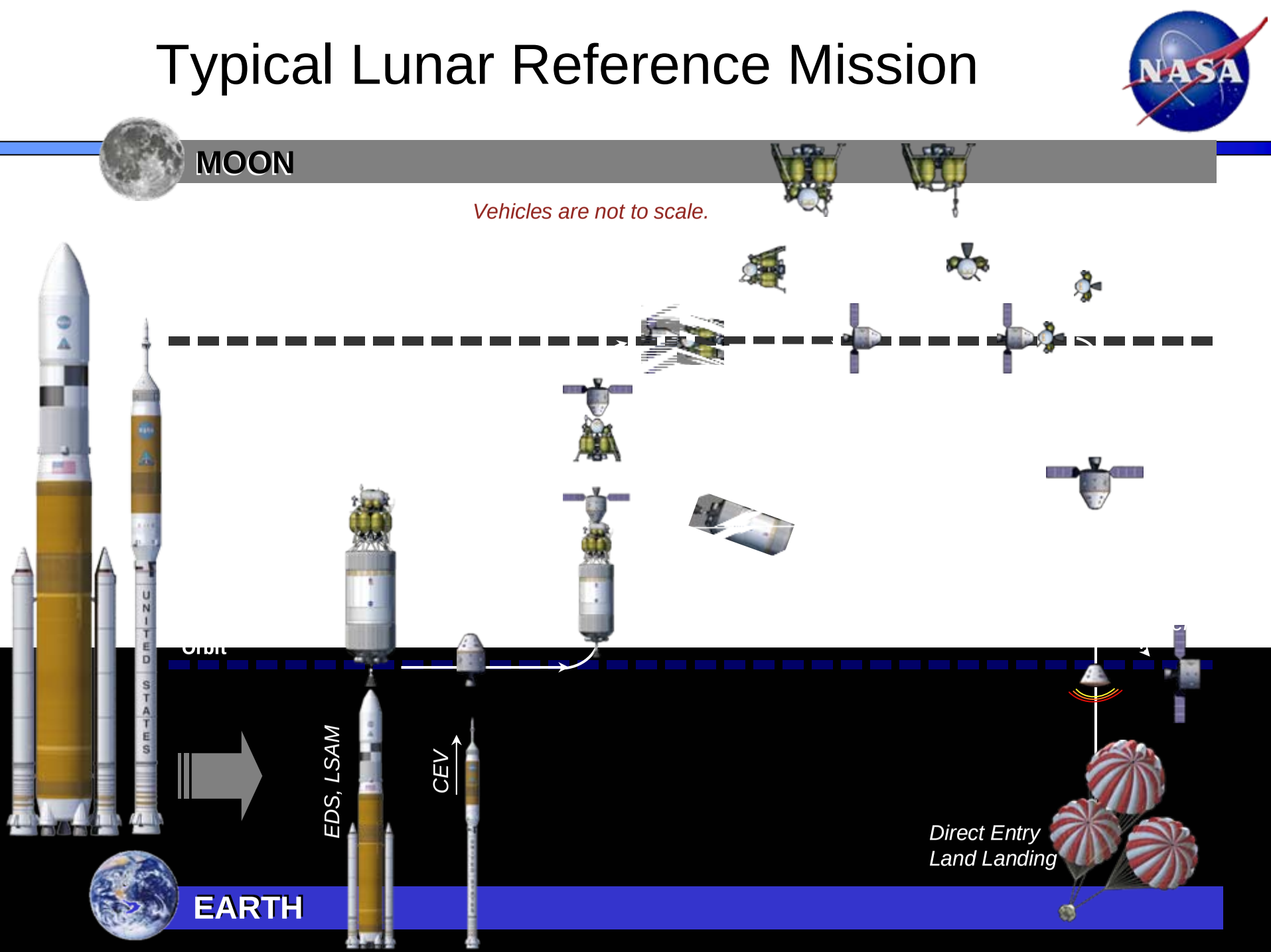
Heavy Lift Launch Vehicle



Crew Launch Vehicle

Lunar Lander

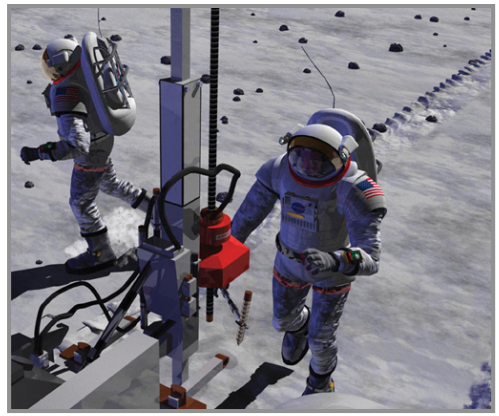
Typical Lunar Reference Mission



The Moon – Reference Architecture

Objectives:

- Gaining significant experience in operating away from Earth's environment
- Developing technologies needed for opening the space frontier
- Conduct fundamental science
  - Astronomy, physics, astrobiology, human research, historical geology, exobiology



Reference Mission Features:

- Polar Site
  - Areas with greater than 80% sunlight and less extreme temps
- Incremental deployment of systems – one mission at a time

Mars – Reference Architecture

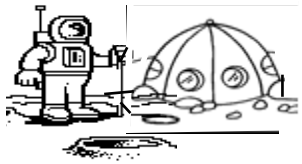
- TBD
- However, NASA will soon charter a team tasked with updated our human mission to Mars reference architecture including:
  - Long term goals and objectives for human exploration missions
  - Flight and surface systems for human missions and supporting infrastructure
  - An Operational Concept
  - Key trade studies for future analysis
  - Key challenges including risk and cost drivers
  - Development schedule options
- Initial results expected at the end of 2007

Reference Health Maintenance Scenario

2018

Lunar Sortie

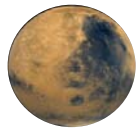
- Medical support
- Specimen collection
- Minimal analytical capabilities
- Radiation protection and monitoring



2020

Lunar Outpost

- Medical support
  - Diagnostics
  - Expanded health care capabilities
- Exercise countermeasures
- Specimen collection
- Expanded life support systems
- Radiation protection and monitoring



2030-35

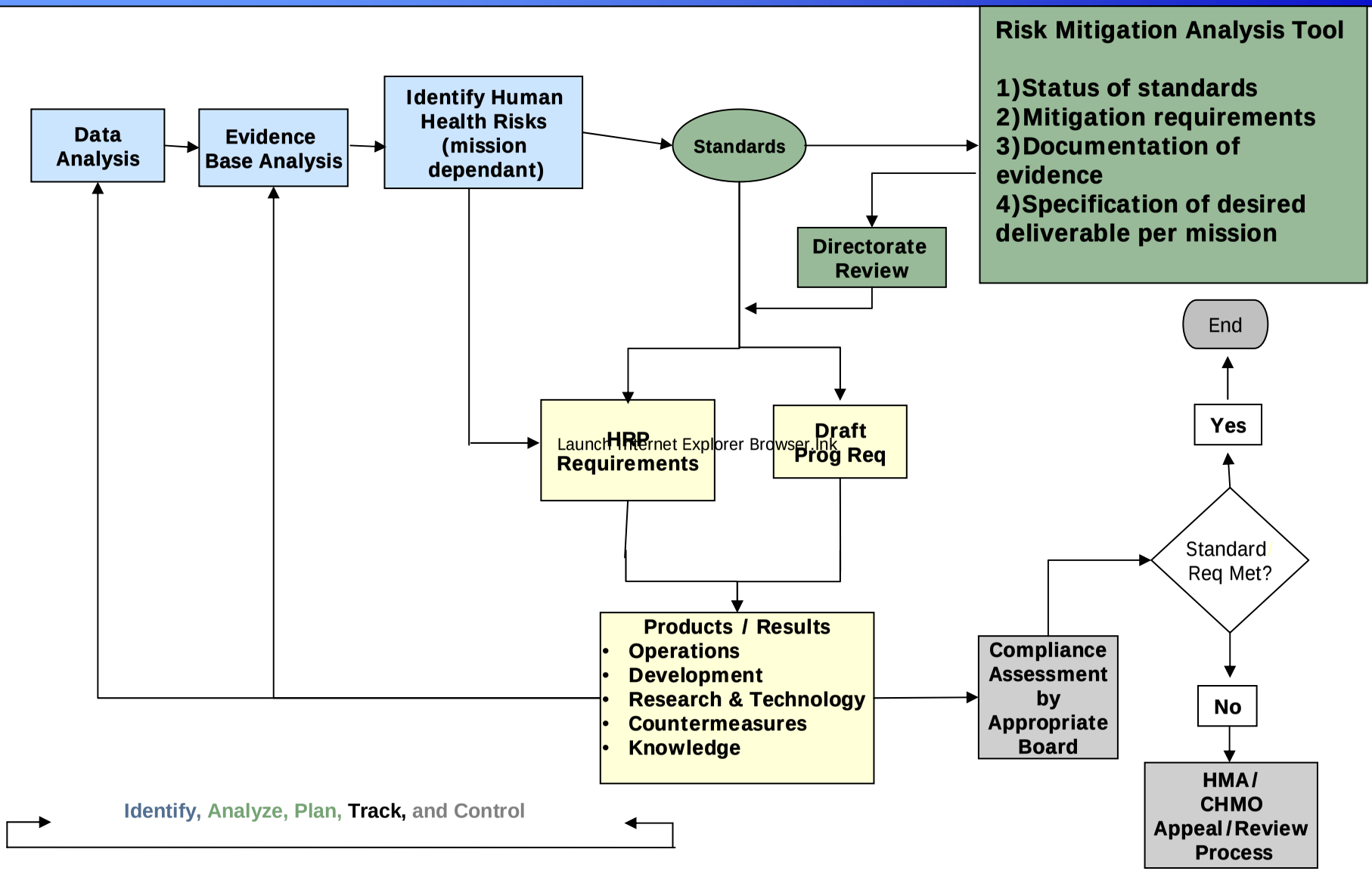
Mars

- Autonomous Medical operation
  - Diagnostics
  - Health care capabilities
- Life support systems
  - Food production
  - Bioregeneration
  - Waste Management
- Specimen collection
- Exercise and pharmaceutical countermeasures
- Radiation protection, monitoring, and exposure countermeasures

The Human Research Program

- The role of Human Research Program is to:
  - Perform research necessary to understand and reduce spaceflight human health and performance risks in support of exploration
    - Very dependant on mission design and duration
  - Enable development of human spaceflight medical and human performance standards
    - Very dependant on agency level of human health risk tolerance
  - Develop and validate technologies that serve to reduce medical risks associated with human spaceflight
    - Always necessary to reduce mass, volume and increase robustness

Risk Management Process



The Role of the Human Research Program

- HRP Program Elements:
  - ISS Medical Project
  - Space Radiation
  - Human Health Countermeasures
  - Exploration Medical Capability
  - Behavioral Health & Performance
  - Space Human Factors & Habitability
  - Program Science Management/National Space Biomedical Research Institute (NSBRI)
- HRP team members from JSC, ARC, GRC, KSC, and LaRC
- International partnerships are very important
  - ISLSWG, IMAG, Joint Working Group (Russia), others

Conclusion

- The global exploration architecture will continue to be defined based on established principles, including partnership and open architectures
- The exploration mission brings significant challenges to the human system
  - Partnerships such as IMAG are key to our success in developing risk mitigation strategies
- Resources available to human research are constrained
  - Money, crew time, upmass
- The Human Research Program, in consultation with partners, must continue to direct resources towards the highest priority research and technology development gaps
  - Leading to human heath and performance risk prevention and mitigation