NASA’s Space Launch System: A Heavy-Lift Platform for Entirely New Missions

Stephen D. Creech
Strategic Development Manager
Space Launch System (SLS) Program
NASA Marshall Space Flight Center

October 2012
“This expanded role for the private sector will free up more of NASA’s resources to do what NASA does best — tackle the most demanding technological challenges in space, including those of human space flight beyond low-Earth orbit.”

— John P. Holdren, Science and Technology Assistant to the President
The White House, May 22, 2012

“My desire is to work more closely with the human spaceflight program so we can take advantage of synergy. We think of the SLS as the human spaceflight program, but it could be hugely enabling for science.”

— John Grunsfeld, Associate Administrator
NASA Science Mission Directorate
Nature, Jan 19, 2012
SLS Benefits for Payloads

- **Less Risk**
  - Increased lift capacity
  - Increased payload margin

- **Less Expensive Mission Operations**
  - High-energy orbit
  - Shorter trip times

- **Increased Design Simplicity**
  - Volume & Mass capability
  - Fewer deployments and critical operations

- **Increased Mission Reliability and Confidence**
  - Volume & Mass capability
  - Simpler technologies and redundant systems

*Vehicle Margin to Drive Payload Affordability & Functionality*
Platform for Expanded Missions

◆ SLS Enables Exploration Missions
  • Maintains reasonable number of launches per mission
  • Simplifies on-orbit operations
  • Maximize mission reliability
  • Very Large Payload Volume

◆ SLS investment can be leveraged for other missions
  • Deep Space Exploration
  • Planetary Landers
  • Human Habitats
  • Great Observatories
  • Space Solar Power
  • Outer Planet Missions
  • Department of Defense / NRO Payloads

SLS Block 1 C3 Performance

Payload System Mass (mt) vs. C3 (km^2/s^2)
SLS Potential Missions

- Mission Enhancing
  - Bigelow BA 2100
  - Human lunar missions
  - EM-L2
  - Human asteroid missions
  - Human Mars missions
  - Outer Planet Sample Return

- Mission Enabling
  - Solar Power Satellites
  - Telescopes
  - Depots
  - Mars Sample Return
  - JEO
  - Saturn/Titan System
  - Ice Giant mission
  - Some robotic planetary missions

Note: Not intended to represent a geo-centric solar system.
Summary

- SLS can provide a unique national capability to enable future exploration goals, offering:
  - Reduced Mission Time
  - Increased Mass Margins
  - Reduced Spacecraft Complexity
  - Increased Payload Volume

- Preliminary screening indicates key arenas where SLS can be most effective, such as:
  - Mars Sample Return
  - Jupiter Europa Orbiter
  - Saturn/Titan Sample Return
  - Ice Giant Exploration
  - Outer Planet Sample Return
  - Large Telescopes
  - In-Space Infrastructure