SPACE LAUNCH SYSTEM

A NEW CAPABILITY FOR DISCOVERY

Steve Creech
NASA Space Launch System
October 13, 2017
**SLS CAPABILITY AVAILABILITY**

<table>
<thead>
<tr>
<th>SLS Block 1</th>
<th>As Early As 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides</td>
<td>Initial Heavy-Lift Capability</td>
</tr>
<tr>
<td>Enables</td>
<td>Orion Test</td>
</tr>
<tr>
<td></td>
<td>SmallSats to Deep Space</td>
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</tbody>
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<table>
<thead>
<tr>
<th>SLS Block 1B Crew</th>
<th>As Early As 2022</th>
</tr>
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<tbody>
<tr>
<td>Provides</td>
<td>105 t lift capability via Exploration Upper Stage</td>
</tr>
<tr>
<td></td>
<td>Co-manifested payload capability in Universal Stage Adapter</td>
</tr>
<tr>
<td>Enables</td>
<td>Deep Space Gateway</td>
</tr>
<tr>
<td></td>
<td>Larger CubeSat- and ESPA-Class Payloads</td>
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<table>
<thead>
<tr>
<th>SLS Block 1B Cargo</th>
<th>As Early As 2022</th>
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</thead>
<tbody>
<tr>
<td>Provides</td>
<td>8.4-meter fairings for primary payloads</td>
</tr>
<tr>
<td>Enables</td>
<td>Europa Clipper/Lander</td>
</tr>
<tr>
<td></td>
<td>Deep Space Transport</td>
</tr>
<tr>
<td></td>
<td>Ice or Ocean Worlds Missions</td>
</tr>
<tr>
<td></td>
<td>Large-Aperture Space Telescopes</td>
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<table>
<thead>
<tr>
<th>SLS Block 2</th>
<th>As Early As 2028</th>
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<tbody>
<tr>
<td>Provides</td>
<td>130 t lift capability via advanced boosters</td>
</tr>
<tr>
<td></td>
<td>10-meter fairings for primary payloads</td>
</tr>
<tr>
<td>Enables</td>
<td>Crewed Mars Orbit-Missions</td>
</tr>
<tr>
<td></td>
<td>Crewed Mars Surface Missions</td>
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</tbody>
</table>
A PHASED APPROACH TO HUMAN SPACEFLIGHT
SLS PLAYS A KEY ROLE INTO THE 2030s

Now
Using the International Space Station

2020s
Operating in the Lunar Vicinity (proving ground)

After 2030
Leaving the Earth-Moon System and Reaching Mars Orbit

Phase 0
Continue research and testing on ISS to solve exploration challenges. Evaluate potential for lunar resources. Develop standards.

Phase 1

Phase 2
Complete Deep Space Transport and conduct yearlong Mars simulation mission.

Phases 3 and 4
Begin sustained crew expeditions to Martian system and surface of Mars.
CORE STAGE PROGRESS
IN-SPACE STAGE AND ADAPTER PROGRESS
SLS SPACECRAFT/PAYLOAD INTEGRATION & EVOLUTION (SPIE)

ISPE HARDWARE DEVELOPMENT & PAYLOAD INTEGRATION FOR SLS MISSIONS

SLS Block 1

Test Flight
- ICPS (D-IV derived)
- 13x SPL

Crew
- EUS (new)
- USA & PAF (new)
- 1x CPL
  - (e.g., Power SEP Bus)
- 14x SPL
  - (e.g., 10x 6U; 2x 12U; 2x 27U)

SLS Block 1B

Cargo
- EUS
- PLF (new)
- 1x PPL
  - (e.g., 7.2m Habitat)


www.nasa.gov/sls
Europa Clipper
- Desired launch date of June 2022
- Jovian system transit time reduced by 65% over existing launch vehicles
- Reduced mission operations cost over time

Earliest Launch
*Period: 6/4/22 – 6/24/22 (SLS)

Cruise:
2.5 Years (SLS)
7.4 Years (Atlas)

Jupiter Orbit Insertion
12/24/24 or 5/1/25 (SLS)
11/26/29 (Atlas)

Jovian System Operations
Prime Europa Flyby
Campaign: 36 months
Potential opportunities exist for launch of a 5m fairing on the Block 1 configuration of SLS.

Universal Stage Adapter offers opportunity for co-manifested payloads with Orion spacecraft or near-term 8.4-meter lower-height accommodations.

Universal Stage Adapter accommodations early as soon as second flight of SLS; 8.4- and 10-meter fairings available as needed.

<table>
<thead>
<tr>
<th>Fairing Type</th>
<th>Volume (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5m fairing w/ science payload</td>
<td>250</td>
</tr>
<tr>
<td>Science Missions</td>
<td>400</td>
</tr>
<tr>
<td>Orion w/ short-duration hab module</td>
<td>400</td>
</tr>
<tr>
<td>8m fairing w/ large aperture telescope</td>
<td>1,200</td>
</tr>
<tr>
<td>10m fairing w/notional Mars payload</td>
<td>1,800</td>
</tr>
</tbody>
</table>

**Total mission volume = ~**

250m³ 400m³ 400m³ 1,200m³ 1,800m³
SLS SECONDARY PAYLOAD EVOLUTION
SLS MASS TO DESTINATION

- Up to 5 times greater mass to orbit capability than current launch systems
  - Increases payload mass margins
  - Offers range of injection propulsion options

- New Horizons
  - SLS would have doubled delivered payload mass to Pluto

- Europa Lander
  - 16 mT delivery to outer planets (with margin)
THE ADVENTURE BEGINS NOW.

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