SPACE LAUNCH SYSTEM

A NEW CAPABILITY FOR DISCOVERY

Steve Creech
NASA Space Launch System
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<th>As Early As 2019</th>
<th>Provides</th>
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**SLS Block 1**
- Provides: Initial Heavy-Lift Capability
- Enables: Orion Test
- Enables: SmallSats to Deep Space

**SLS Block 1B Crew**
- Provides: 105 t lift capability via Exploration Upper Stage
- Enables: Deep Space Gateway
- Enables: Larger CubeSat- and ESPA-Class Payloads

**SLS Block 1B Cargo**
- Provides: 8.4-meter fairings for primary payloads
- Enables: Europa Clipper/Lander
- Enables: Deep Space Transport
- Enables: Ice or Ocean Worlds Missions
- Enables: Large-Aperture Space Telescopes

**SLS Block 2**
- Provides: 130 t lift capability via advanced boosters
- Enables: Crewed Mars Orbit-Missions
- Enables: Crewed Mars Surface Missions
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)

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.

Phase 3 and 4
Begin sustained crew expeditions to Martian system and surface of Mars.

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

Creating economic opportunities, advancing technologies, and enabling discovery

0368.3
ENGINE PROGRESS
**SLS SPACECRAFT/PAYLOAD INTEGRATION & EVOLUTION (SPIE)**

**ISPE HARDWARE DEVELOPMENT & PAYLOAD INTEGRATION FOR SLS MISSIONS**

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**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)

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**SLS Block 1B**

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

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**Notes:**
- ISPE – Integrated Spacecraft Payload Element
- SPL – Secondary Payload
- MSA – MPCV Stage Adapter
- ICPS – Integrated Cryogenic Propulsion Stage
- LVSA – Launch Vehicle Stage Adapter
- EUS – Exploration Upper Stage
- USA – Universal Stage Adapter
- CPL – Co-manifested Payload
- PLA – Payload Adapter
- PLF – Payload Fairing
- PPL – Primary Payload

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**ISPE Separation Plane**

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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.

- **5m fairing w/ science payload**: 250m³
- **Science Missions**: 400m³
- **Orion with short-duration hab module**: 400m³
- **8m fairing with large aperture telescope**: 1,200m³
- **10m fairing w/notional Mars payload**: 1,800m³

**Total mission volume** = ~250m³ + 400m³ + 400m³ + 1,200m³ + 1,800m³
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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