NASA Space Launch System (SLS): State of the Rocket

Todd May
Program Manager
NASA Marshall Space Flight Center

September 10, 2013
Most Capable U.S. Launch Vehicle

<table>
<thead>
<tr>
<th>Type</th>
<th>Mass (mT)</th>
<th>Volume (m³)</th>
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<tbody>
<tr>
<td>ULA Atlas V 551</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>SpaceX Falcon 9</td>
<td>130</td>
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<tr>
<td>ULA Delta IV H</td>
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<tr>
<td>NASA Space Shuttle</td>
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<tr>
<td>NASA Saturn V</td>
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<td>NASA 70 t</td>
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<td>NASA 130 t</td>
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As of May 2, 2013
SLS 70t Expanded View

Solid Rocket Boosters (2)

RS-25 Engines (4)

Interim Cryogenic Propulsion Stage (ICPS)

Launch Vehicle/Stage Adapter

Core Stage and Avionics

Encapsulated Service Module Panels

Spacecraft Adapter

MPCV/Stage Adapter (MSA)

Service Module

Launch Abort System

Crew Module

Orion Multi-Purpose Crew Vehicle (MPCV)
SLS Development Schedule

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<tbody>
<tr>
<td>SLS Design Chosen</td>
<td>Engines Delivered to Inventory</td>
<td>Manufacturing Tooling Installed</td>
<td>Orion Flight Test</td>
<td>Main Engine Test-Firing</td>
<td>Core Stage Assembly</td>
<td>Vehicle Stacking at KSC</td>
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<tr>
<td>Booster Development Test</td>
<td>Wind Tunnel Testing</td>
<td>Production of First New Flight Hardware</td>
<td>ICPS Production Begins</td>
<td>Booster Test-Firings</td>
<td>Core Stage Test-Firing</td>
<td>First Flight</td>
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**PROGRAM PROGRESS**

- **MCR**: Mission Concept Review
- **CDR**: Critical Design Review
- **SRR**: System Requirements Review
- **SIR**: System Integration Review
- **SDR**: System Definition Review
- **FRR**: Flight Readiness Review
- **PDR**: Preliminary Design Review
- **PLAR**: Post-Launch Assess. Review
Concept to Preliminary Design in 21 Months

Liquid Engines
Tested selective laser melted part on J-2X at Stennis Space Center (March 2013), and storing RS-25 Core Stage Engines at Stennis Space Center

Boosters
Conducted Thrust Vector Flight Control Test at ATK in Promontory, UT (Jan 2013)

Core Stage
Completed welding on first confidence barrel section at Michoud Assembly Facility (July 2013)

Spacecraft & Payload Integration
Performed fit-check of Multi-Purpose Crew Vehicle Stage Adapter for 2014 Exploration Flight Test at the Marshall Space Flight Center (June 2013)

Advanced Development
Conducted F-1 engine gas generator hot-fire testing at Marshall (Jan 2013)

Systems Engineering & Integration
Tested buffet model in Langley Research Center's Transonic Dynamics Wind Tunnel (Nov 2012)

Low Technical Risk Due to Hardware Maturity
Somewhere, something incredible is waiting to be known.

— Carl Sagan

For More Information

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