



National Aeronautics and Space Administration

NASA Space Launch System (SLS) Outer Planets Utilization

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Space Launch System (SLS) Program

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Space Launch System

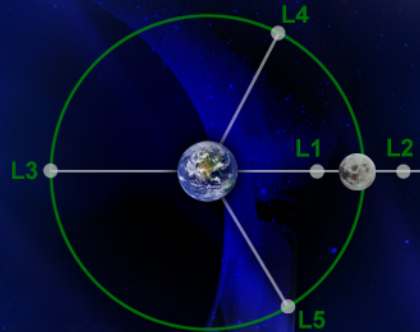


"To reach for new heights..."

National Aeronautics and
Space Administration



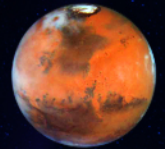
and reveal the unknown so that what we do
and learn will benefit all humankind."



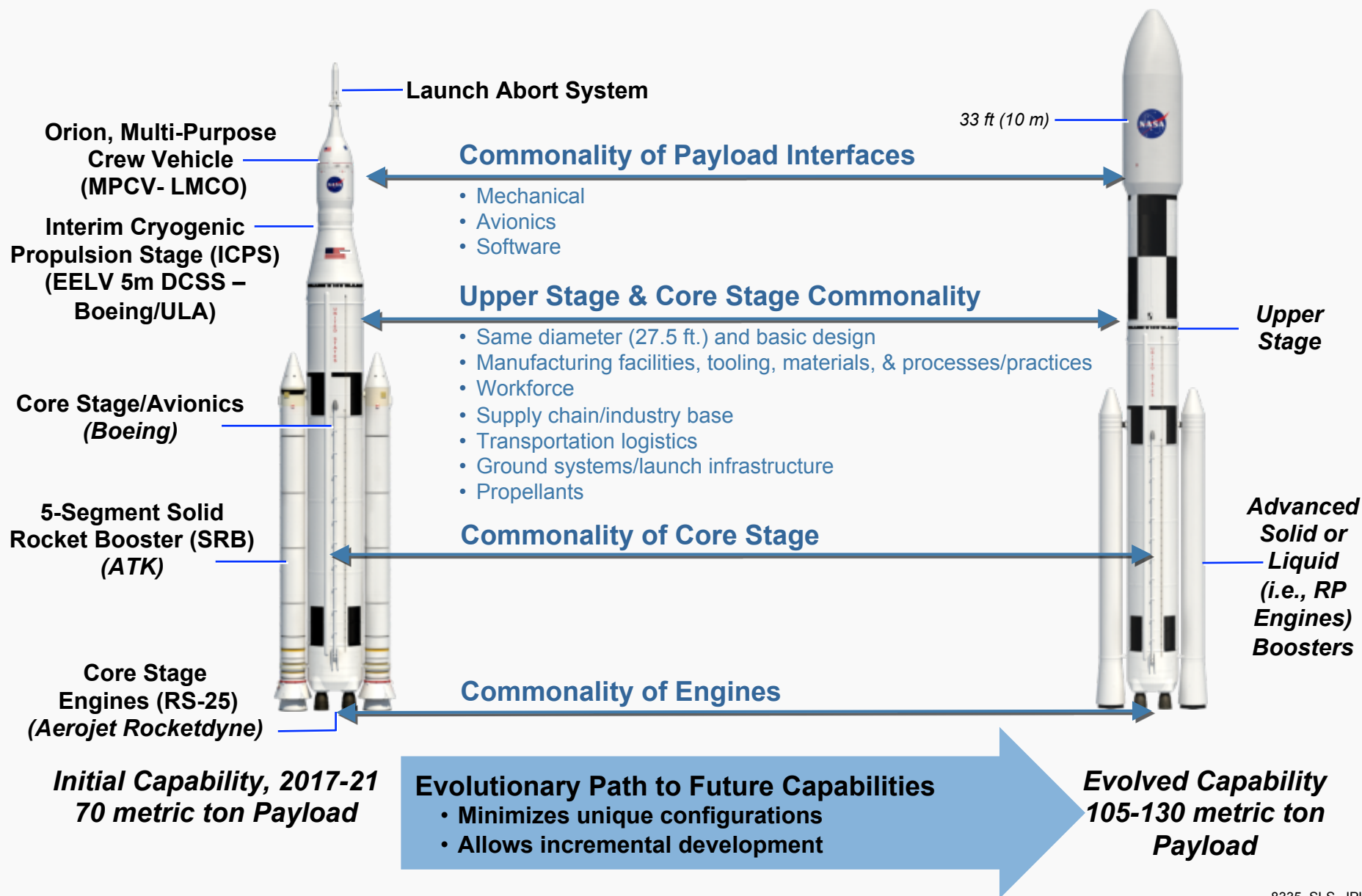
***SLS Launches
in 2017***

- Extend & sustain human activities across the solar system.
- Expand scientific understanding of the Earth & the universe in which we live.

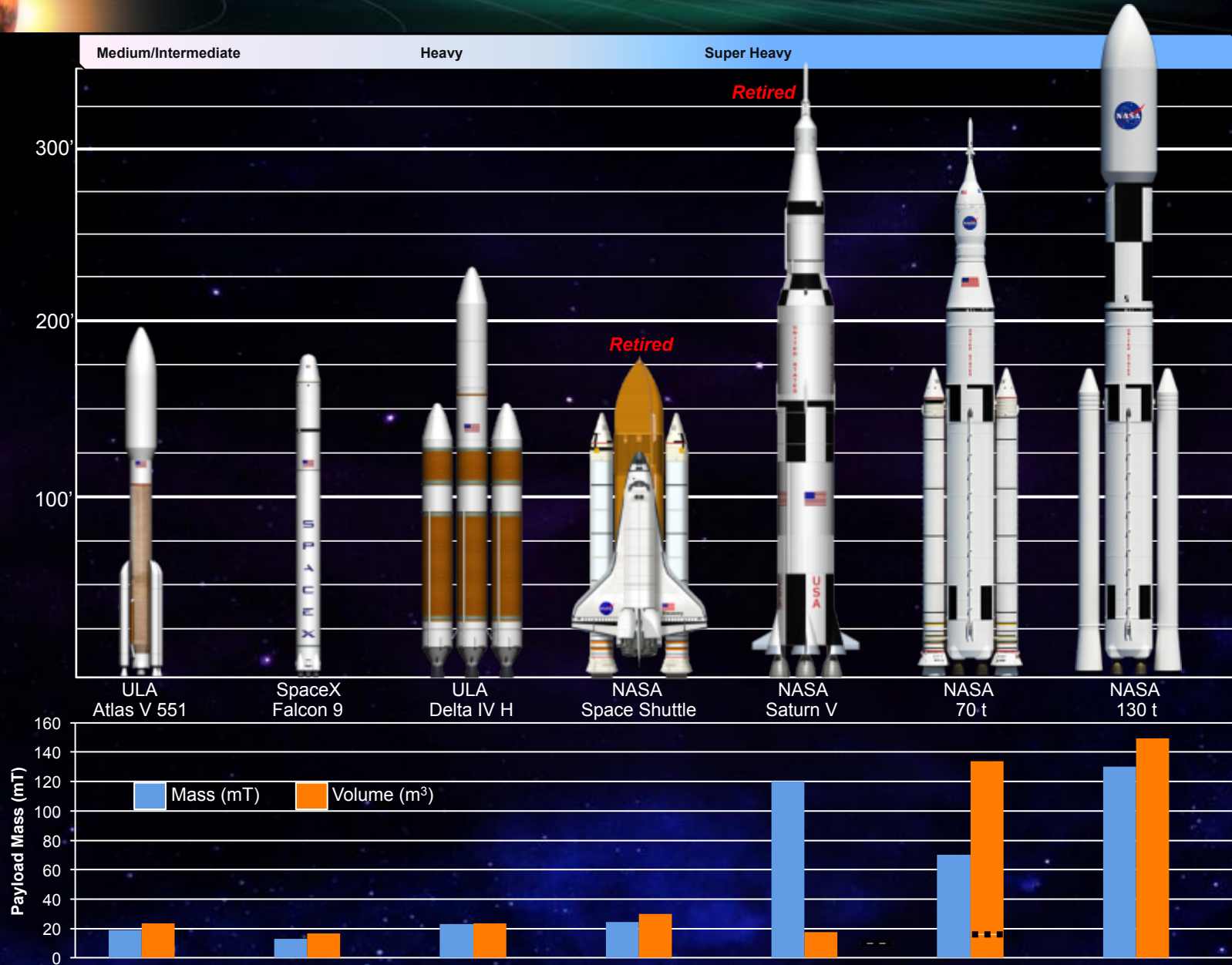
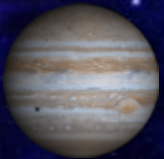
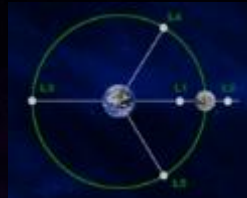
NASA 2011 Strategic Plan



SLS Block Commonality



Most Capable U.S. Launch Vehicle



As of May 2, 2013

SLS Benefits for Other Missions



◆ SLS Enables Exploration Missions

• Greater volume and mass capability/ margin

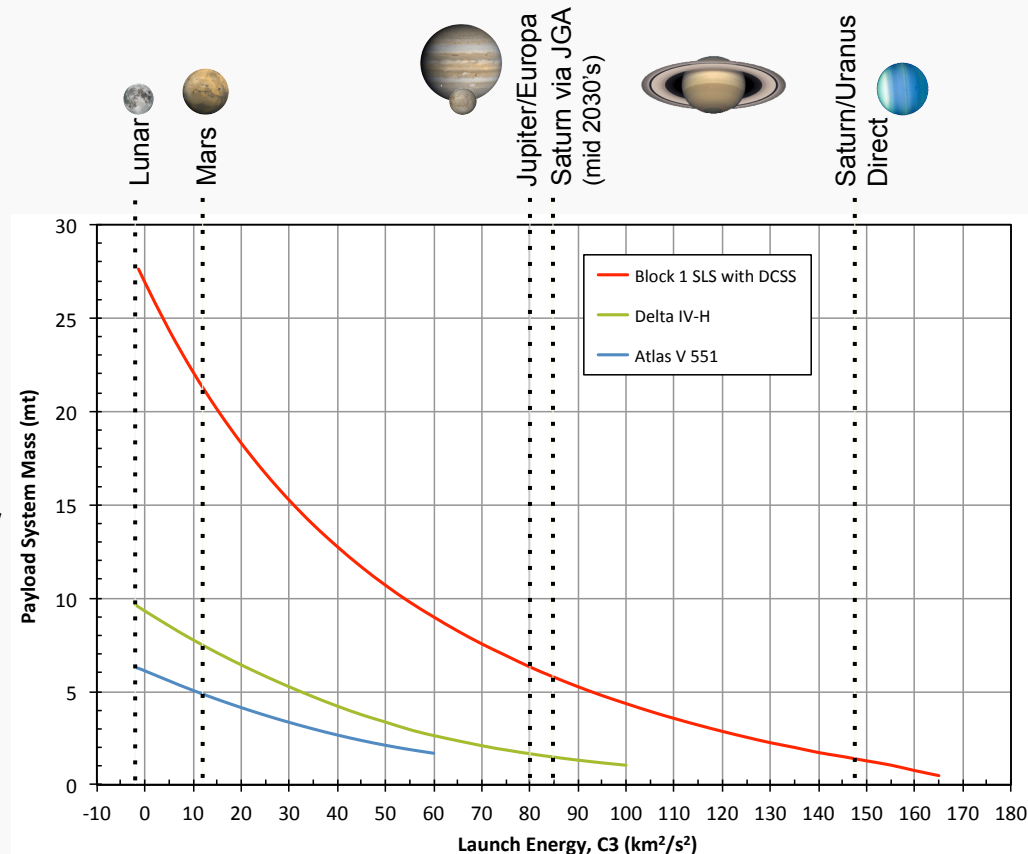
- Increased design simplicity
- Fewer origami-type payload designs needed to fit in the fairing

• Single launch of multiple elements means fewer launches, deployments, and critical operations

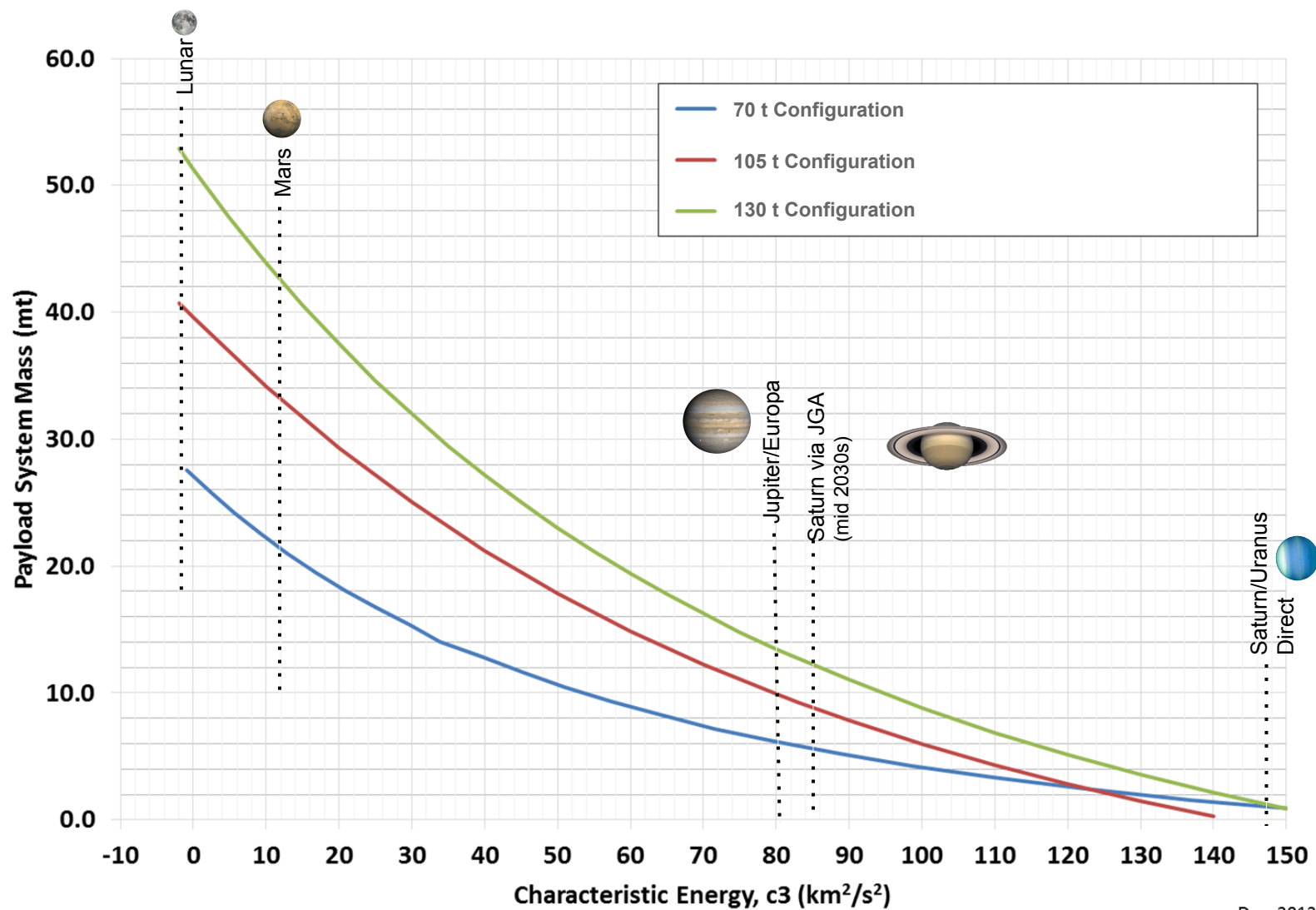
- Simplifies on-orbit operations
- Reduced risks and hazards

◆ SLS investment can be leveraged for other missions requiring large volume or mass, or reduced trip times

- Deep Space Exploration
- Planetary Landers
- Human Habitats
- Great Observatories
- Space Solar Power
- Outer Planet Missions
- Department of Defense/NRO Payloads



Evolved Performance



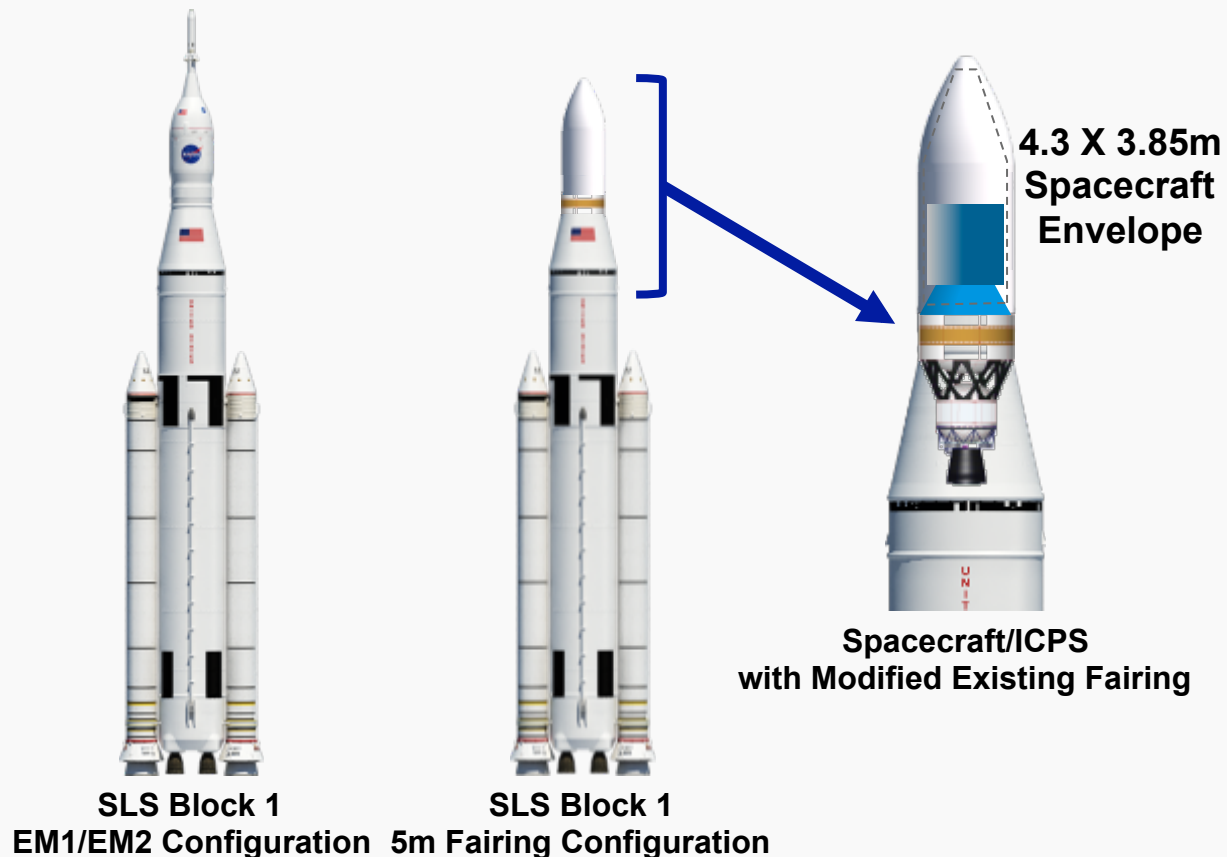
Dec. 2013



5-, 8.4- and 10-Meter Fairing Options



- ◆ SLS is investigating utilizing existing fairings for early cargo flights
- ◆ Offers payload envelope compatibility with design for current EELVs
- ◆ RFI results have been received with information on multiple fairing options
- ◆ Phase A studies in work for 8.4m and 10 m fairing options



SLS Development Schedule



2011	2012	2013	2014	2015	2016	2017
 MCR	 SRR/SDR	 PDR		 CDR	 SIR	PLAR FRR Launch

PROGRAM PROGRESS

 SLS Design Chosen Booster Development Test	 Engines Delivered to Inventory Wind Tunnel Testing	 Manufacturing Tooling Installed Production of First New Flight Hardware	 Orion Flight Test ICPS Production Begins	 Main Engine Test-Firing Core Stage Assembly Booster Test-Firings	 Core Stage Structure Testing Booster Assembly at KSC Core Stage Test-Firing	 Vehicle Stacking at KSC First Flight
Concept Studies	Concept & Technology Development	Preliminary Design & Technology Completion	Final Design & Fabrication		System Assembly, Integration & Test, Launch & Checkout	

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 Asses. Review

2013 Accomplishments



Liquid Engines:

Tested selective laser melted (3D manufactured) parts and prepared to test RS-25 Main Engines at Stennis Space Center, MS



Boosters:

Conducted Thrust Vector Flight Control Test and began casting Qualification Motor at ATK in Promontory, UT



Core Stage:

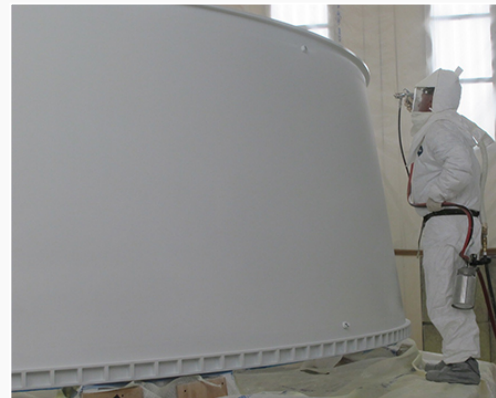
Completed welding on first confidence barrel section at Michoud Assembly Facility (MAF) in New Orleans, LA



Installed 5 of 6 major tools at MAF

Spacecraft & Payload Integration:

Designed and manufactured Multi-Purpose Crew Vehicle Stage Adapter at Marshall Space Flight Center, AL for 2014 Exploration Flight Test from KSC



Avionics:

Conducted Adaptive Augmenting Control flight test at Dryden Flight Research Center, CA



Systems Engineering & Integration:

Tested buffet model in Unitary Plan Wind Tunnel at Ames Research Center, CA



- ◆ **SLS provides capability for human exploration missions.**
 - 70 t initial capability enables EM-1 and EM-2 flight tests.
 - Evolved configurations enable missions including humans to Mars.

- ◆ **SLS offers unrivaled benefits for a variety of missions.**
 - 70 t initial capability provides greater mass lift than any contemporary launch vehicle; 130 t offers greater lift than any launch vehicle ever.
 - With 8.4m and 10m fairings, SLS will offer greater volume lift capability than any other vehicle.
 - Initial ICPS configuration and future evolution will offer high C3 for beyond-Earth missions.

- ◆ **SLS continues to study potential cooperation with SMD and other users.**
 - SLS offers capability to launch larger payloads into low Earth orbit.
 - For planetary missions, SLS offers reduced transit times and greater mass margins.
 - SLS enables unique payloads not possible using other vehicles.



*Somewhere, something
incredible is waiting to
be known.*

— Carl Sagan

For More Information

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