



5...4...3...2...1...

SPACE LAUNCH SYSTEM

Exploration Class Capability for
Deep Space Exploration

Bob Hawkins
Deputy Lead Engineer
SLS Integrated Avionics and Software



JOURNEY TO MARS



HUBBLE SPACE TELESCOPE

INTERNATIONAL SPACE STATION

SPACE LAUNCH SYSTEM

ORBITERS

LANDERS

DEIMOS

PHOBOS

MARS TRANSIT HABITAT

SOLAR ELECTRIC PROPULSION

ASTEROID REDIRECT MISSION

ORION CREWED SPACECRAFT

DEEP SPACE HABITAT

COMMERCIAL CARGO AND CREW

TECHNOLOGY

EXPLORATION

SCIENCE

EARTH RELIANT

PROVING GROUND

EARTH INDEPENDENT

SLS Driving Objectives

Safe

- Human-rated to provide safe and reliable systems
- Protecting the public, NASA workforce, high-value equipment and property, and the environment from potential harm

Affordable

- Maximum use of common elements and existing assets, infrastructure, and workforce
- Constrained budget environment
- Competitive opportunities for affordability on-ramps

Sustainable

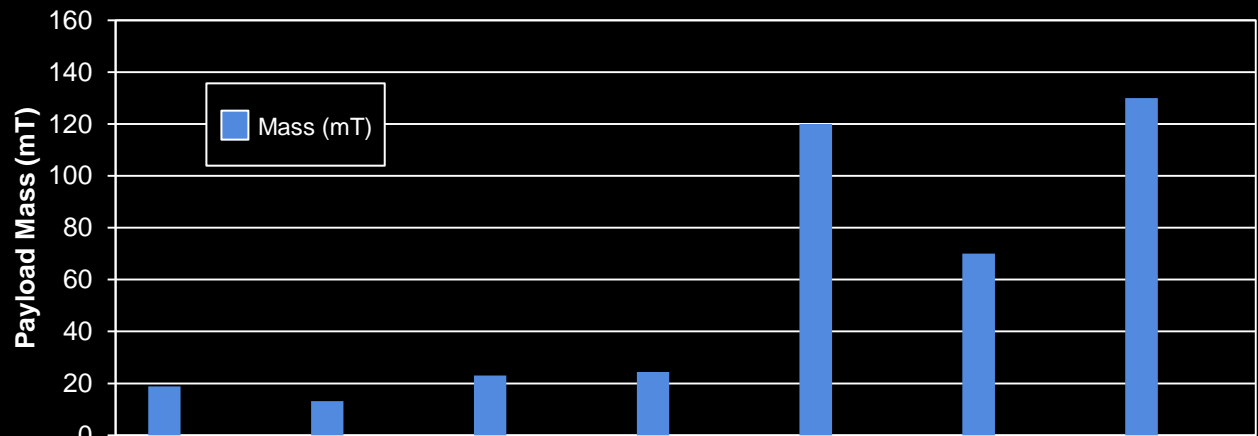
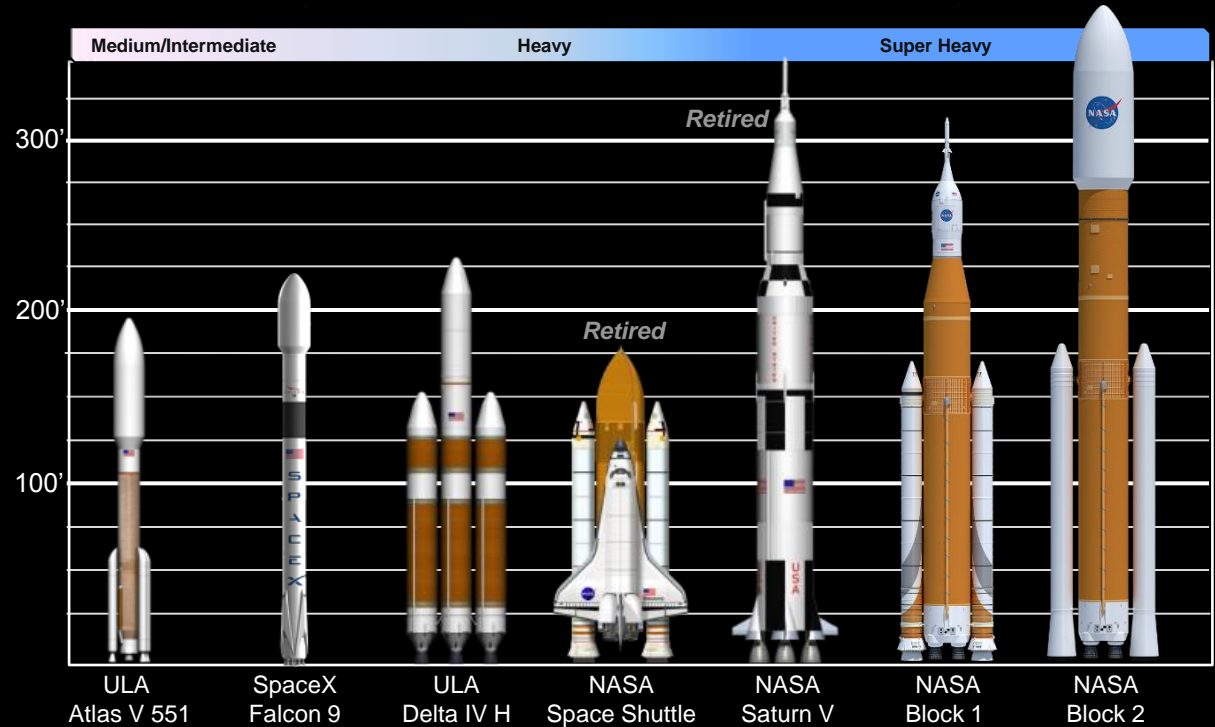
- Initial capability: 70 metric tons (t), 2017–2021
 - Serves as primary transportation for Orion and human exploration missions
- Evolved capability: 105 t and 130 t, post-2021
 - Offers large volume for science missions and payloads
 - Reduces trip times to get science results faster
 - Minimizes risk of radiation exposure and orbital debris impacts



Designed for BEO Missions of National Importance

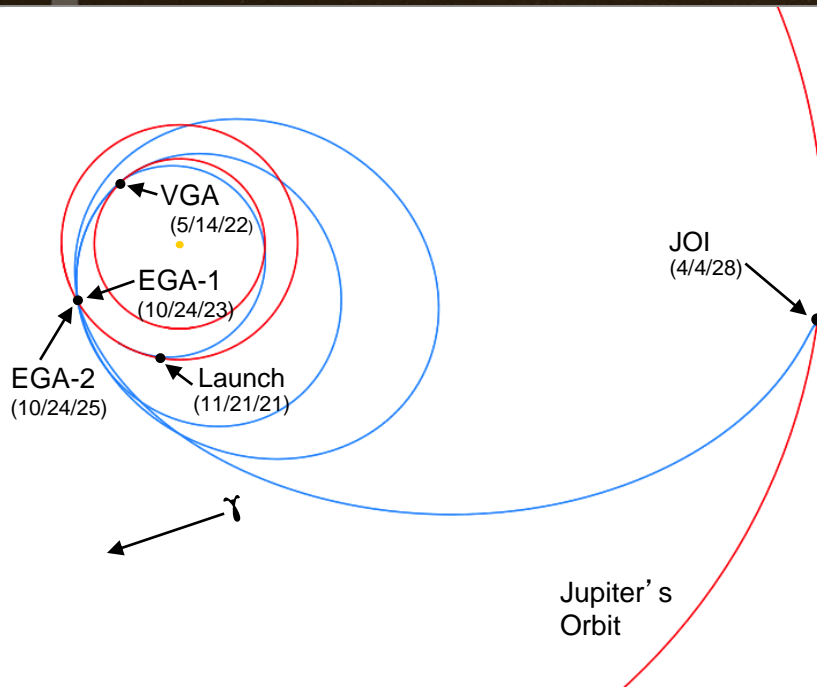
SLS Mass-to-Orbit Comparison

- SLS initial configuration offers Block 1 to LEO.
- Future configurations offer Block 1B and Block 2 to LEO.
- More mass-to-orbit means larger payloads to variety of destinations.

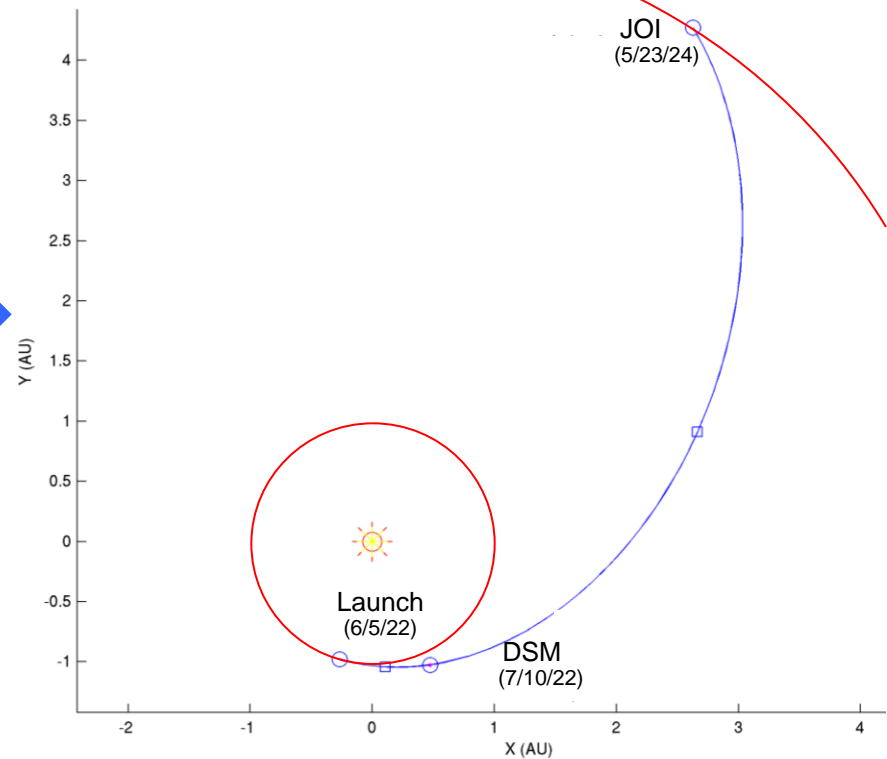


Europa Trajectory Comparison

Atlas V 551: VEEGA

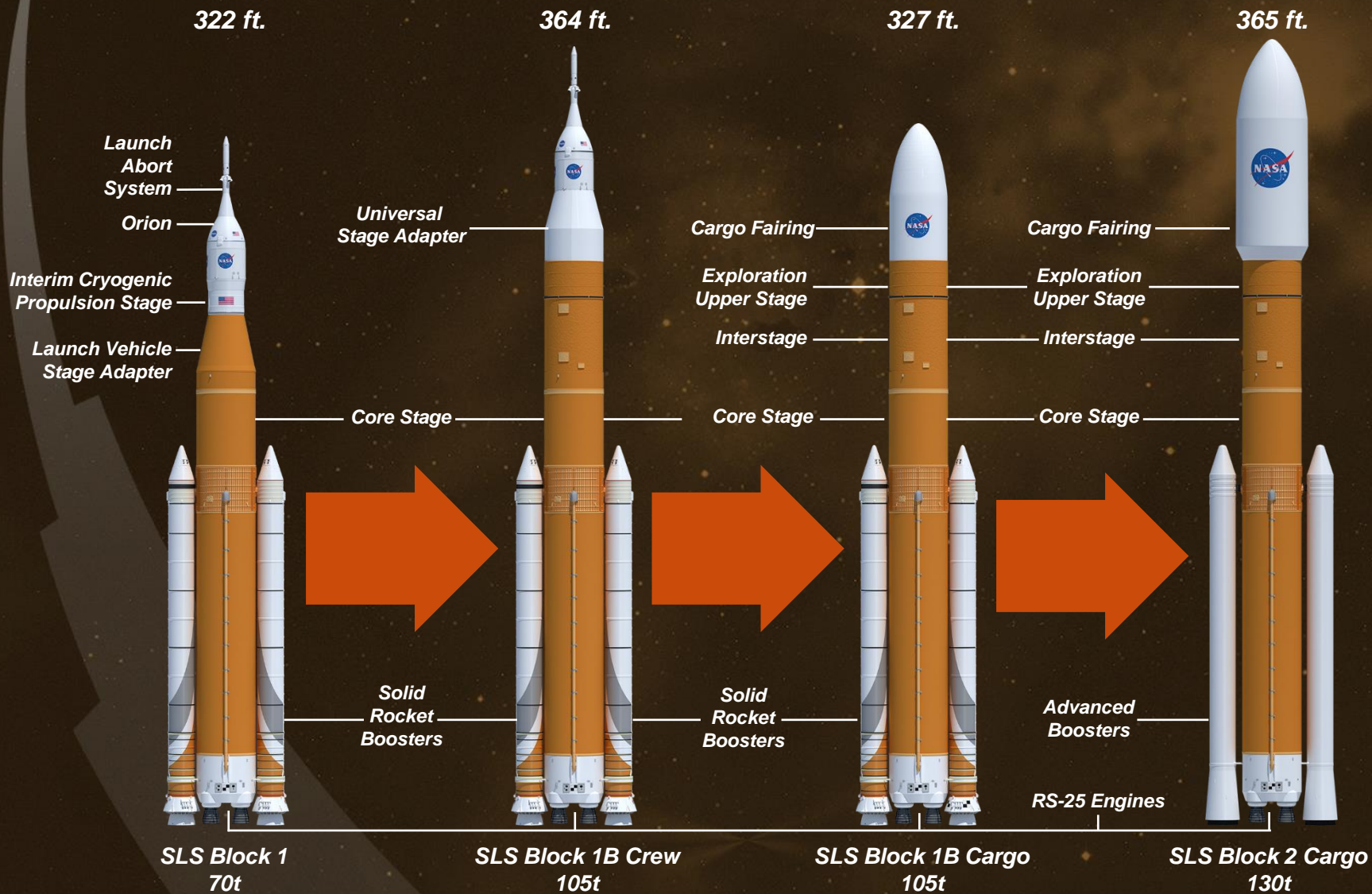


SLS: Direct

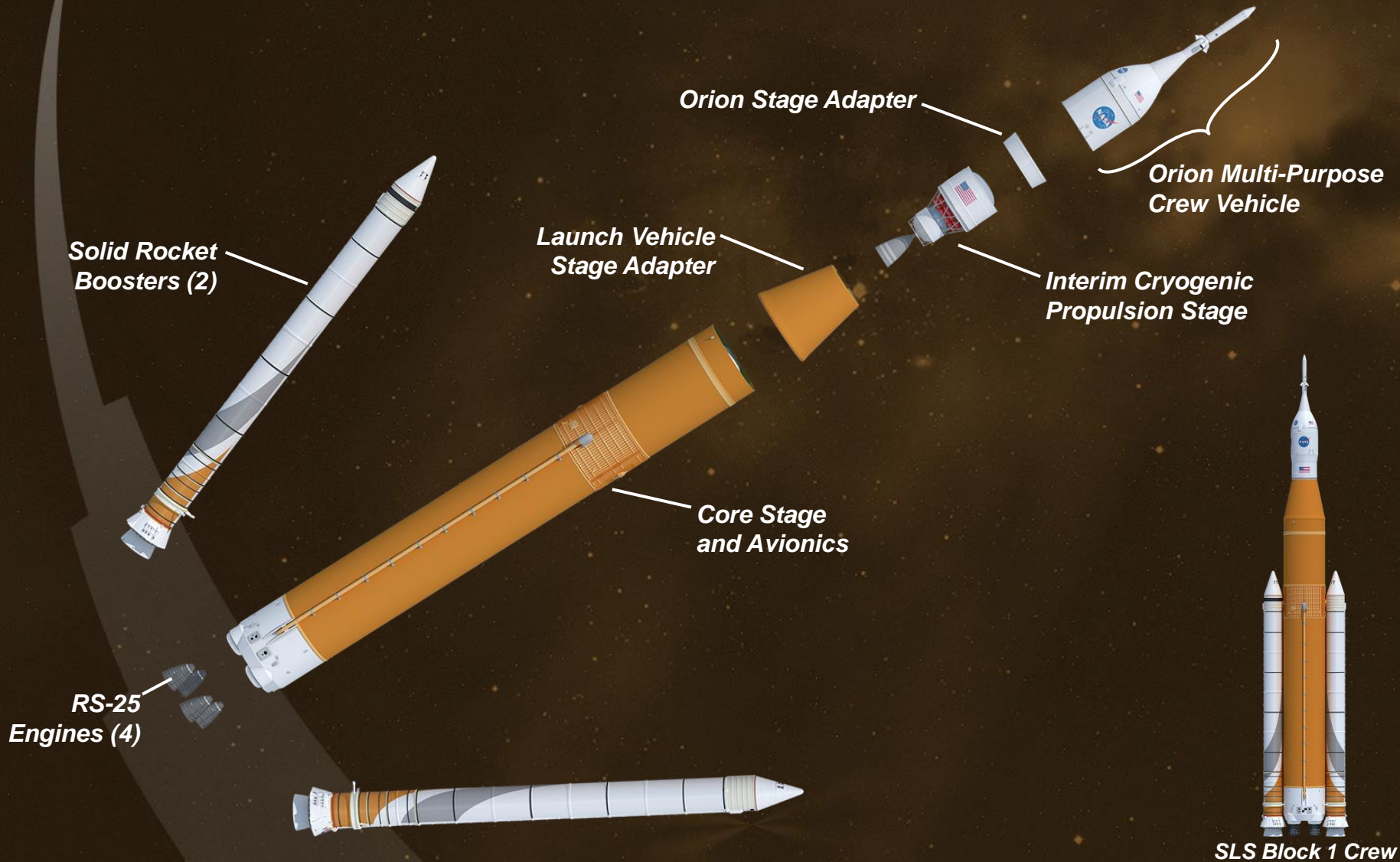


Reduces Transit Time To Europa By Half

SLS Evolution Overview



SLS Block 1 Key Design Features



Five-Segment Solid Rocket Booster



Qualification Motor-1 (QM-1)
March 2015, Promontory, Utah



SRB Aft Skirt Avionics Testing
September 2014



Booster Processing,
Promontory, Utah



SRB Forward Skirt Load Test
May 2014, Promontory Utah

5-Segment Booster Test Video



RS-25 Core Stage Engine



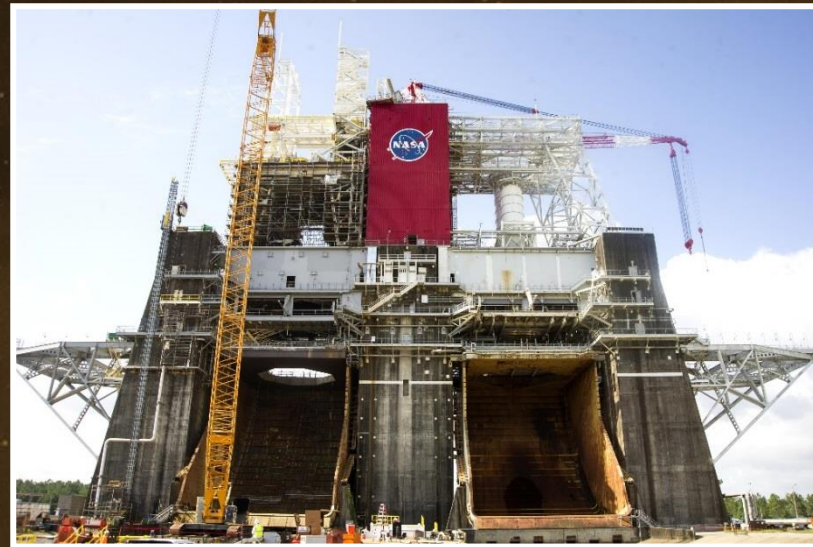
RS-25 Controller

RS-25 Adaptation Test, Stennis Space Center, January – August 2015

Core Stage Progress



LH2 Dome Assembly at Michoud, July 2015



B-2 Test Stand at Stennis Space Center



Pegasus Barge Renovation Complete

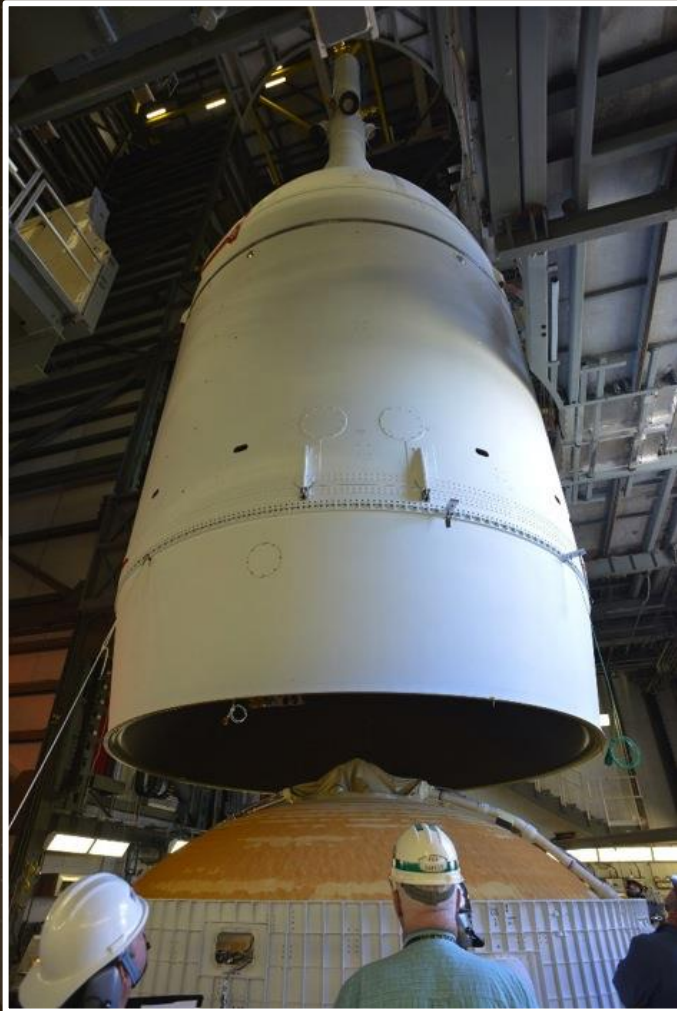


LH2 Structural Test Article (STA) Test Stand,
MSFC, August 2015

SLS MAF/Stages Progress Video



Spacecraft/Payload Integration and Evolution



**Orion/MSA Mated to Delta IV for EFT-1
November 2014**



**DCSS for EFT-1
KSC, June 2014**

Systems Engineering & Integration



SMAT Testing, MSFC August 2014



Booster Separation Tests, LaRC
October 2014

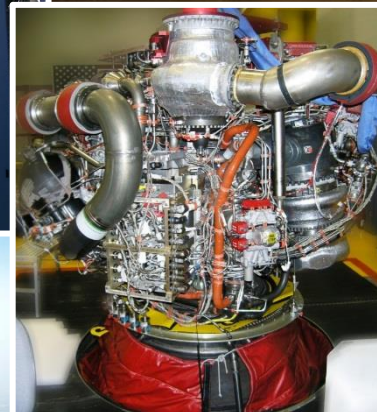
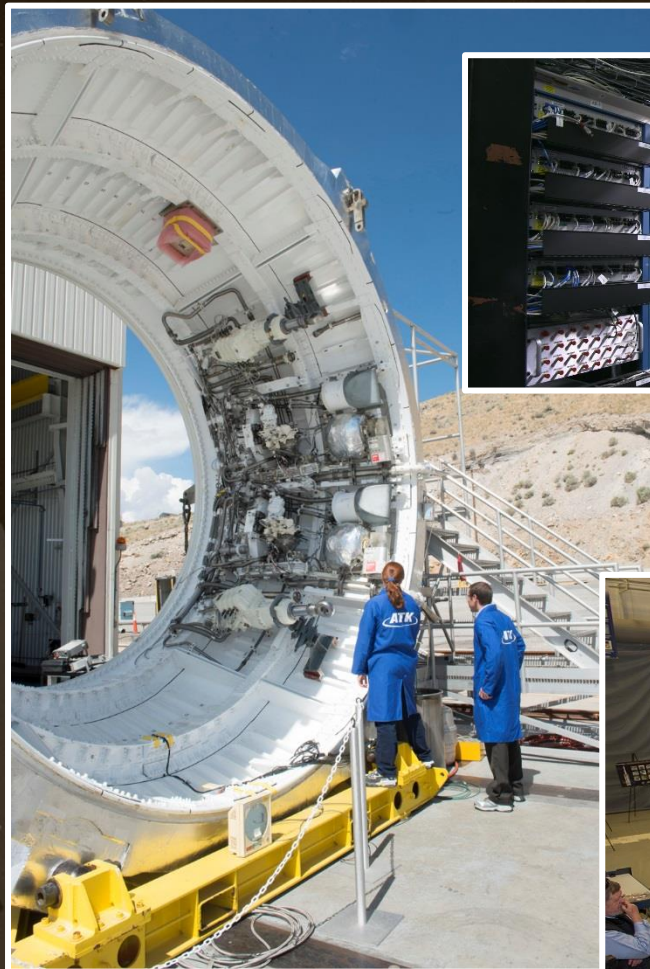


Core Stage
Engine TVC
Actuator Testing
Redstone Test
Center
March 2015

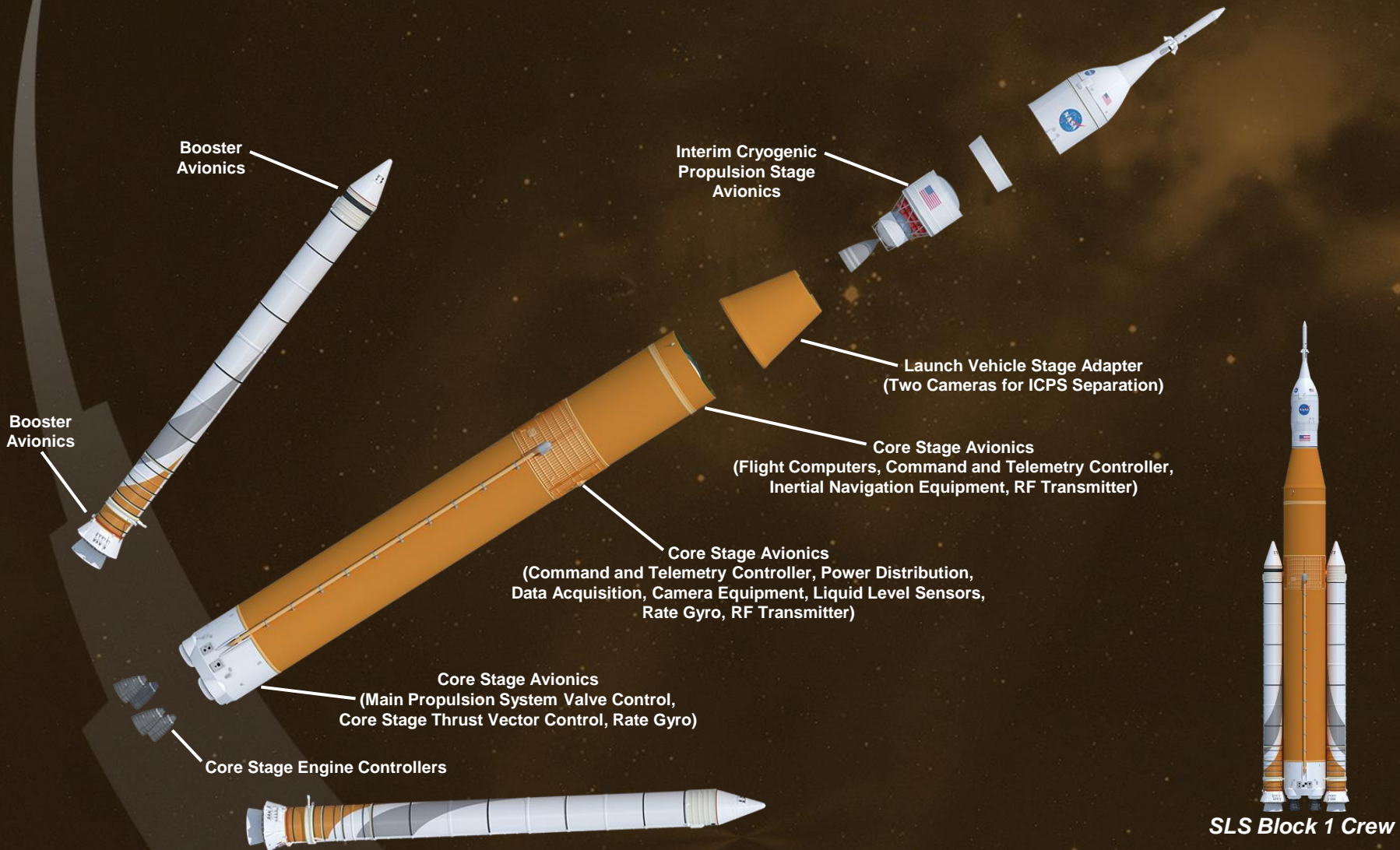


Base Heating
Tests CUBRC,
Buffalo, New York
January 2015

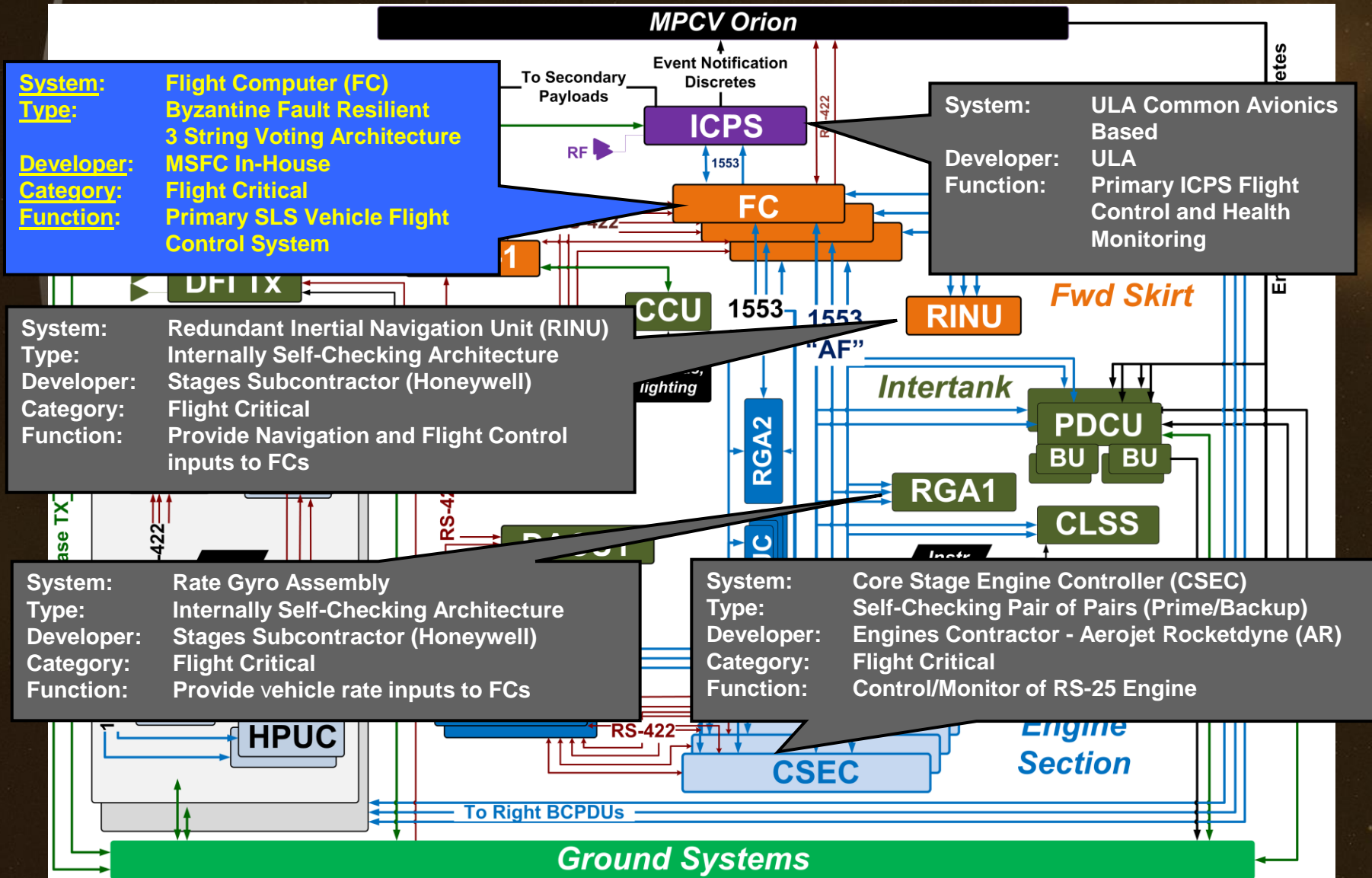
SLS Avionics Progress



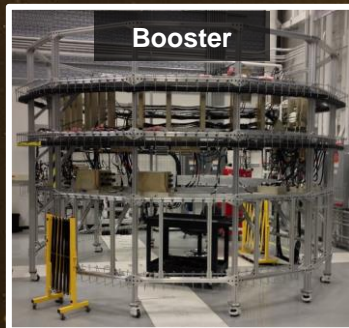
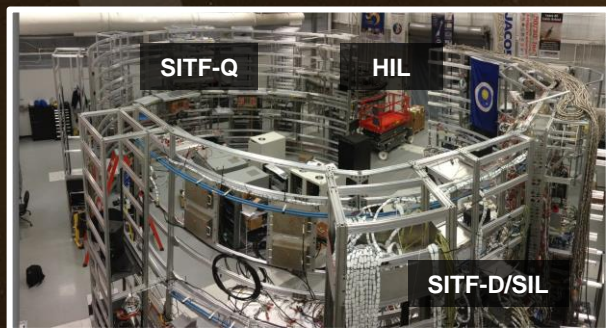
Where is SLS Avionics Located?



SLS Block I Software Providers



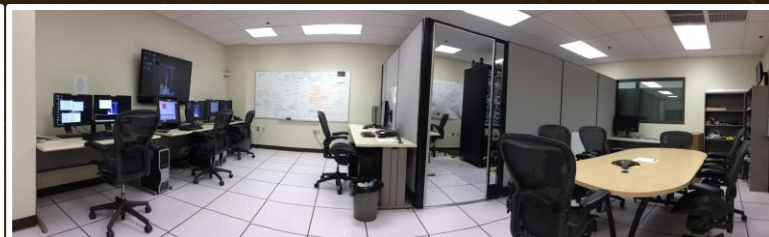
SLS Block I Avionics and SW Test Labs



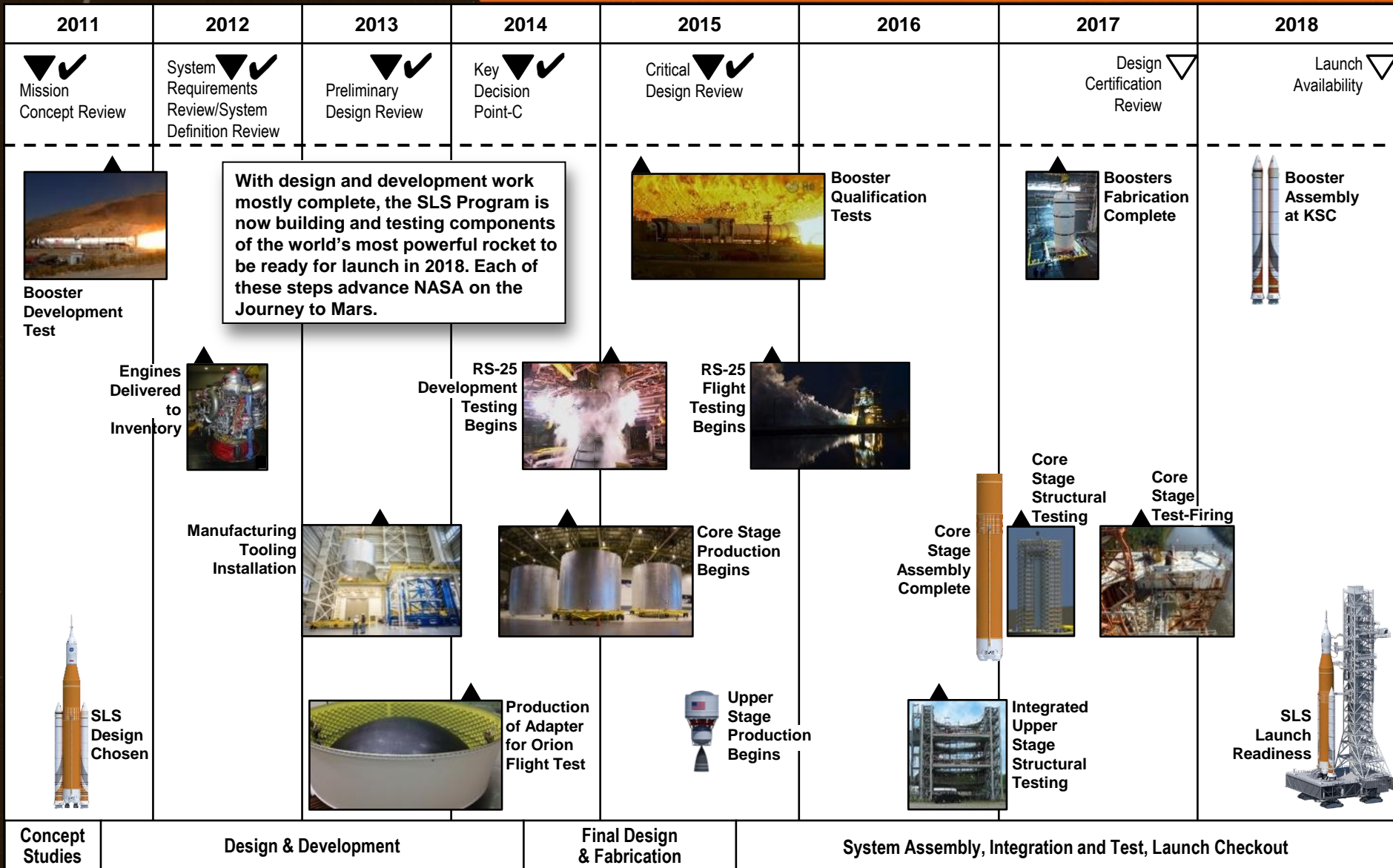
SDF-1&2
(FC FSW)



SDF-3
(FC FSW)



Path to EM-1 (First Launch)



Summary

SLS provides capability for human exploration missions.

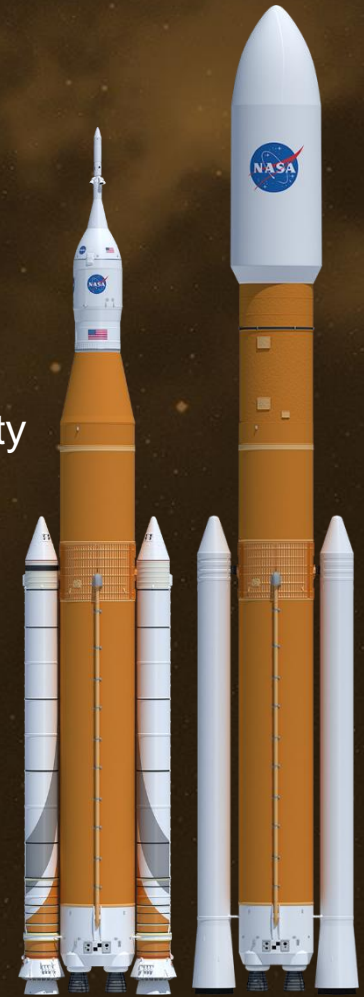
- Block 1 configuration enables initial flight tests.
- Evolved configurations enable missions including humans to Mars.

SLS offers unrivaled benefits for a variety of missions.

- Block 1 provides greater mass lift than any contemporary launch vehicle; Block 2 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.
- Updated Mission Planner's Guide provides capabilities information.

SLS is currently on schedule for first launch.

- Critical design review completed in July 2015; SLS is now in implementation phase.
- Manufacture and testing are currently underway.
- Hardware now exists representing all SLS elements.



SLS will be the Biggest and Most Capable Rocket ever Built

Questions?

