National Aeronautics and Space Administration

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SPACE LAUNCH SYSTEM

SLS at Critical Design Review

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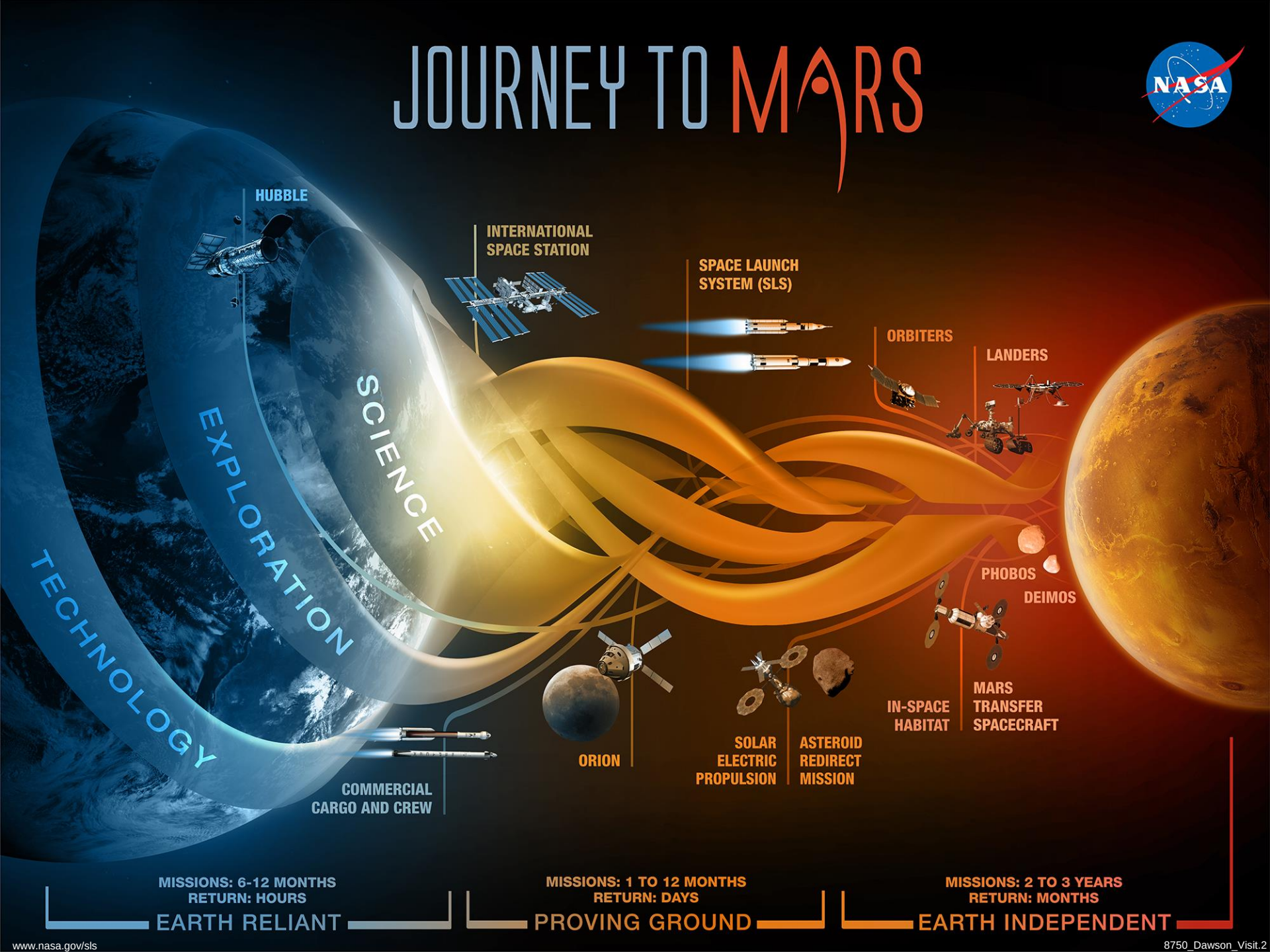
Manager, Spacecraft/Payload Integration & Evolution

JOURNEY TO MARS

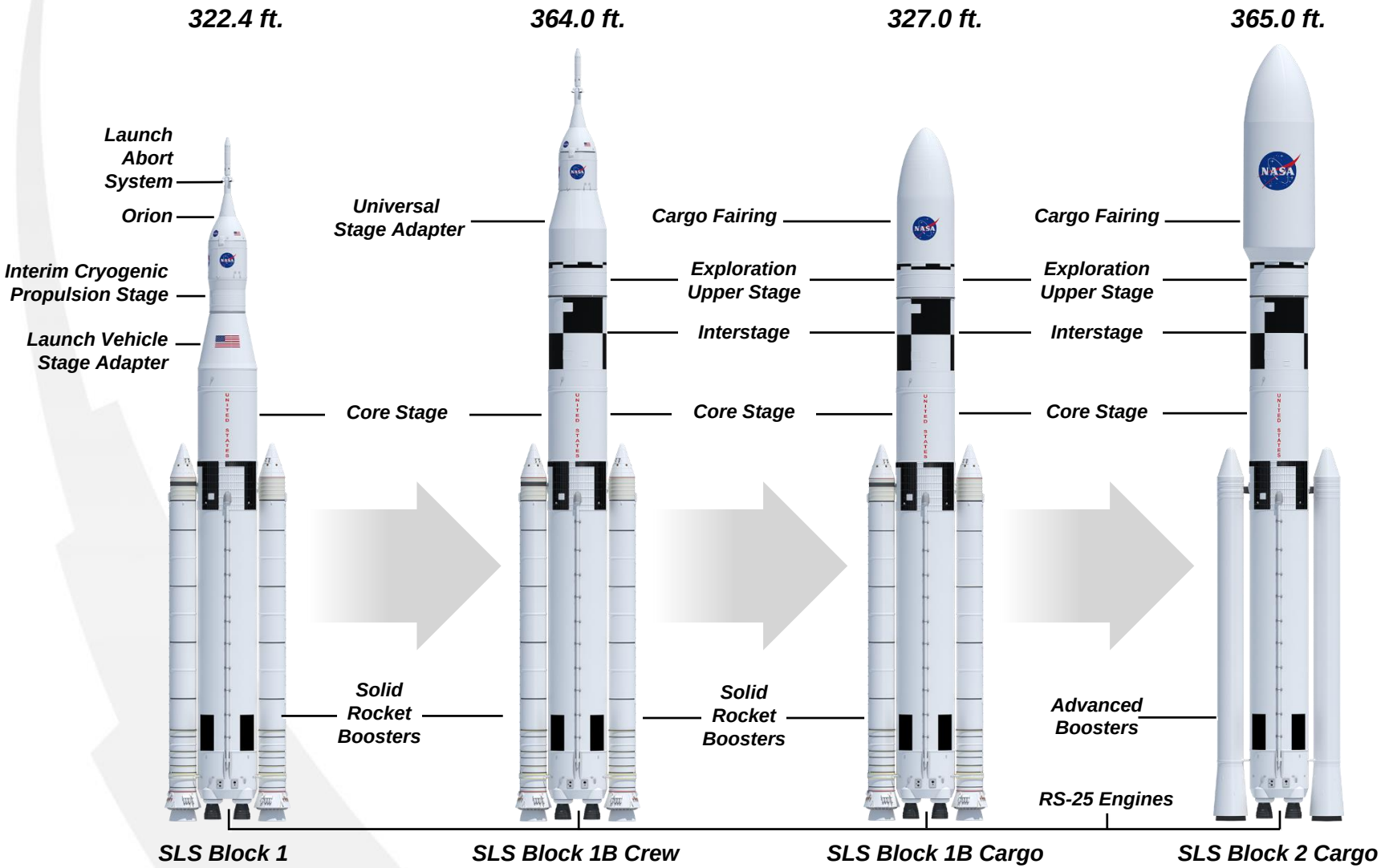


MISSIONS: 6-12 MONTHS
RETURN: HOURS
EARTH RELIANT

MISSIONS: 1 TO 12 MONTHS
RETURN: DAYS
PROVING GROUND

MISSIONS: 2 TO 3 YEARS
RETURN: MONTHS
EARTH INDEPENDENT

SLS Evolution Overview



Critical Design Review

- **Follows KDP-C in 2014**
- ***CDR Objective:*** **Assess the technical maturity of the design to continue with full-scale fabrication, assembly, integration and testing of the vehicle as a whole and meets performance requirements and identifiable cost and schedule constraints.**

- **Attended by Agency Discipline Review Teams, Standing Review Board, Exploration Systems Department, Multi-Purpose Crew Vehicle, Ground Systems Development and Operations, Office of the Chief Engineer, Office of Safety and Mission Assurance, NASA Engineering and Safety Center, Air Force 45th Space Wing, Crew Office, Health and Medical Technical Authority, all NASA Centers, and SLS element prime contractors**

"This rocket will be game changing for our Agency and how we explore."
"You can tell it in the spirit of the people here. They see that this is the review that is going to make it real."

— Jim Reuter, Standing Review Board Chair

Building Today

Interim Cryogenic Propulsion Stage: Test article currently in production; flight article began July 2015.

Stage Adapters: First flight hardware launched on Exploration Flight Test-1 in Dec. 2014.

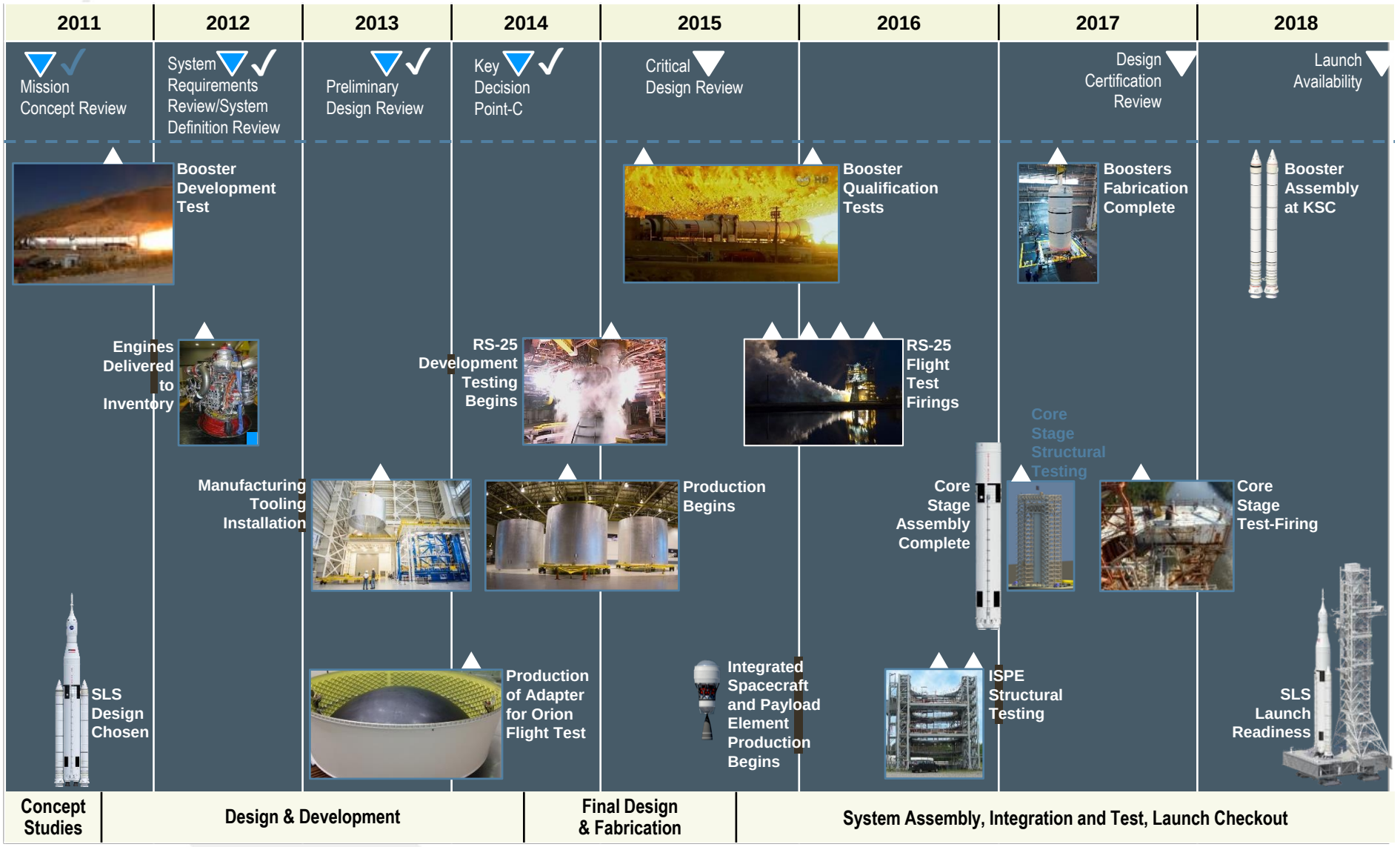
Avionics: Software Integration Test Facility preparing for qualification in second quarter 2016.

Core Stage: Production is underway on hardware for both test articles and EM-1 vehicle.

Boosters: Qualification Motor-1 test completed in March 2015.

Engines: RS-25 testing has begun at Stennis Space Center; renovations underway to B-2 stand.

SLS MILESTONES SCHEDULE

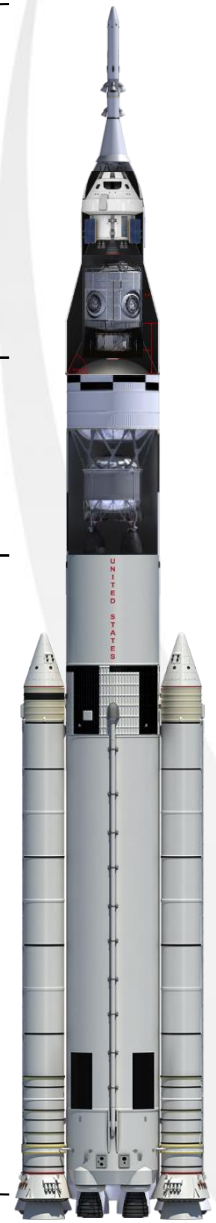


SLS Block 1B & Mission Element Concepts Under Study

Mission Elements

Exploration Upper Stage

Core Stage / Boosters



Mission concepts with Universal Stage Adaptor

Mission concepts with 8m and 10m fairings

Orion with short-duration hab module

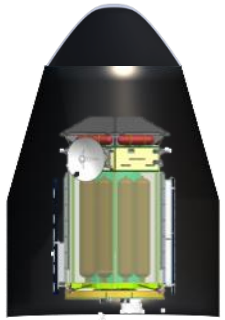
total mission volume = ~ 400m3

5m fairing w/robotic lunar lander & short-duration hab module

total mission volume = ~ 600m3

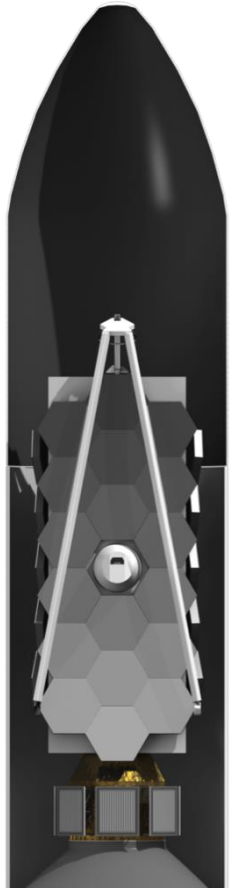
Science Missions

total mission volume = ~ 400m3



ARM Mission

total mission volume = ~ 400m3



8m fairing with large aperture telescope

total mission volume = ~ 1200m3

10m fairing w/notional Mars payload

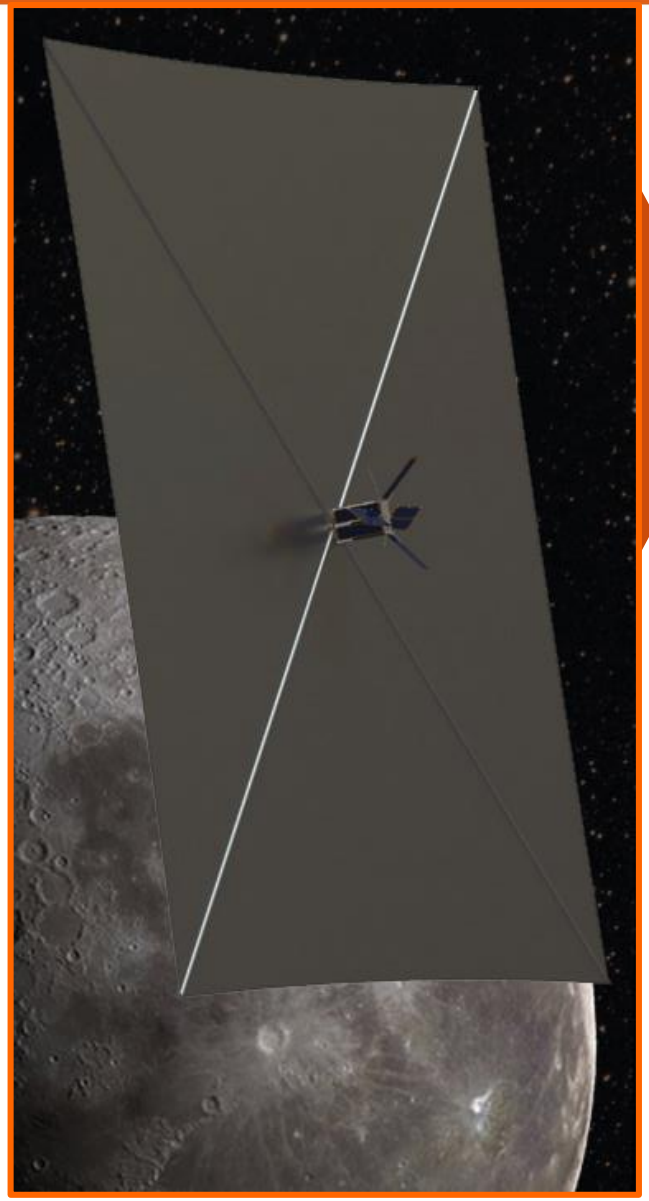
total mission volume = ~ 1800m3

Secondary Payload Capability

Eleven small-sat secondary payloads of 6U volume/mass (14 kg payload mass) will fly on the first flight of Space Launch System.

Among the potential payloads are these three candidates identified by NASA's Advanced Exploration Systems:

- BioSentinel: Study radiation-induced DNA damage of live organisms in cislunar space; correlate with measurements on ISS and Earth.
- Lunar Flashlight: Locate ice deposits in the moon' permanently shadowed craters
- Near Earth Asteroid (NEA) Scout: Flyby/rendezvous and characterize one NEA that is a candidate for a human mission.



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