National Aeronautics and Space Administration

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SPACE LAUNCH SYSTEM

A NEW CAPABILITY FOR SPACE EXPLORATION

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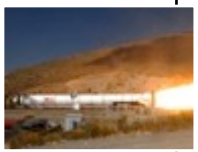
www.nasa.gov/sls

Space Launch System Path to the Pad

2011	2012	2013	2014	2015	2016	2017	2018
Mission Concept Review	System Requirements Review/System Definition Review	Preliminary Design Review	Key Decision Point-C	Critical Design Review			Launch Availability

With design and development work mostly complete, the SLS Program is now building and testing components of the world's most powerful rocket to be ready for launch in 2018. Each of these steps advances NASA on the Journey to Mars.



Booster Development Test

Booster Qualification Tests

Boosters Fabrication Complete

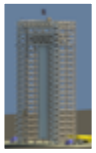
Booster Assembly at KSC

Engines Delivered to Inventory

RS-25 Development Testing Begins

RS-25 Flight Testing Begins

Core Stage Structural Testing



Core Stage Assembly Complete

Core Stage Test-Firing

Manufacturing Tooling Installation

Core Stage Production Begins

SLS Design Chosen

Production of Adapter for Orion Flight Test

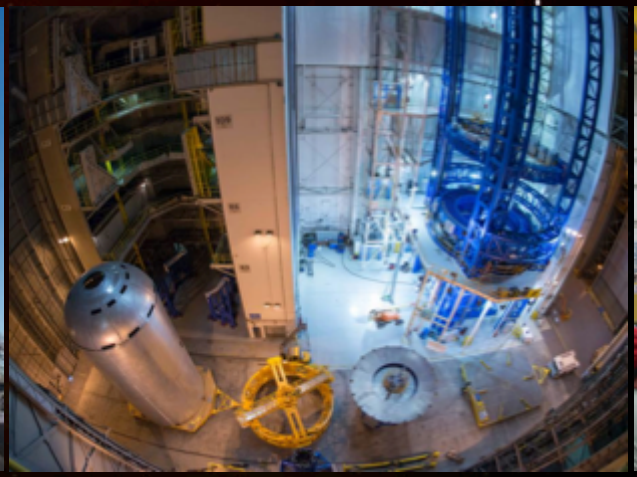
Upper Stage Production Begins

Integrated Upper Stage Structural Testing

SLS Launch Readiness

Concept Studies	Design & Development	Final Design & Fabrication	System Assembly, Integration and Test, Launch Checkout

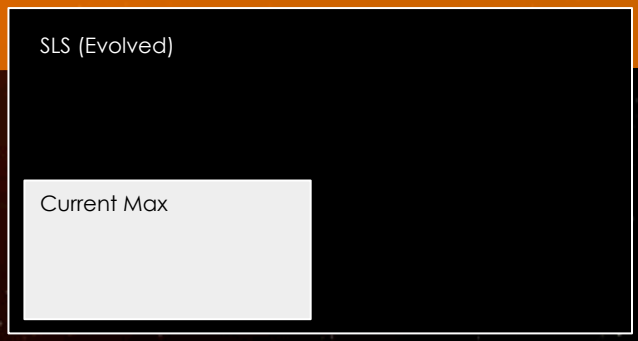
Recent Progress Toward Launch



Benefits of Space Launch System

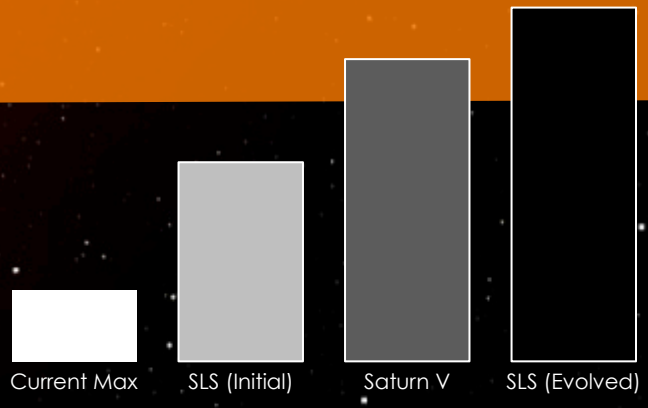
Volume

- Space Launch System will be able to offer payload accommodations with five times more volume than any contemporary launch vehicle.
- Payload fairings of up to 10-meter diameter are planned.



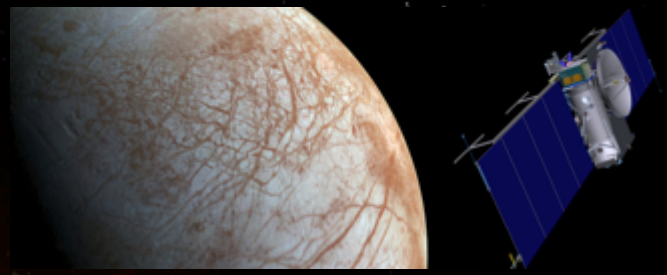
Mass

- Space Launch System will offer an initial capability of greater than 70 metric tons to low Earth orbit; current U.S. launch vehicle maximum is 28 t.
- Evolved version of SLS will offer greatest-ever capability of greater than 130 t to LEO.



Departure Energy

- SLS offers reduced transit times to the outer solar system by half or greater.
- Higher characteristic energy (C3) also enables larger payloads to destination.



SLS SPACE LAUNCH SYSTEM

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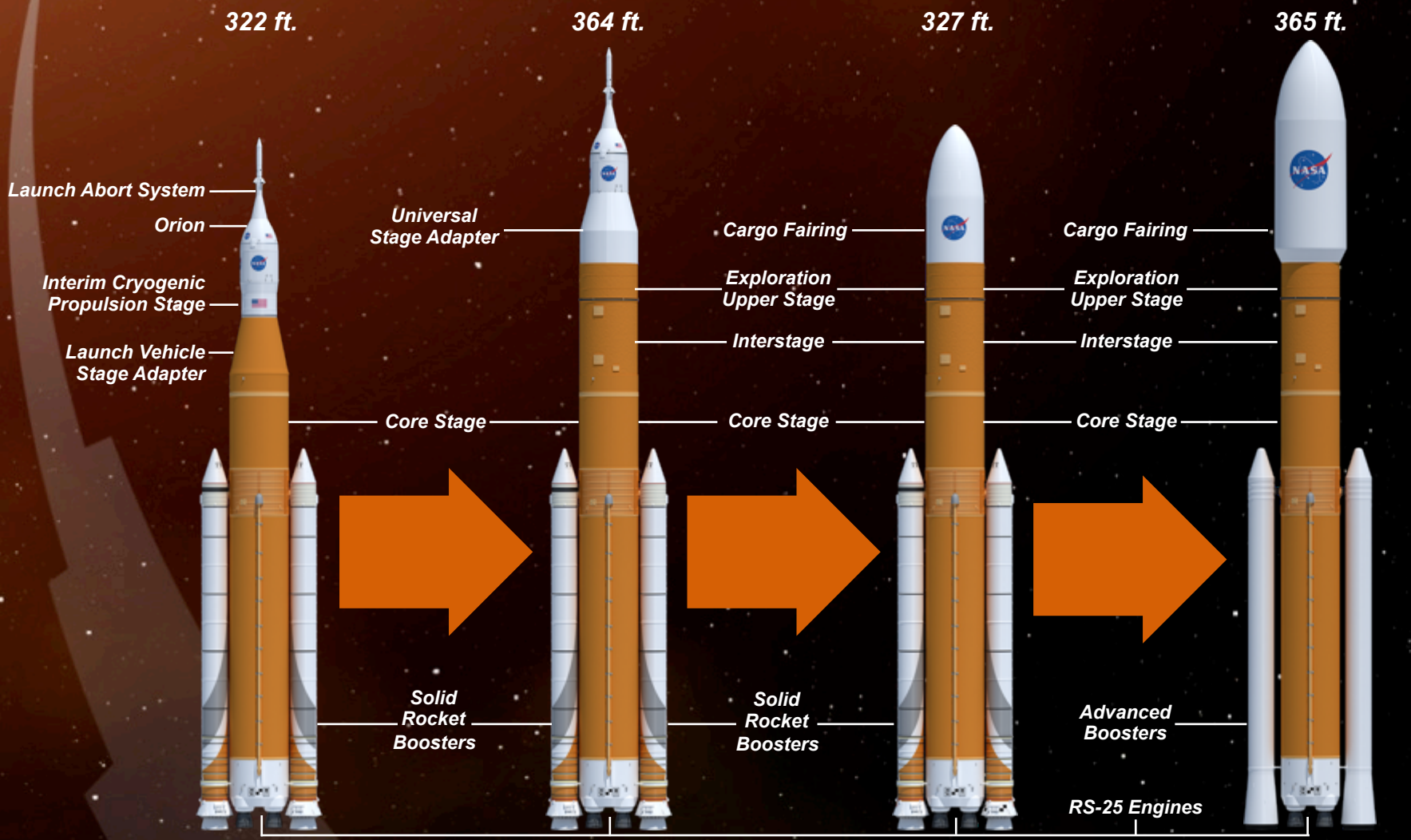
SLS Evolution Overview



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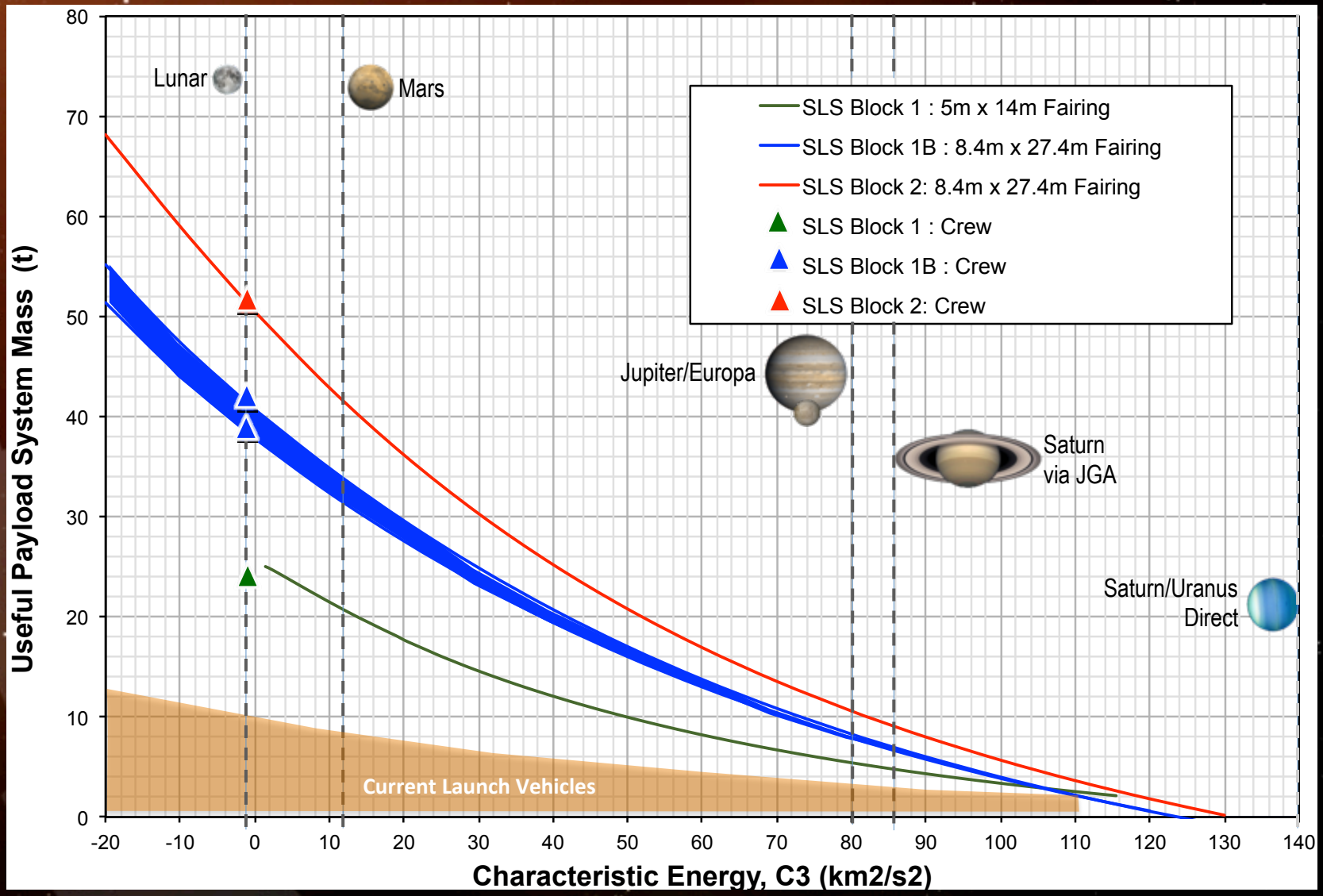
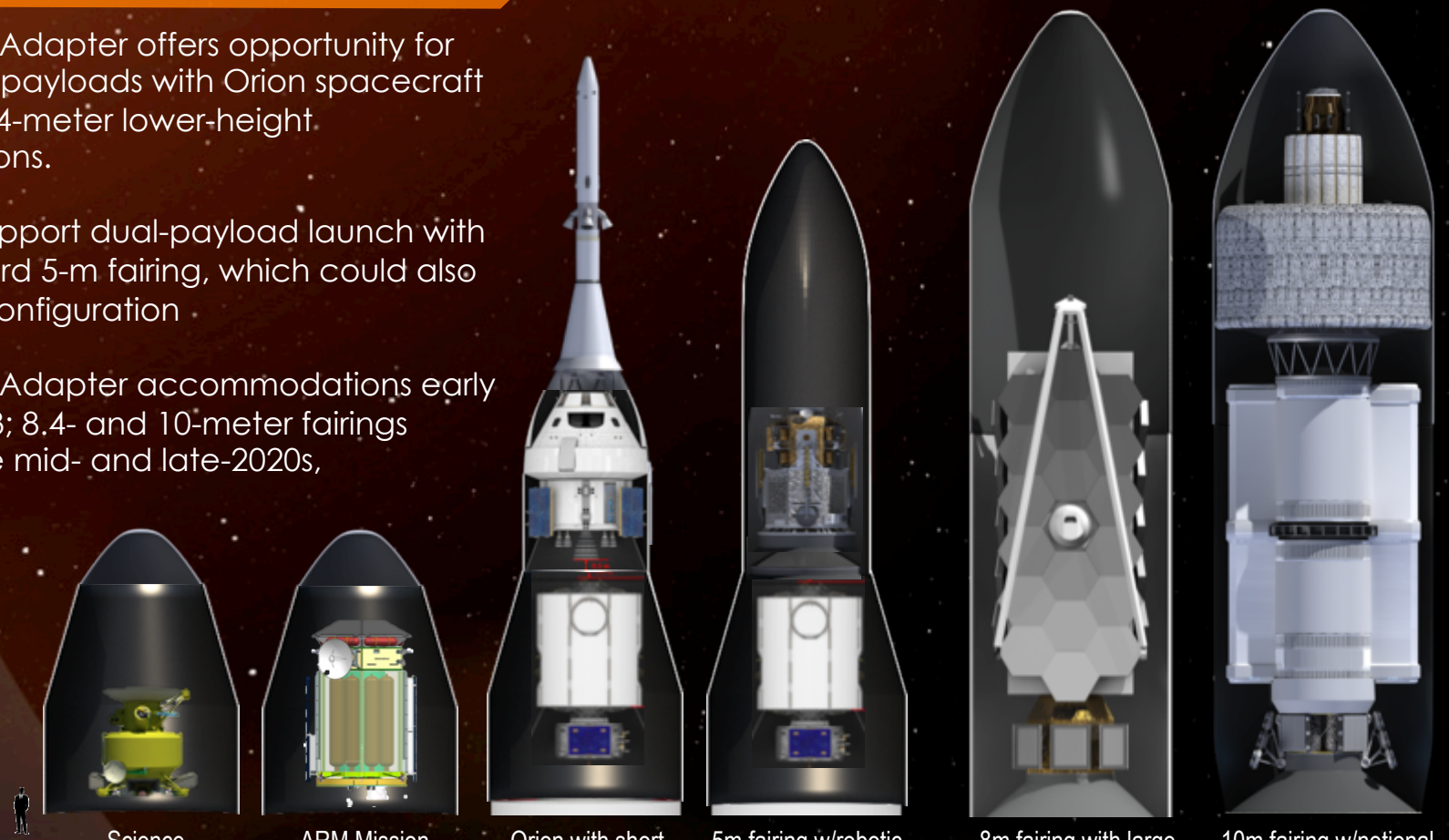
SLS Payload Mission Capture



SLS Payload Accommodations

Fairing Availability

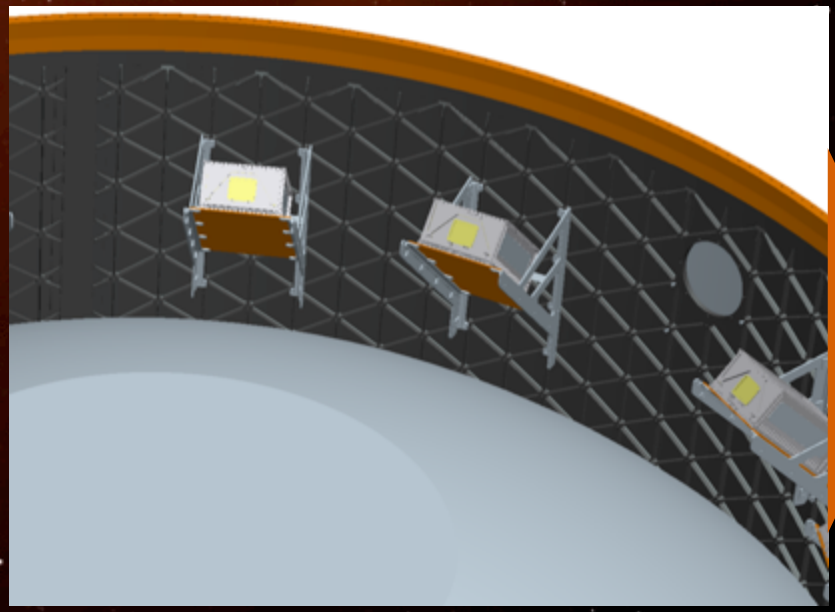
- Universal Stage Adapter offers opportunity for co-manifested payloads with Orion spacecraft or near-term 8.4-meter lower-height accommodations.
- USA can also support dual-payload launch with industry-standard 5-m fairing, which could also fly on Block 1 configuration
- Universal Stage Adapter accommodations early as soon as 2023; 8.4- and 10-meter fairings available in the mid- and late-2020s, respectively.

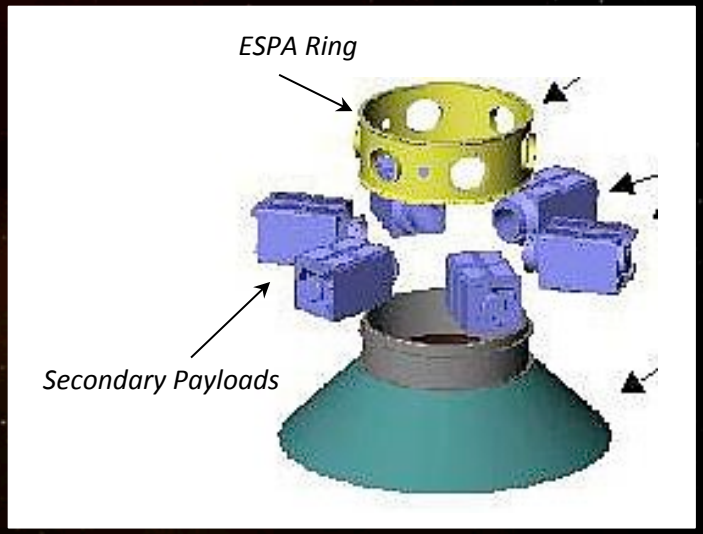


	Science Missions	ARM Mission	Orion with short-duration hab module	5m fairing w/robotic lunar lander & short-duration hab module	8m fairing with large aperture telescope	10m fairing w/notional Mars payload
total mission volume = ~	400m3	400m3	400m3	600m3	1200m3	1800m3

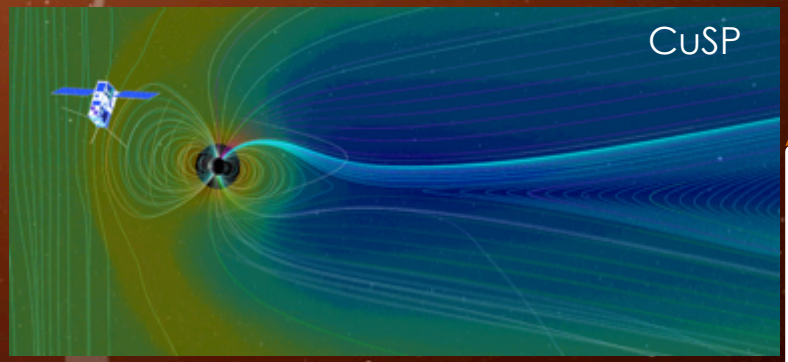
Secondary Payload Capability

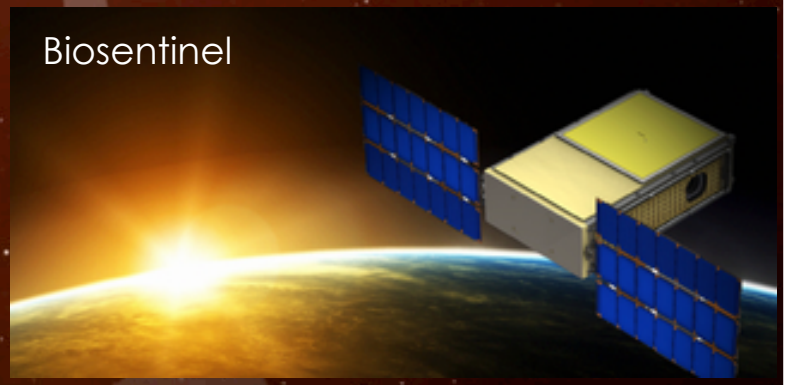
- Block 1 vehicle offers at least thirteen 6U payload locations
- 6U volume/mass is the current standard (14 kg payload mass)
- Payloads will be “off” from roll-out through Orion separation and payload deployment
- Payload Deployment System Sequencer; payload deployment will begin with pre-loaded sequence following MPCV separation and ICPS disposal burn
- Payload requirements captured in Interface Definition and Requirements Document
- Block 1B and 2 vehicles offer up to six larger, ESPA-class secondary payload (>180 kg) accommodations



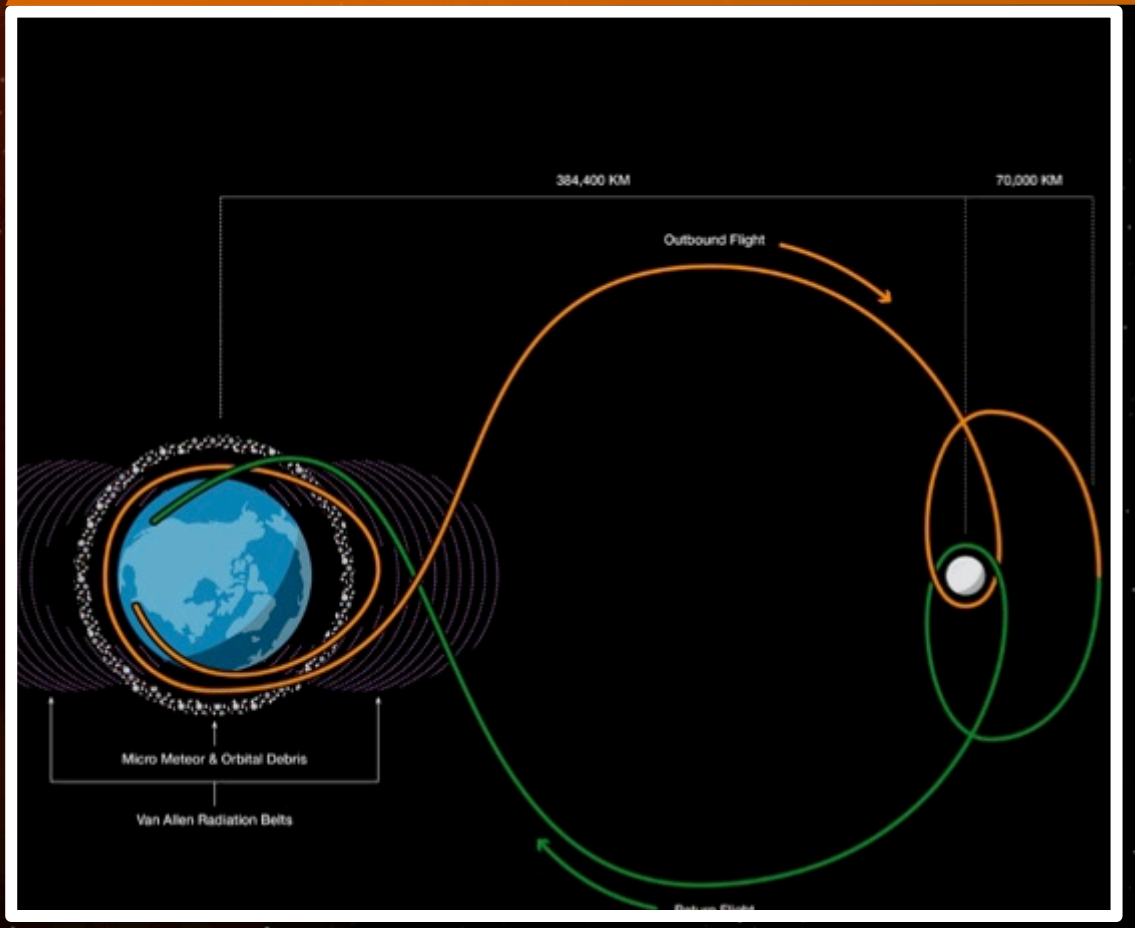


New Opportunities for SmallSats

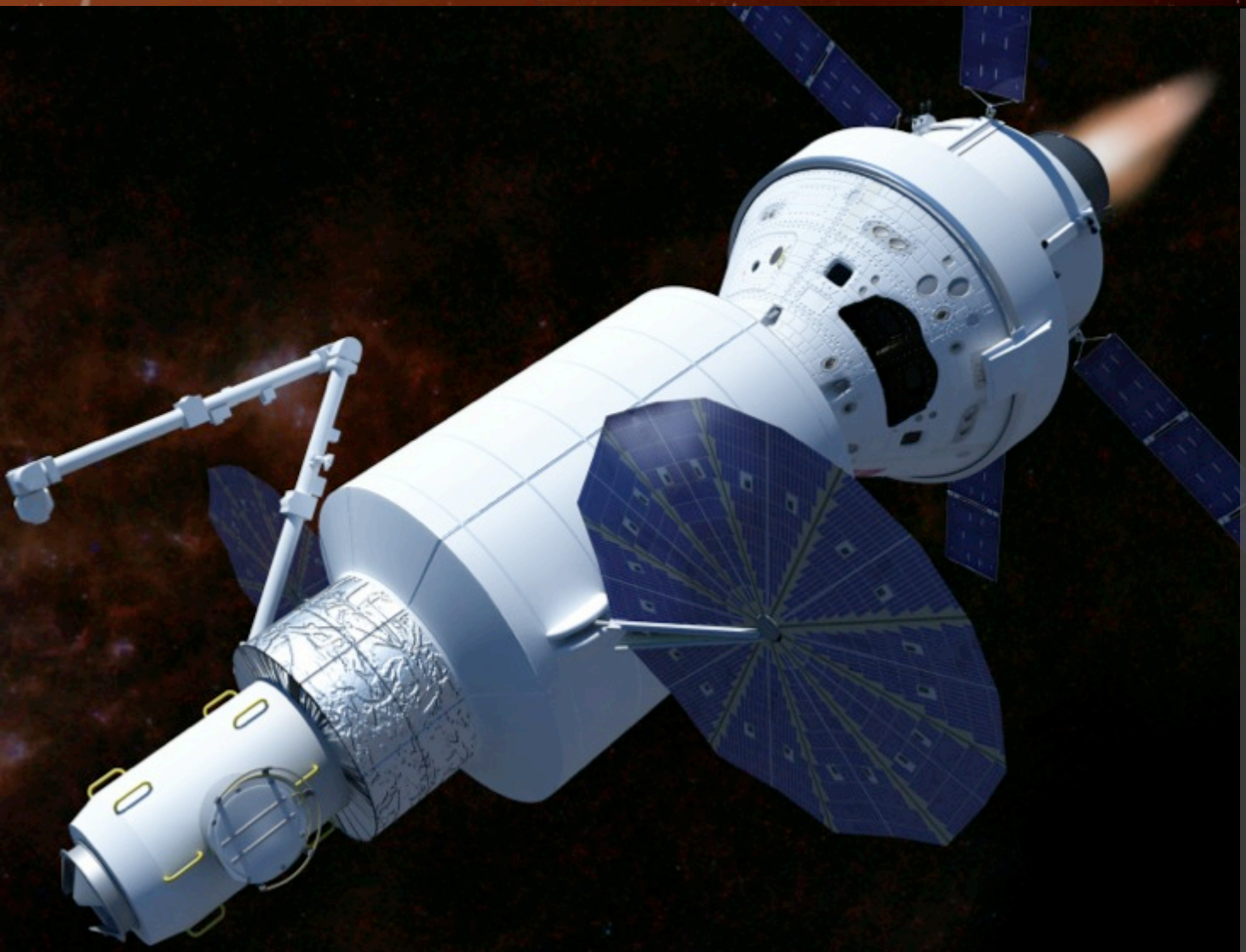


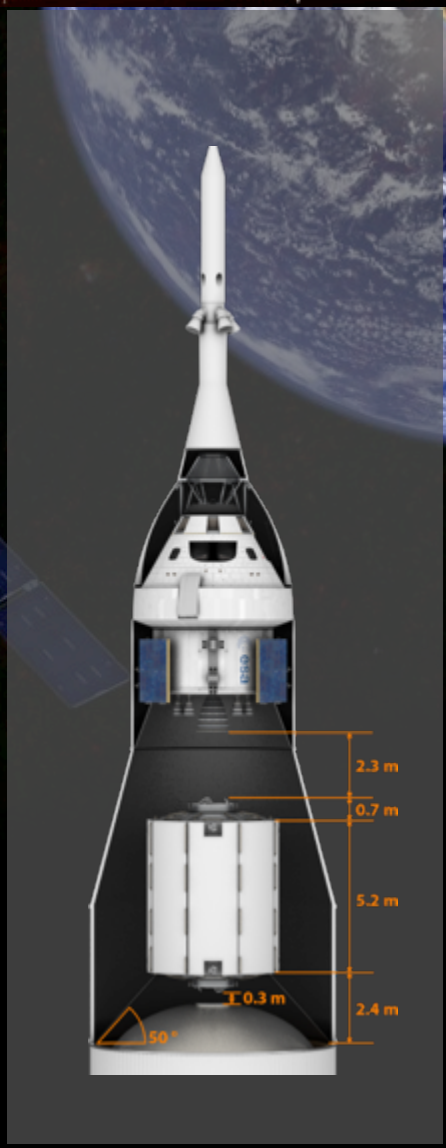


EM-1 Trajectory

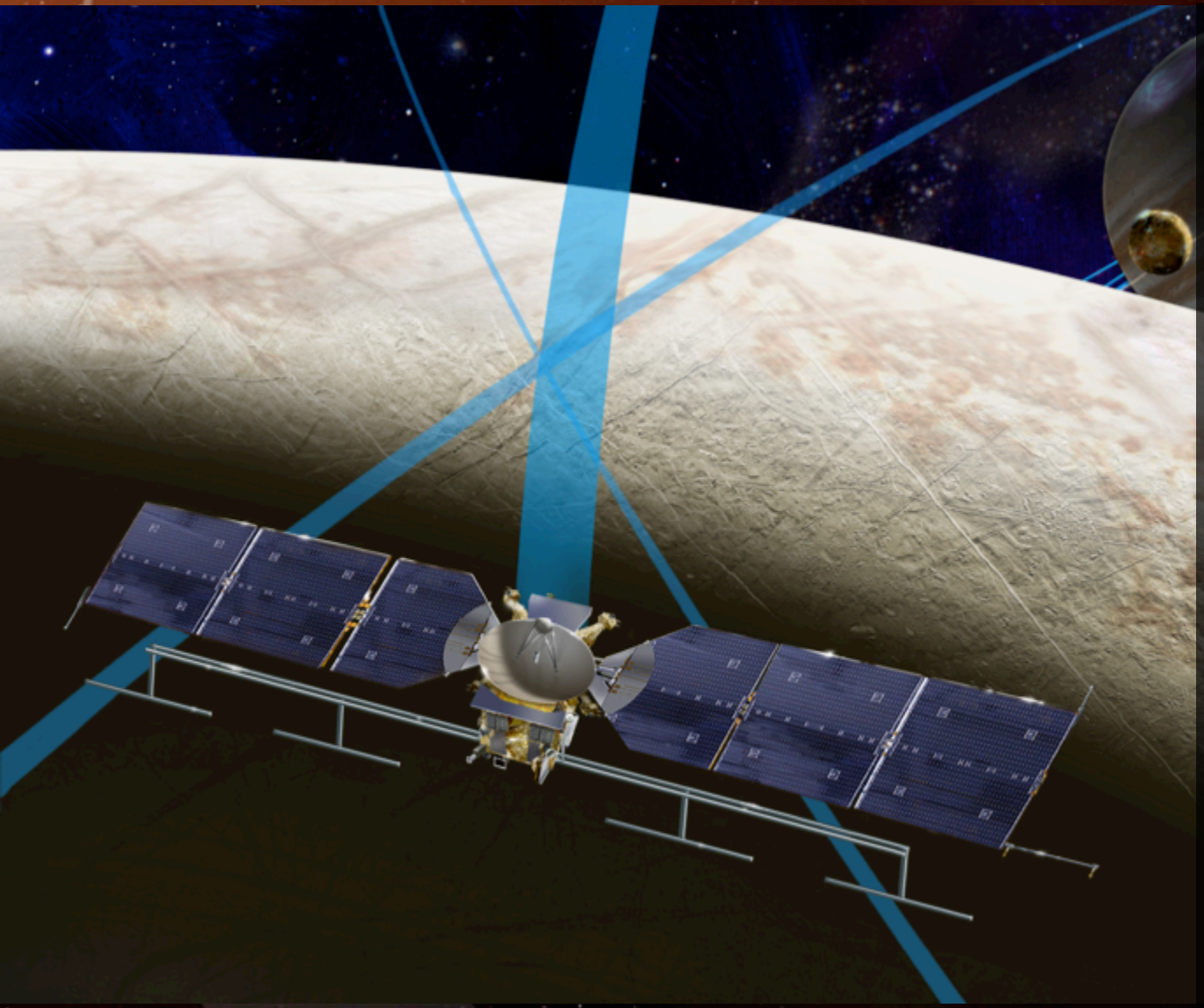


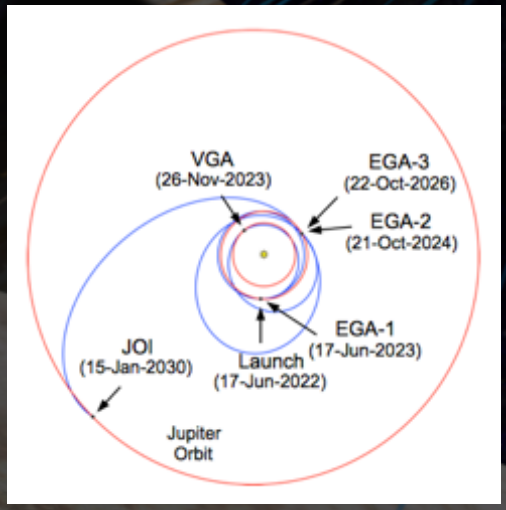
Utilization of SLS Mass Capabilities

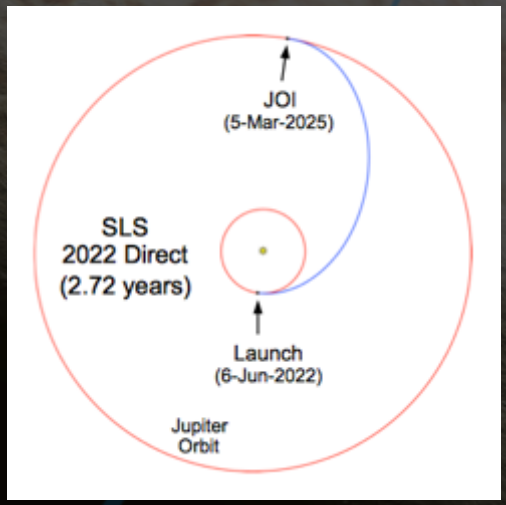




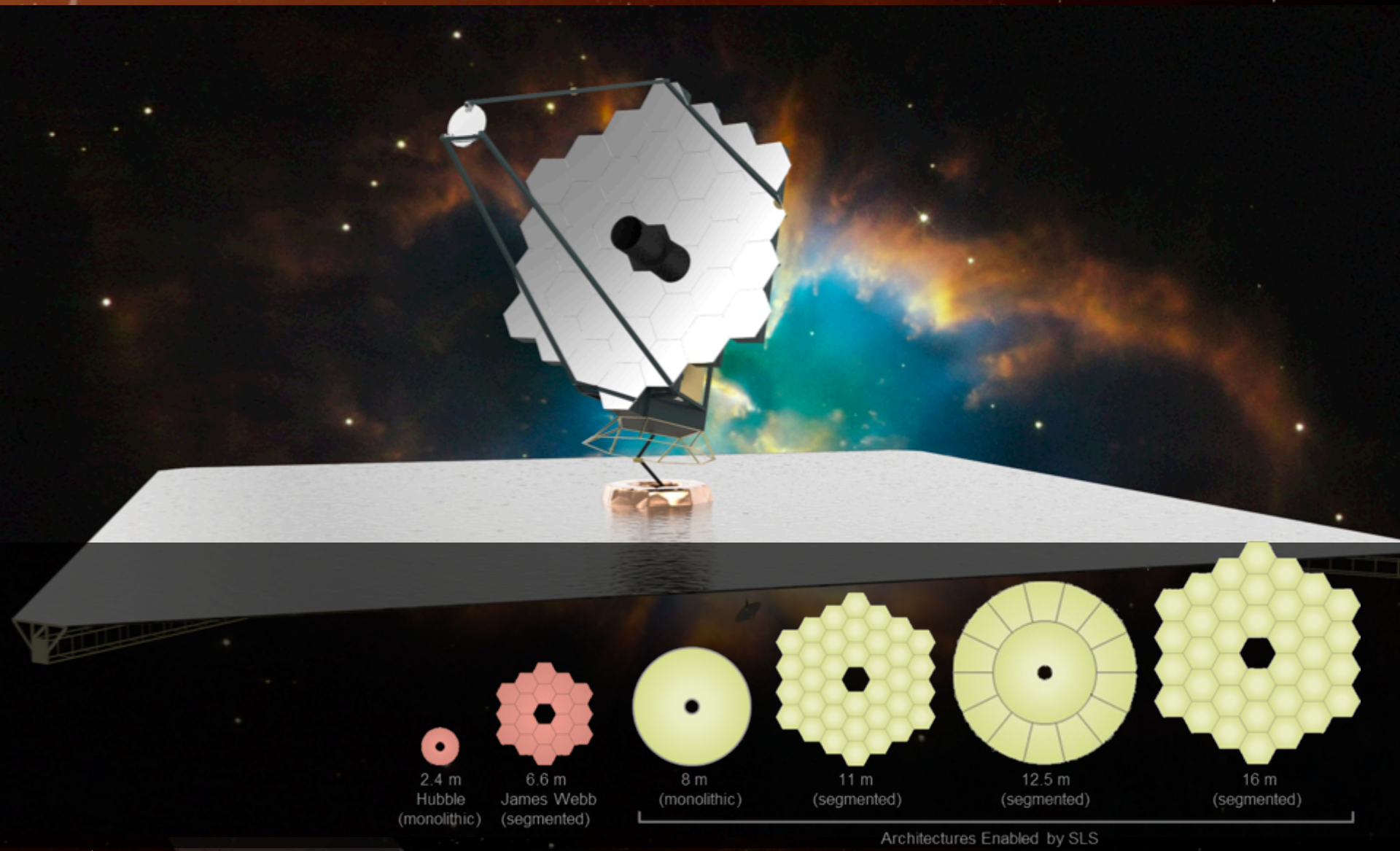
Utilization of SLS Departure Energy







Utilization of SLS Volume



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