Secondary Payloads, EM-1 and Beyond

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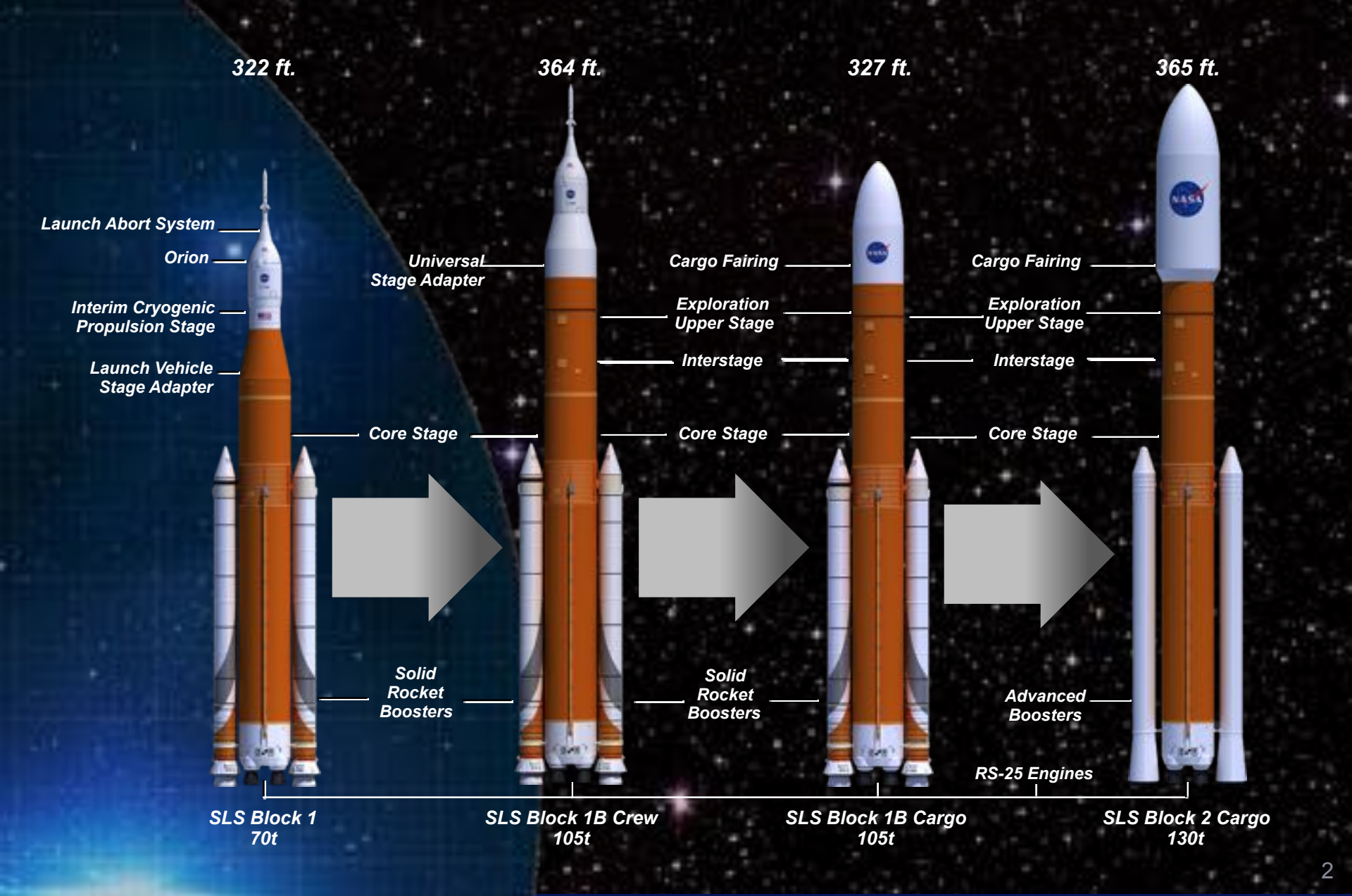
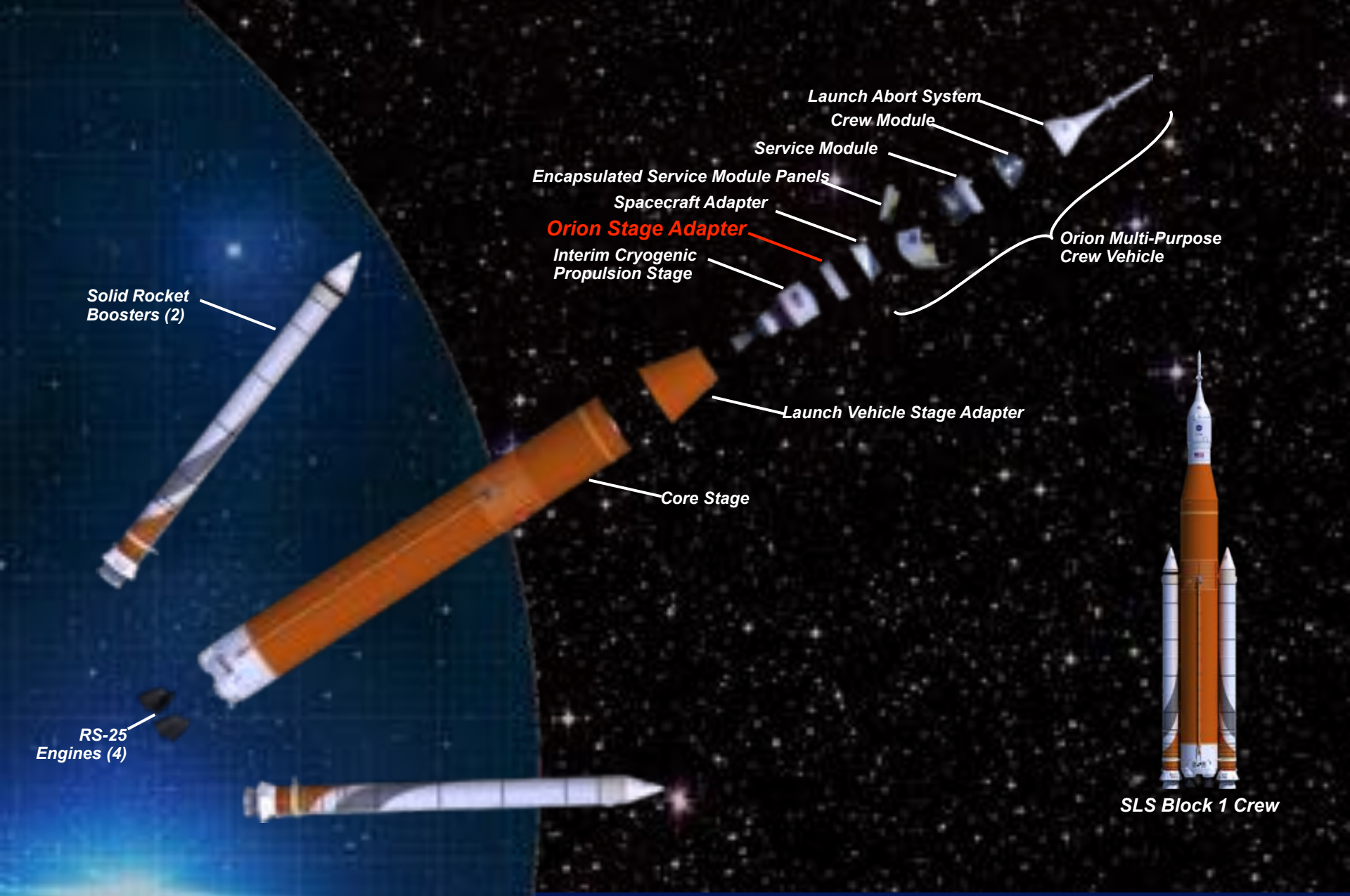
NASA

MARSHALL SPACE FLIGHT CENTER


322 ft.
364 ft.
327 ft.
365 ft.
Launch Abort System
Orion
Interim Cryogenic Propulsion Stage
Launch Vehicle Stage Adapter
Universal Stage Adapter
Cargo Fairing
Exploration Upper Stage
Interstage
Core Stage
Solid Rocket Boosters
Advanced Boosters
RS-25 Engines
SLS Block 1 70t
SLS Block 1B Crew 105t
SLS Block 1B Cargo 105t
SLS Block 2 Cargo 130t

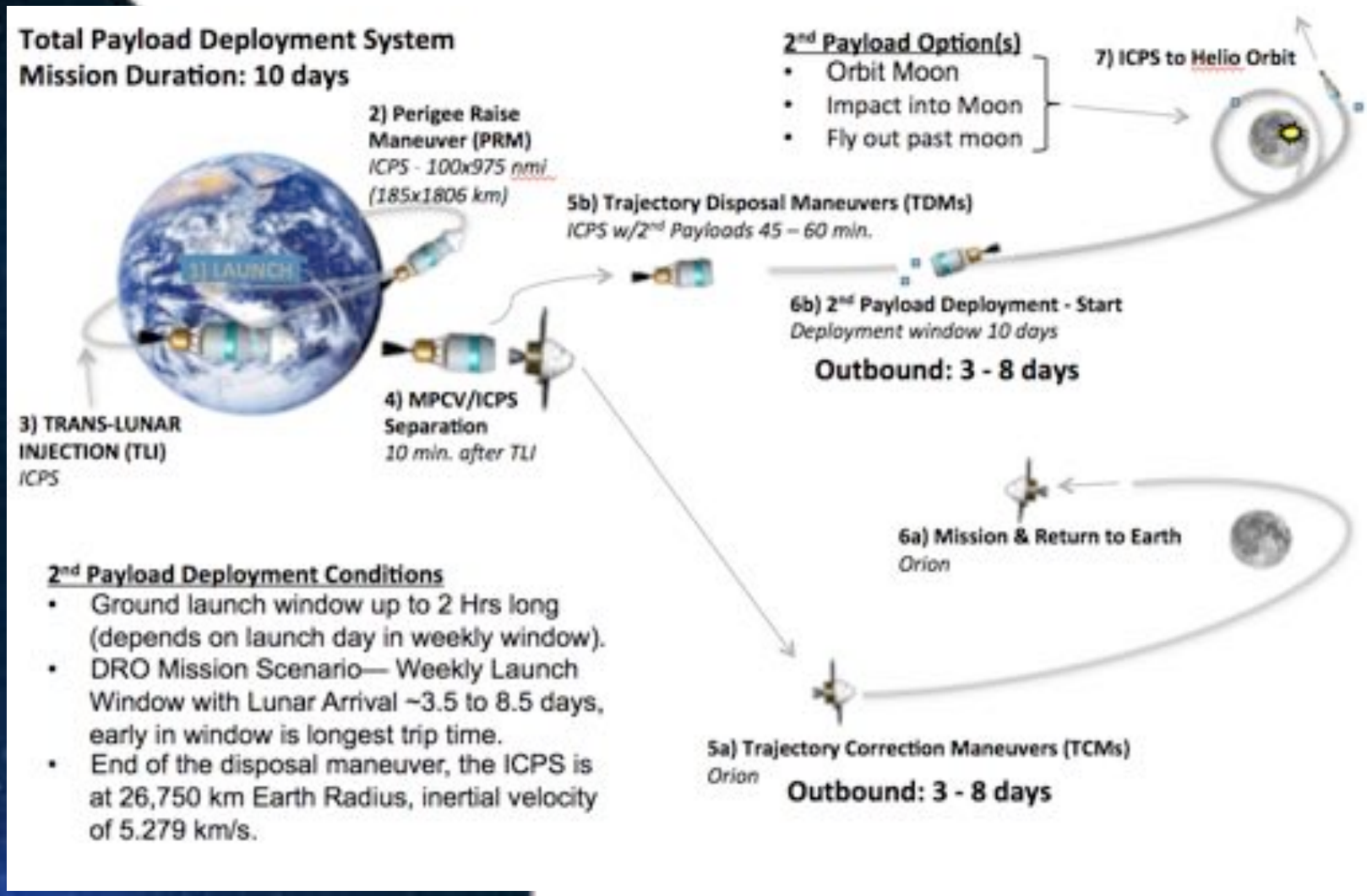
SLS Family



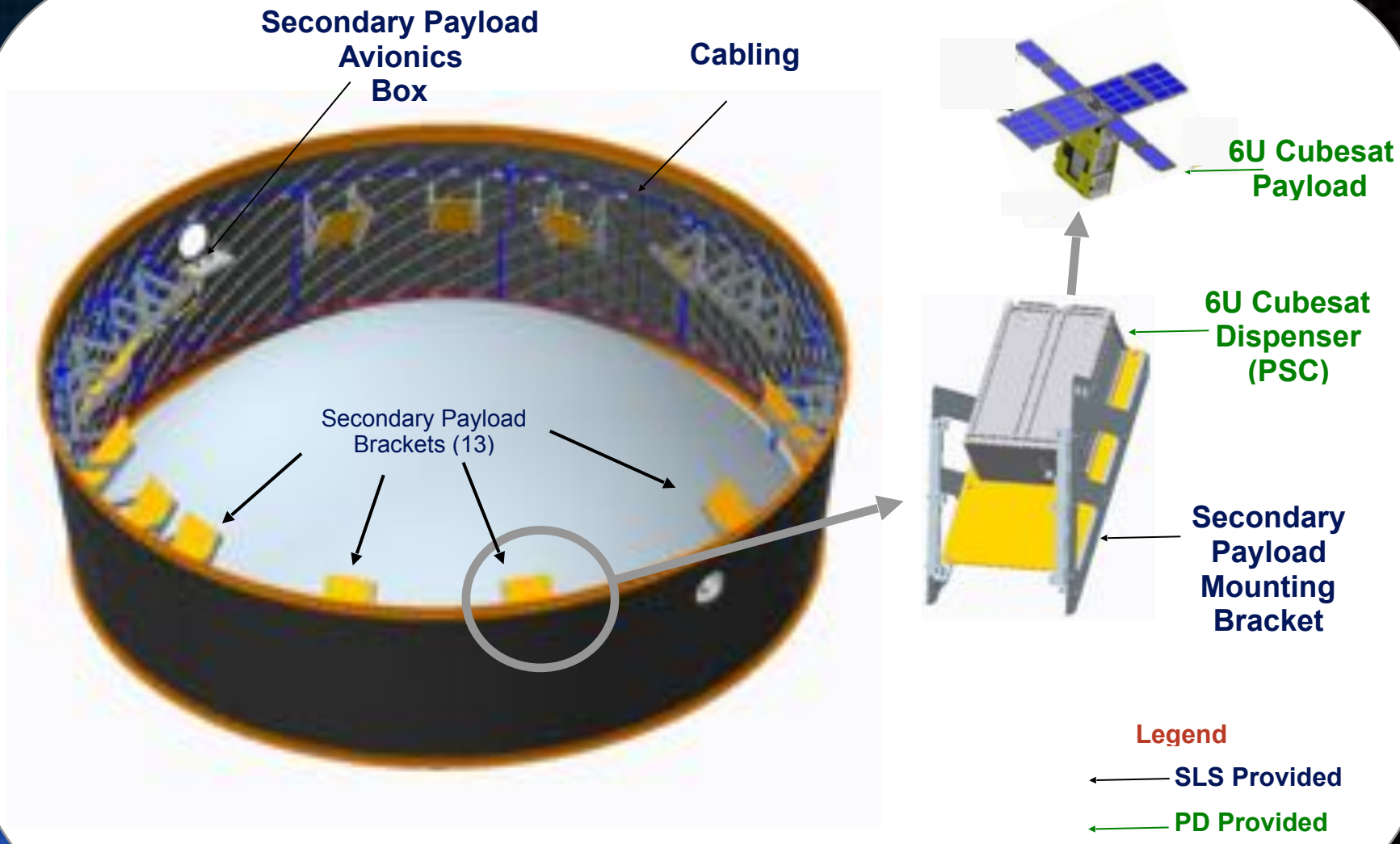
EM-1, SLS Block 1 (70-Metric-Ton)

MSA

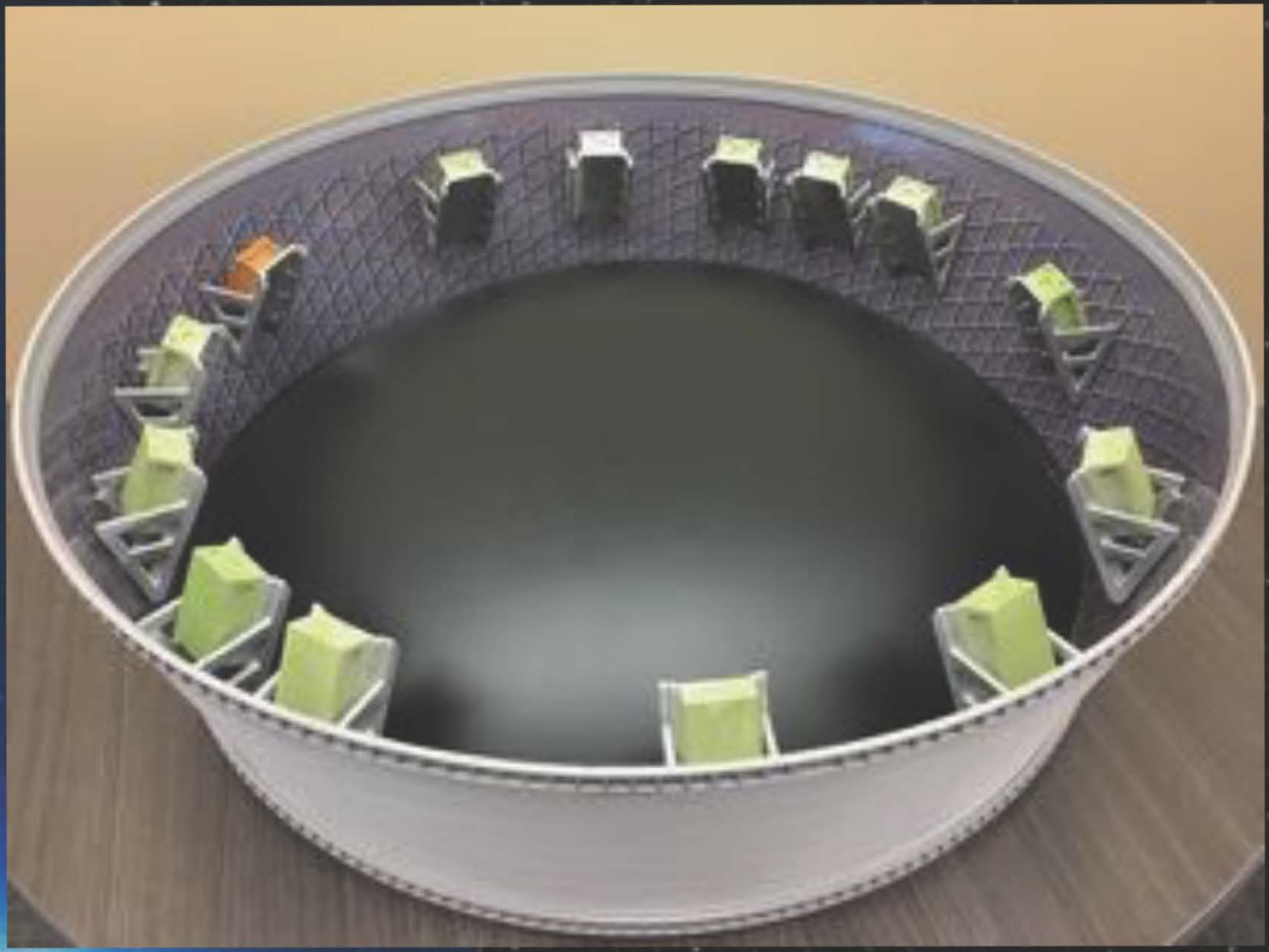
LVSA Structural Test Article



EM-1 Mission Profile



MSA Configuration



EM-1 MSA Configuration Model

Movie of EM-1 Secondary Payload Deployment Place Holder

(removed embedded video so charts can be emailed)

The Moon

Lunar Flashlight
LEAD PARTNER: JPL
SPONSOR: NASA HEO AES
Using a laser, search for ice deposits and locations with valuable resources on the moon.

Lunar IceCube
LEAD PARTNER: Morehead State University of Morehead, Kentucky
SPONSOR: NASA HEO Next Step
Using an Infrared Spectrometer, search for water in all forms and other volatiles on the moon.

LunaH-Map
LEAD PARTNER: Arizona State University, Tempe, Arizona
SPONSOR: NASA SMD Planetary Science
Using neutron spectrometers, create maps of near-surface hydrogen in craters and other permanently shadowed regions of the moon's south pole

OMOTENASHI:
LEAD PARTNER: JAXA
INTERNATIONAL PARTNER: University of Tokyo
Observe the radiation environment and soil mechanics of the moon.

The Sun

CuSP
LEAD PARTNER: Southwest Research Institute of San Antonio, Texas
SPONSOR: NASA SMD Helio Physics
As the first prototype of an interplanetary cubist space weather station, observe space weather events hours before they reach Earth.

The Earth

EQUULEUS
LEAD PARTNER: JAXA
INTERNATIONAL PARTNER: University of Tokyo
Image the earth's plasmasphere for a better understanding of earth's radiation environment

Skyfire
LEAD PARTNER: Lockheed Martin
SPONSOR: NASA HEO Next Step
Perform environmental señor analysis as passing the Moon and in final position in geosynchronous orbit around Earth.

An Asteroid

NEA Scout:
LEAD PARTNER: Marshall Space Flight Center
SPONSOR: NASA HEO AES
Travel by solar sail to a near-earth asteroid and take pictures and other characterizations of its surface.

Avionics Unit
Development Managed By Marshall Space Flight Center
The avionics unit deploys the payloads with an electrical pulse to individual dispensers, activating a spring-loaded deployment mechanism.

Other Missions

BioSentinel
LEAD PARTNER: Ames Research Center
SPONSOR: NASA HEO AES
Use single-celled yeast to detect, measure, and compare the impact of deep-space radiation on living organisms over a long period of time.

ArgoMoon
LEAD PARTNER: European Space Agency/ASI, International Partner
Observe the Interim Cryogenic Propulsion Stage as it follows its disposal stage

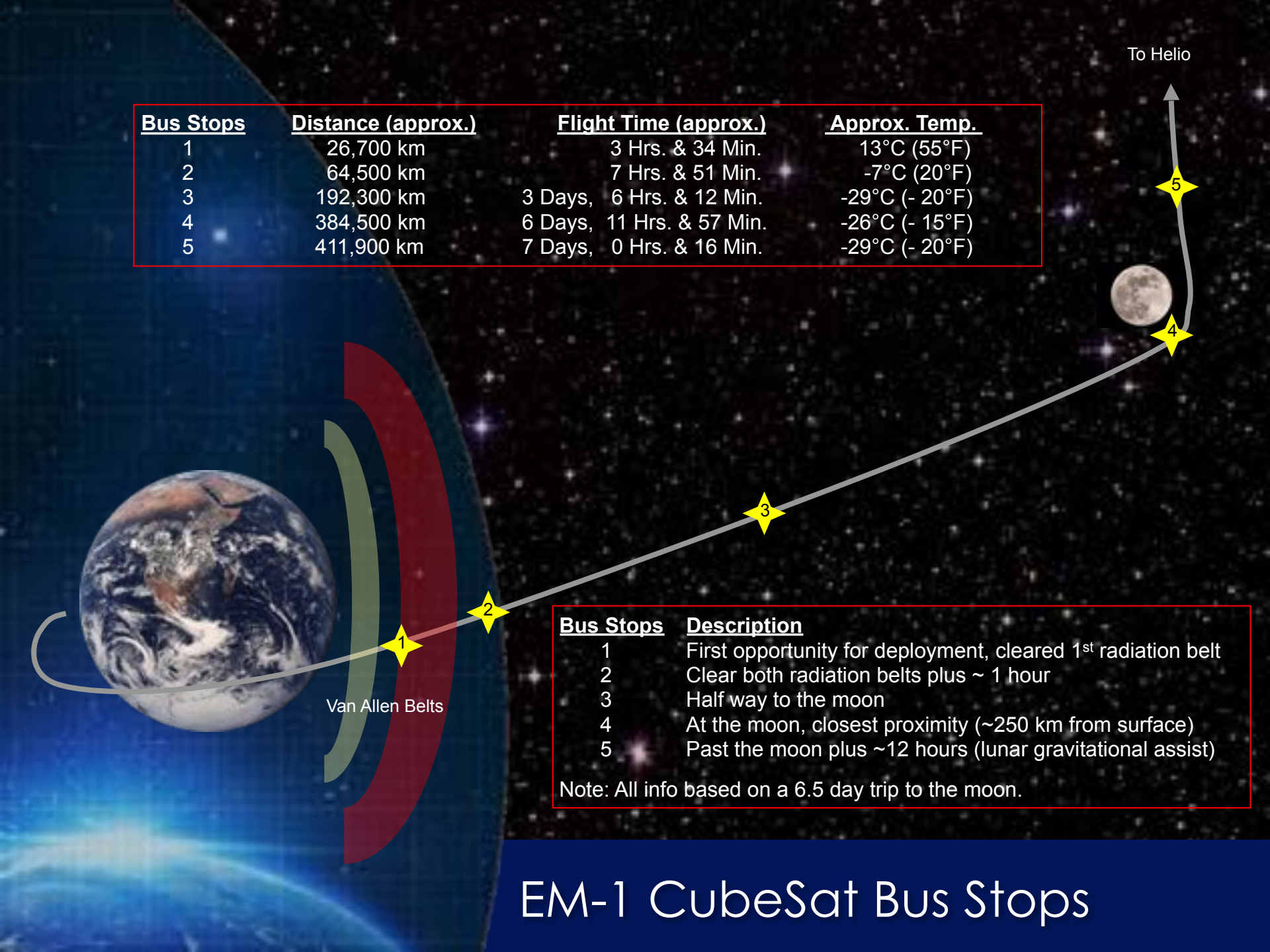
Centennial Challenge's Cube Quest Winners

As winners of the Ground Tournament, three CubeQuest payloads will ride on EM-1. Once in deep space, the next phase of the Cube Quest Challenge begins with the Deep Space Derby and the Lunar Derby. Each payload will demonstrate various communications, navigation and longevity achievements. Competitors have a shot at $5 million in prize money, marking the agency's largest-ever prize competition.

Team Miles (Fluid & Reason, LLC)
Cislunar Explorers (Cornel University)
SEDS Triteia (University of California at San Diego)
Heimdallr (Ragnarok Industries)
CU-E3 (University of Colorado)

SLS EM-1 Secondary Payloads

EM-1 CubeSat Developer Locations

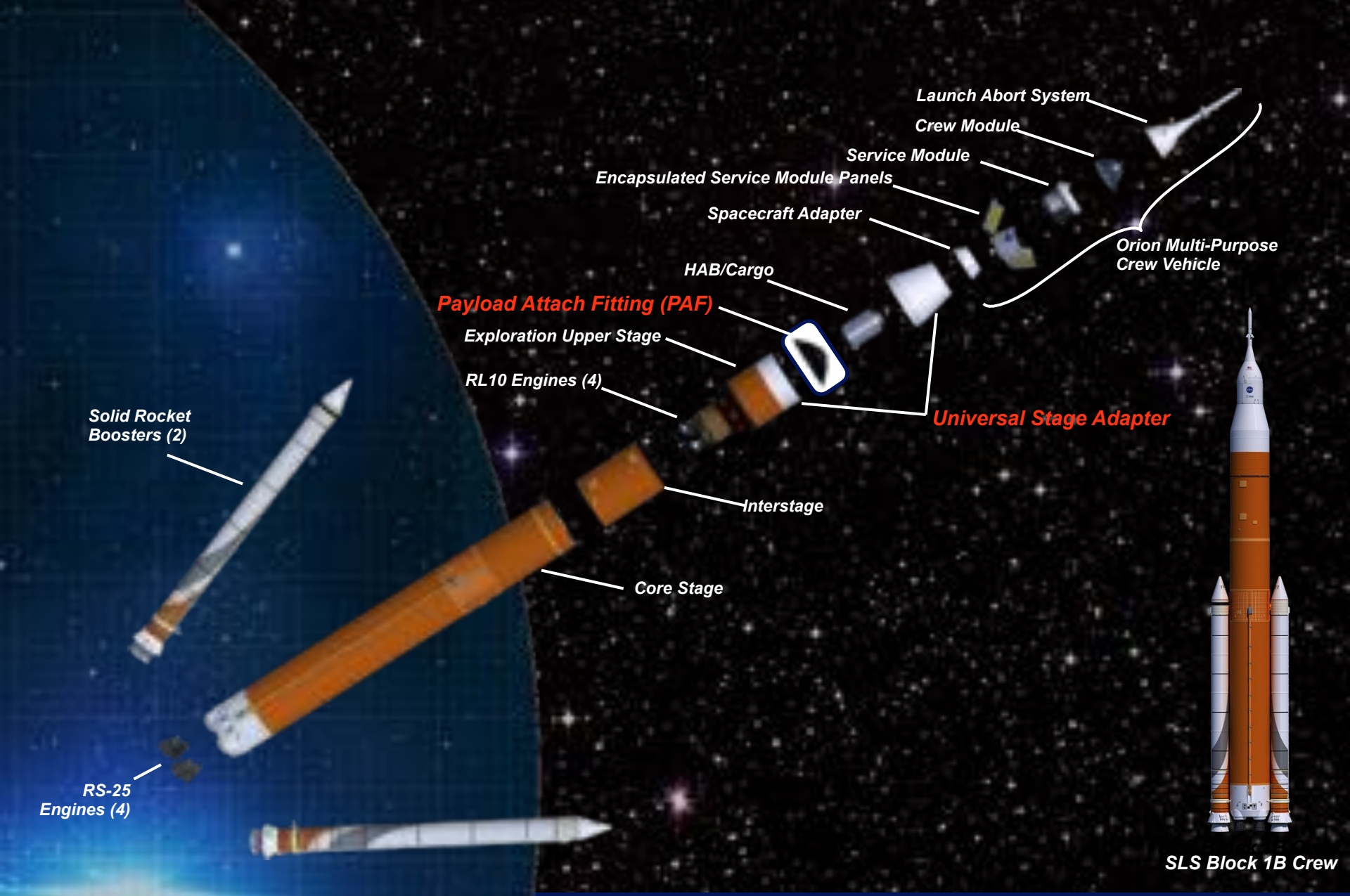


Bus Stops	Distance (approx.)	Flight Time (approx.)	Approx. Temp.
1	26,700 km	3 Hrs. & 34 Min.	13°C (55°F)
2	64,500 km	7 Hrs. & 51 Min.	-7°C (20°F)
3	192,300 km	3 Days, 6 Hrs. & 12 Min.	-29°C (- 20°F)
4	384,500 km	6 Days, 11 Hrs. & 57 Min.	-26°C (- 15°F)
5	411,900 km	7 Days, 0 Hrs. & 16 Min.	-29°C (- 20°F)

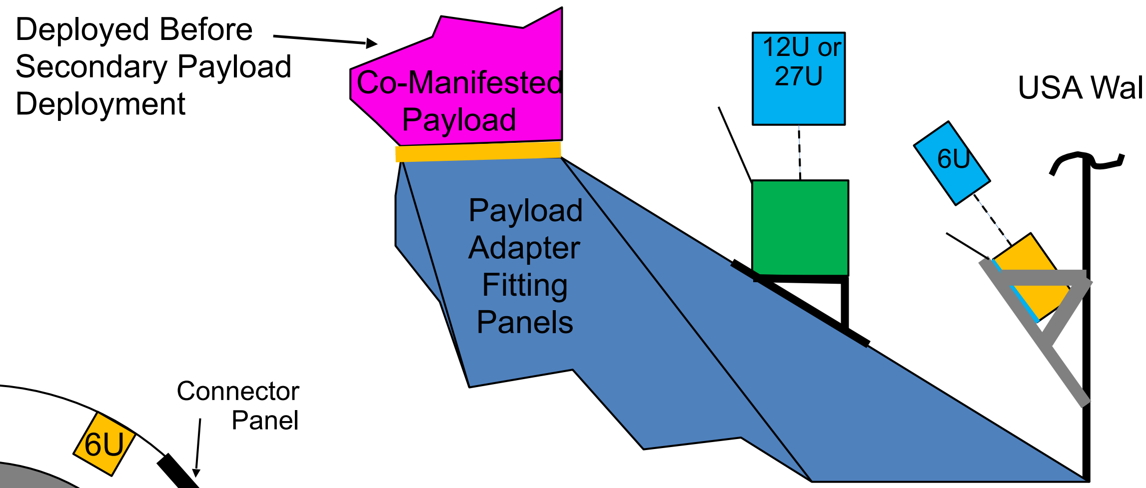
Bus Stops	Description
1	First opportunity for deployment, cleared 1st radiation belt
2	Clear both radiation belts plus ~ 1 hour
3	Half way to the moon
4	At the moon, closest proximity (~250 km from surface)
5	Past the moon plus ~12 hours (lunar gravitational assist)

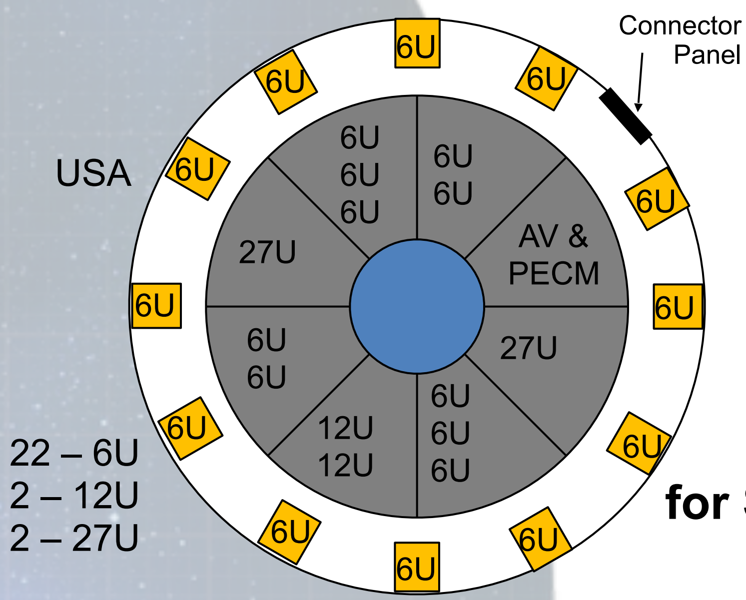
Note: All info based on a 6.5 day trip to the moon.

EM-1 CubeSat Bus Stops



Block 1B Crew





(USA & Payload Adapter Fitting for Secondary Payload mounting locations)

B1B SecPay Config Concept

B1B SecPay Config. Concept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