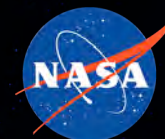


National Aeronautics and Space Administration



# Space Launch System Status

*Todd A. May, Program Manager*  
*Garry M. Lyles, Chief Engineer*

May 2012





“To reach for new heights...

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

National Aeronautics and  
Space Administration

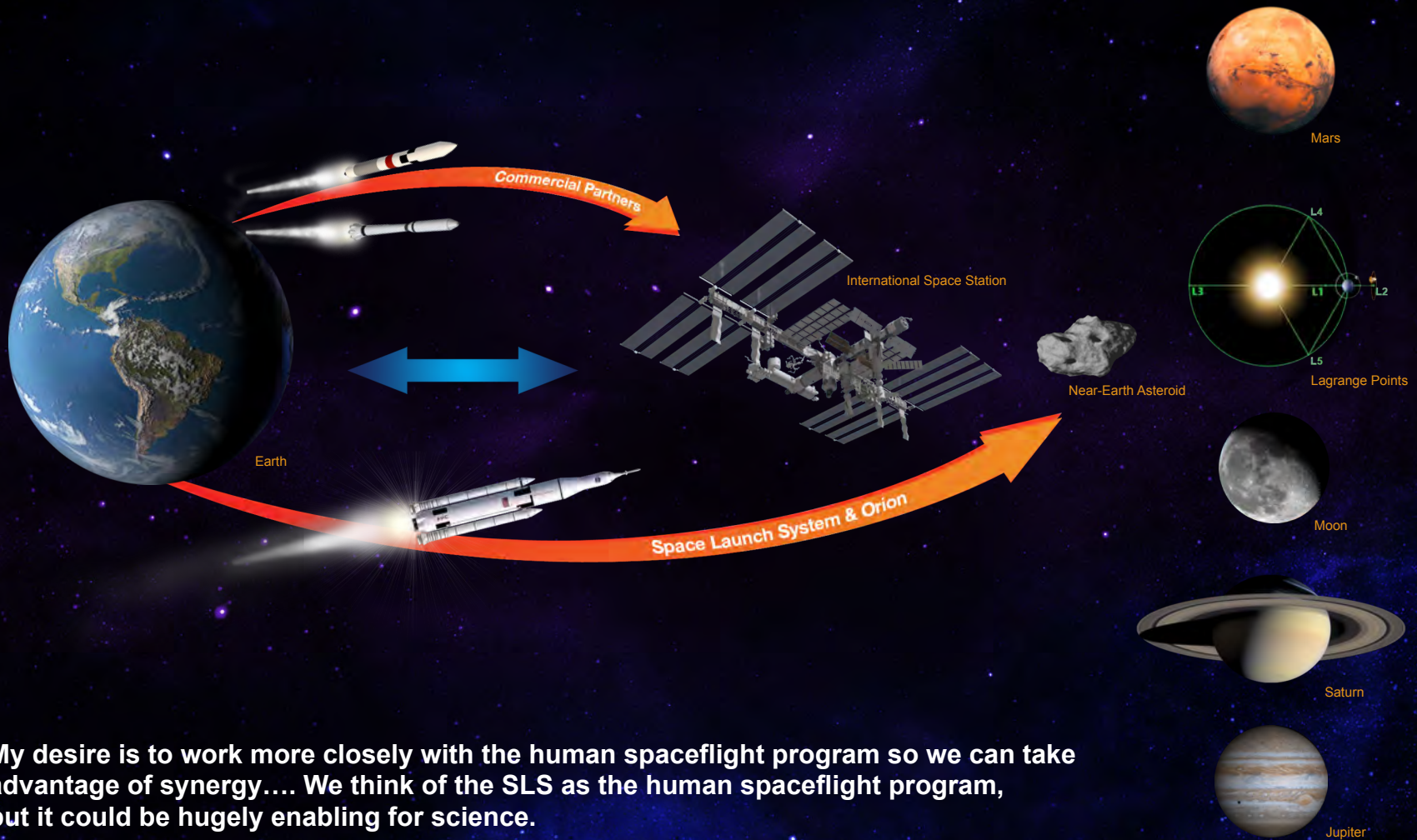


# ***SLS Launches in 2017***

*“Extend and sustain human activities  
across the solar system.”*  
NASA 2011 Strategic Plan



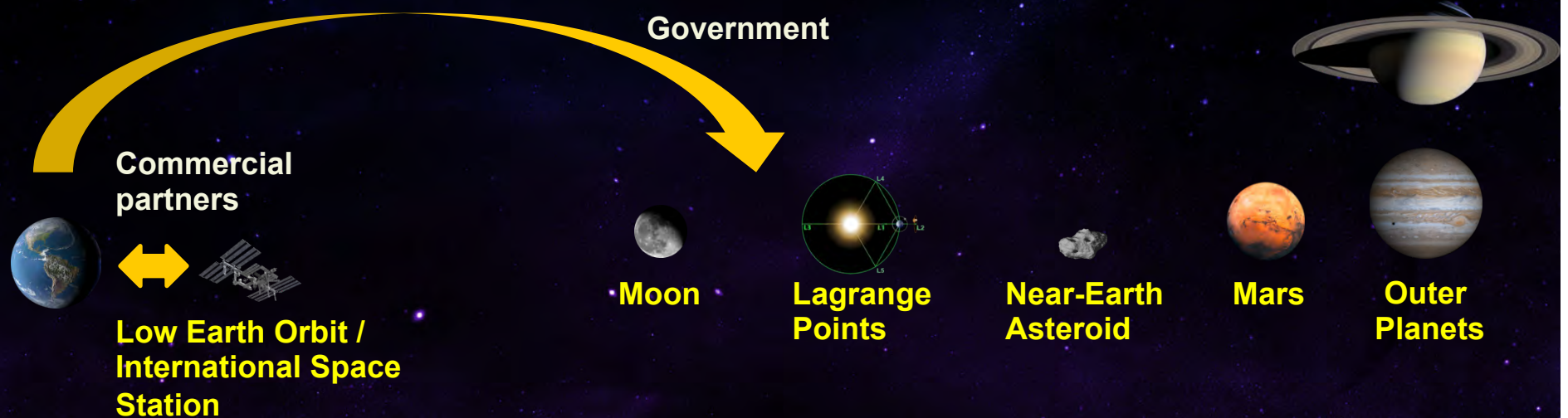
# The Future of Exploration



My desire is to work more closely with the human spaceflight program so we can take advantage of synergy.... We think of the SLS as the human spaceflight program, but it could be hugely enabling for science.

— John Grunsfeld, Associate Administrator  
NASA Science Mission Directorate  
Nature, Jan 19, 2012

# The Future of Exploration



## Development

- Proven capabilities
- Proven market potential
- Understood risks and hazards
- Known costs
- Predictable return on investment
- Refining known engineering
- Using existing technology
- Existing infrastructure
- Mature research infrastructure

## Exploration

- New capabilities
- Undetermined market potential
- Undefined risks and hazards
- Indeterminate costs
- Indeterminate (or zero) ROI on indeterminate timeline
- Engineering existing hardware for new environment or developing new technologies
- No infrastructure
- Unique, groundbreaking research



# A National Asset for Stakeholders and Partners

Incremental steps to steadily build, test, refine, and qualify capabilities that lead to affordable flight elements and a deep space capability.

Mars: 33,900,000 mi  
54,556,000 km

## Planetary Exploration

- Mars
- Solar System

## Exploring Other Worlds

- Low-Gravity Bodies
- Full-Capability Near-Earth Asteroid Missions
- Phobos/Deimos

## Into the Solar System

- Interplanetary Space
- Initial Near-Earth Asteroid Missions
- Lunar Surface

## Extending Reach Beyond LEO

- Cis-Lunar Space
- Geostationary Orbit
- High-Earth Orbit
- Lunar Flyby & Orbit

## Initial Exploration Missions

- International Space Station
- Space Launch System
- Orion Multi-Purpose Crew Vehicle
- Ground Systems Development & Operations
- Commercial Spaceflight Development

Moon: 237K mi / 381K km

ISS: 237 mi / 381 km

Surface Capabilities Needed

Advanced Propulsion Needed

High Thrust In-Space Propulsion Needed

Long Duration Habitat Needed

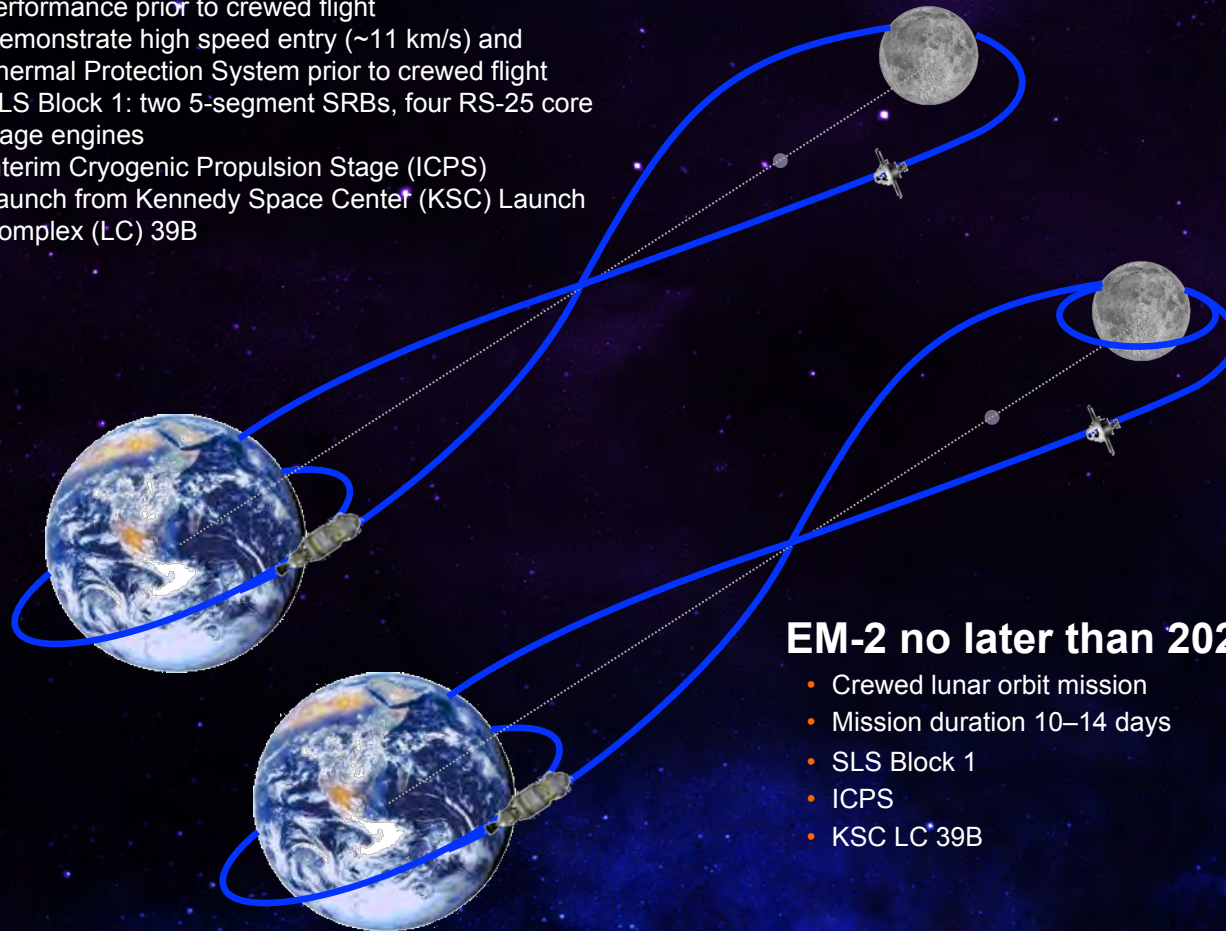
# SLS — Going Beyond Earth's Orbit



# Initial Exploration Missions (EM)

## EM-1 in 2017

- Un-crewed circumlunar flight – free return trajectory
- Mission duration ~7 days
- Demonstrate integrated spacecraft systems performance prior to crewed flight
- Demonstrate high speed entry (~11 km/s) and Thermal Protection System prior to crewed flight
- SLS Block 1: two 5-segment SRBs, four RS-25 core stage engines
- Interim Cryogenic Propulsion Stage (ICPS)
- Launch from Kennedy Space Center (KSC) Launch Complex (LC) 39B

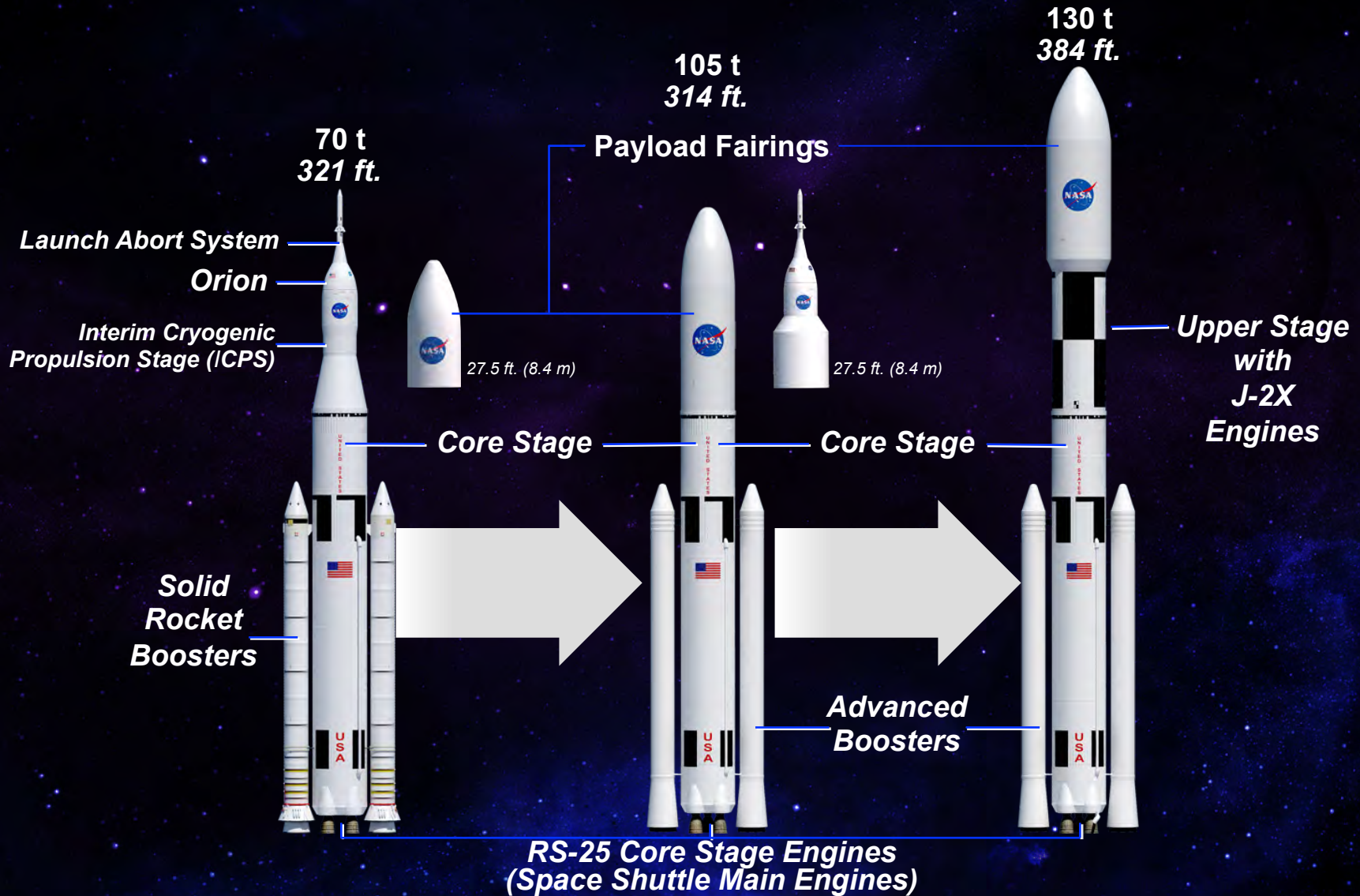


## EM-2 no later than 2021

- Crewed lunar orbit mission
- Mission duration 10–14 days
- SLS Block 1
- ICPS
- KSC LC 39B



# SLS Architecture Block Upgrade Approach

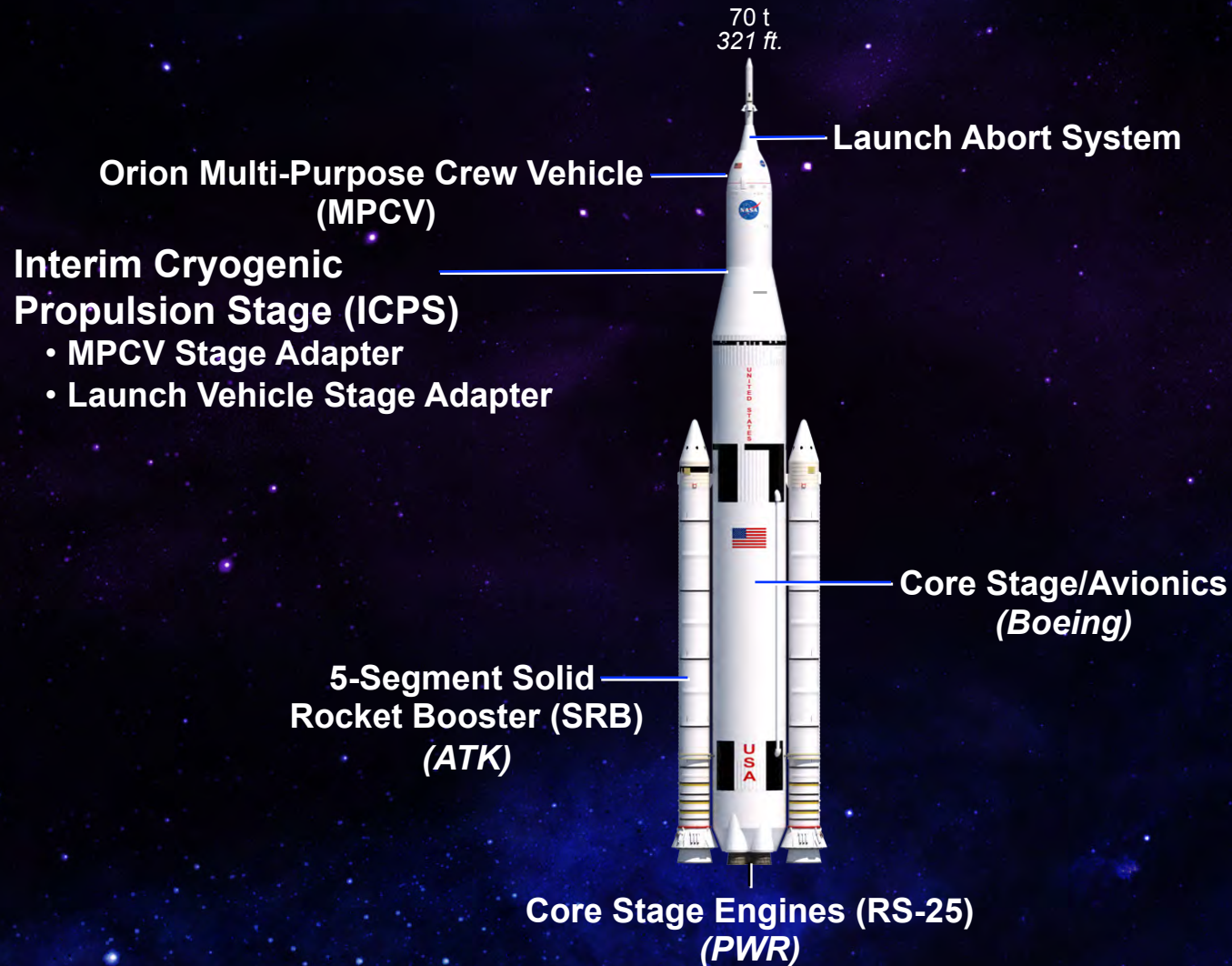


*Starting with Available Assets and Evolving the Design*



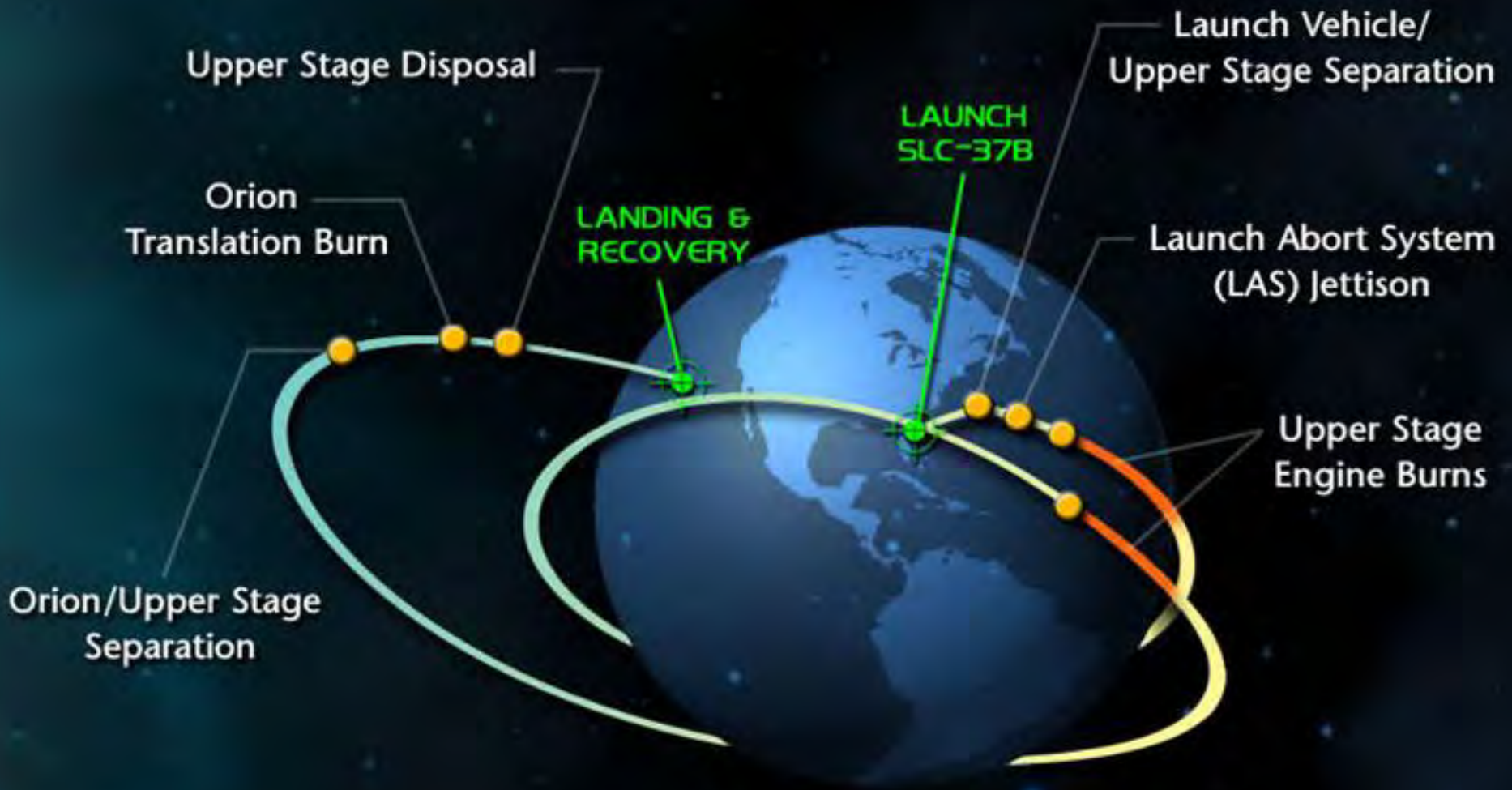
# SLS 70 Metric Tons: *First Flight 2017*

INITIAL CAPABILITY, 2017-21





# Exploration Flight Test-1 Mission Overview







*SLS will launch from  
Kennedy Space Center  
in 2017*





**Core Stage  
Engine (RS-25)**





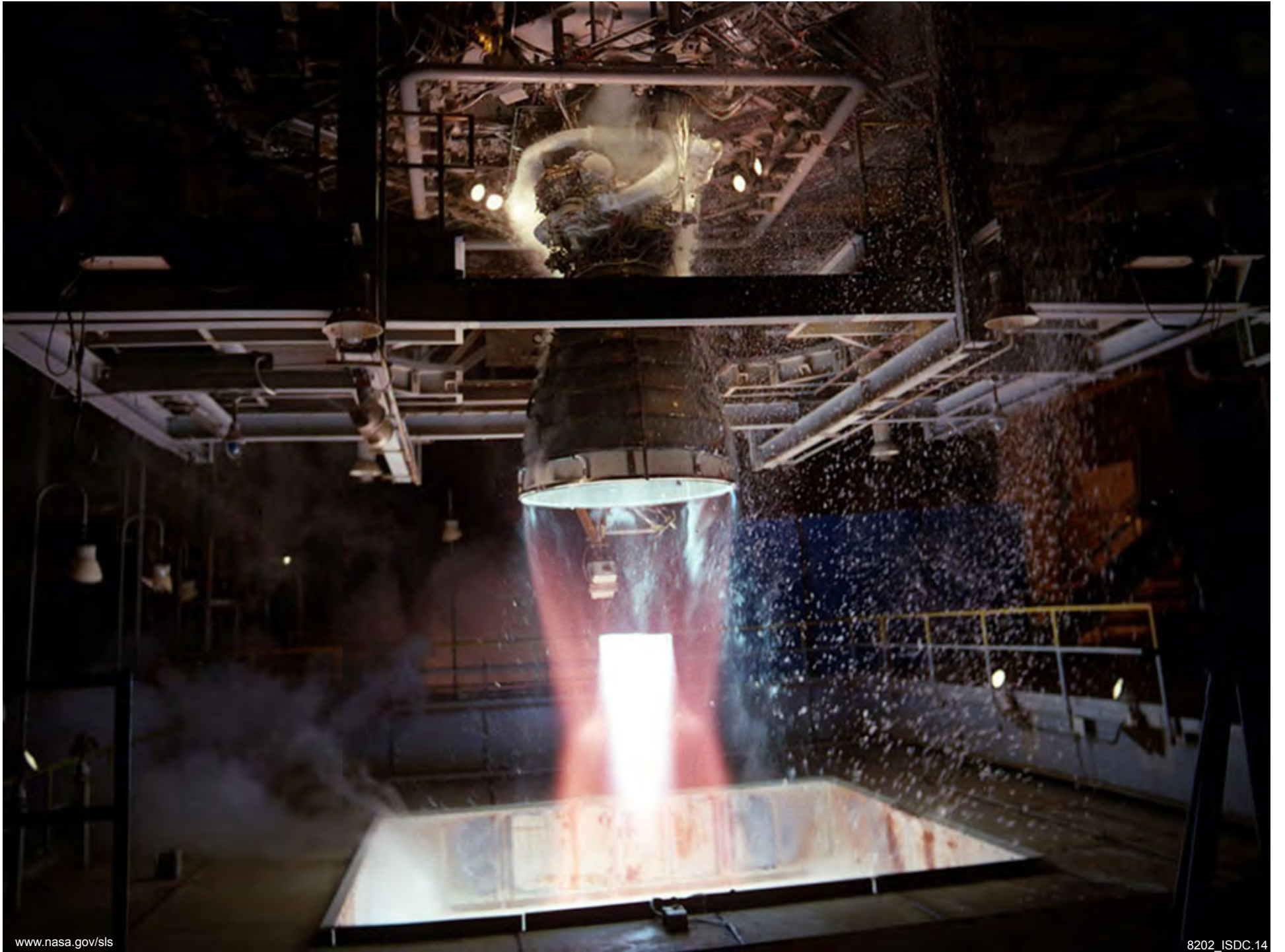
**Space Shuttle Main Engine packed into a container for shipment to Stennis Space Center**



Space Shuttle Main Engines being received at Stennis Space Center, Mississippi











**Solid Rocket Booster awaiting  
Development Motor Test 3 at  
ATK's Promontory, Utah Test  
Site, September 8, 2011**





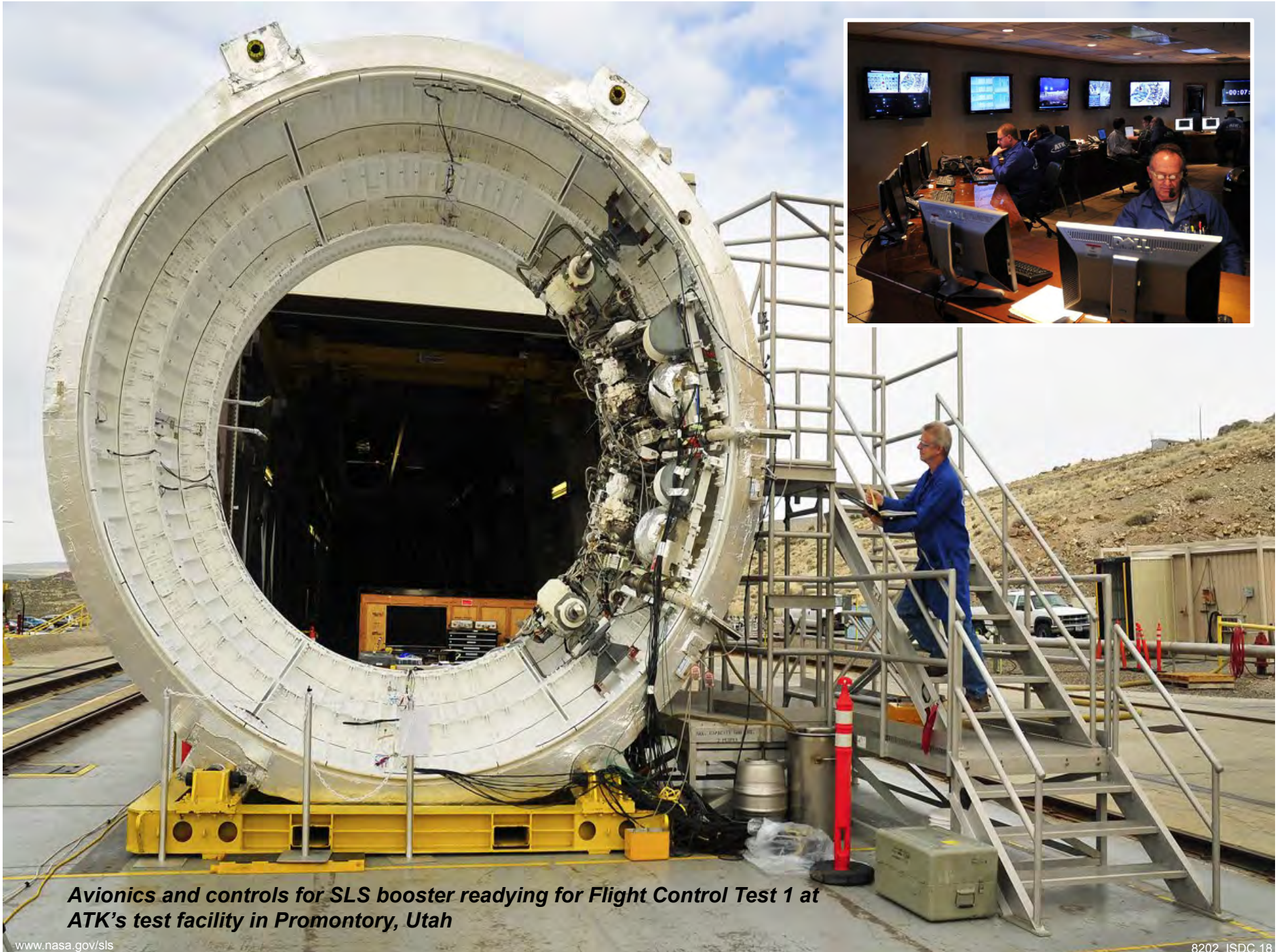
*Development Motor Test 3  
ATK Promontory, Utah  
Test Site, September 8, 2011*





*Motor casings for Qualification Motor 1 are inspected at ATK's facility in Brigham City, Utah*





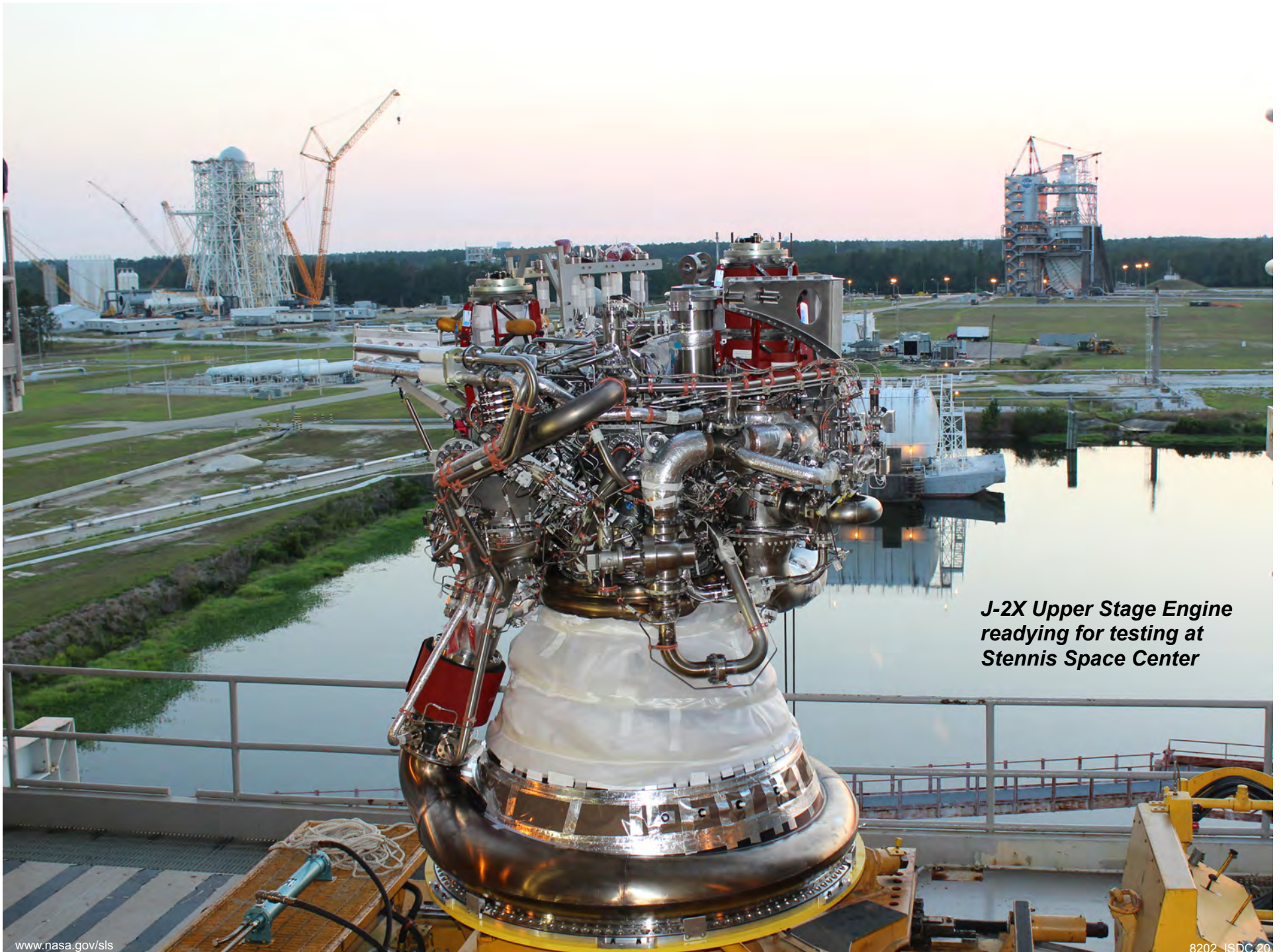
**Avionics and controls for SLS booster readying for Flight Control Test 1 at ATK's test facility in Promontory, Utah**



*Subscale solid rocket motor test performed at Marshall Space Flight Center, Alabama to evaluate new nozzle insulation material*

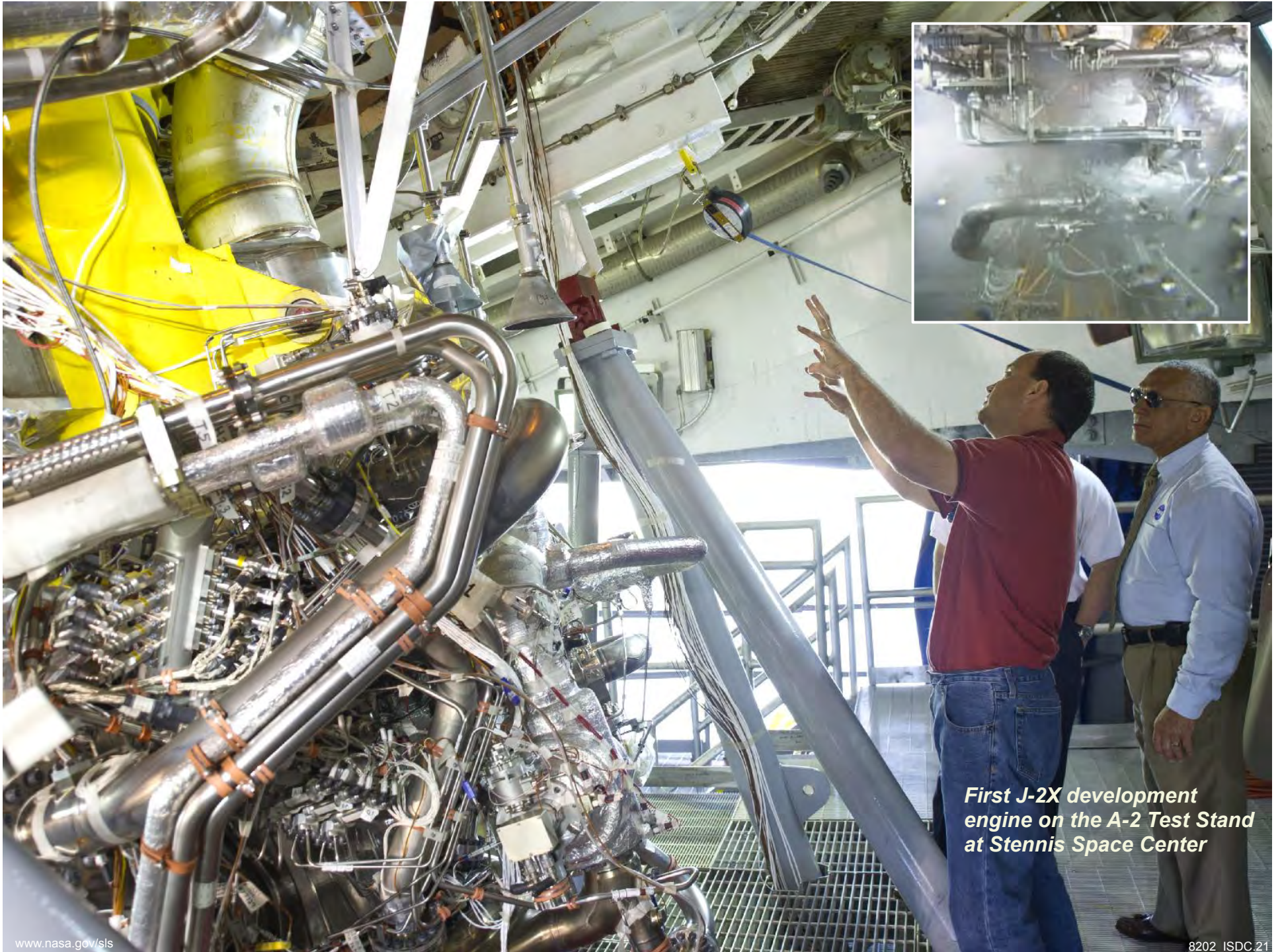






***J-2X Upper Stage Engine  
readying for testing at  
Stennis Space Center***





*First J-2X development engine on the A-2 Test Stand at Stennis Space Center*





***J-2X Upper Stage Engine  
test at Stennis Space Center,  
Mississippi***





*J-2X Upper Stage Engine  
subscale injector test at  
Marshall Space Flight  
Center, Alabama*

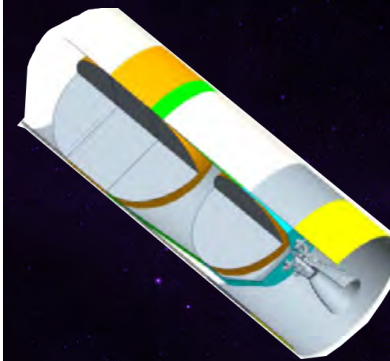




*J-2X Upper Stage Engine  
Powerpack test, Stennis  
Space Center, Mississippi*



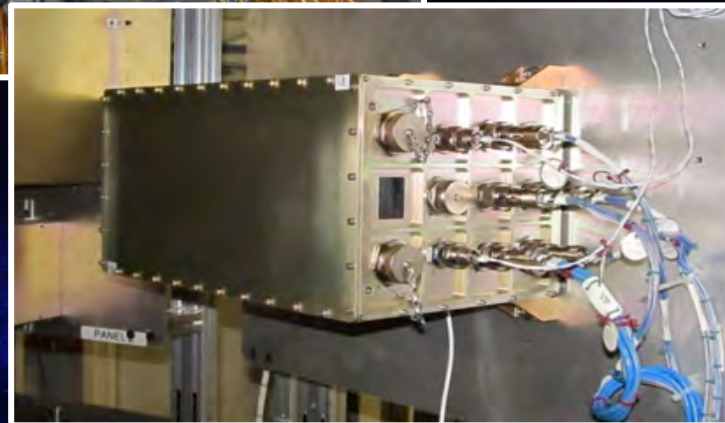
# Stages and Avionics



Upper Stage



Core Stage







*Barrel section buckling test,  
Marshall Space Flight Center,  
Alabama*





***Design for Orion Multi-Purpose Crew Vehicle Stage Adapter completed for EFT-1 mission***



# Orion MPCV Stage Adapter



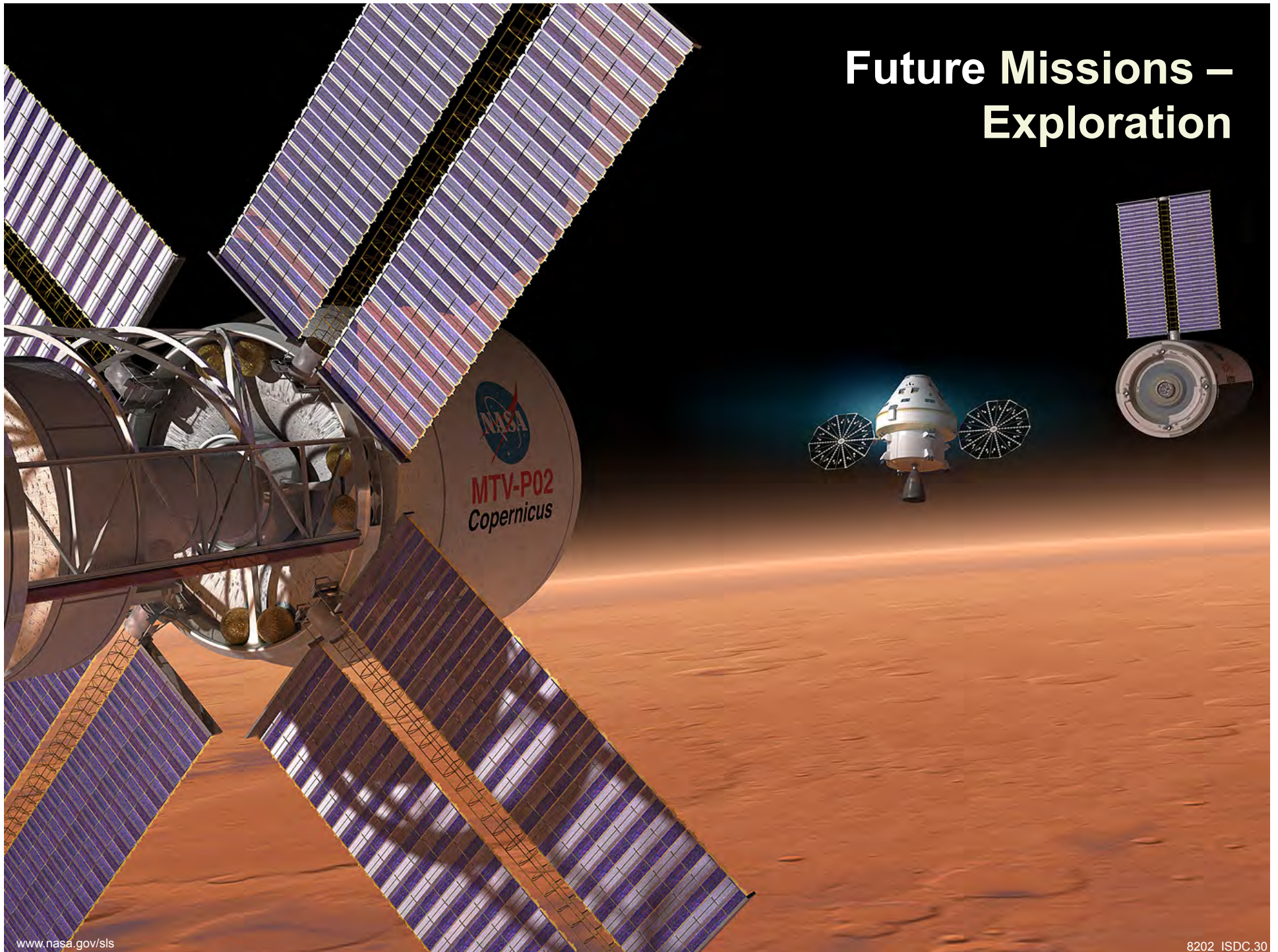




***First ring forging preparation by  
ATI/Ladish Forging, Cudahy,  
Wisconsin***

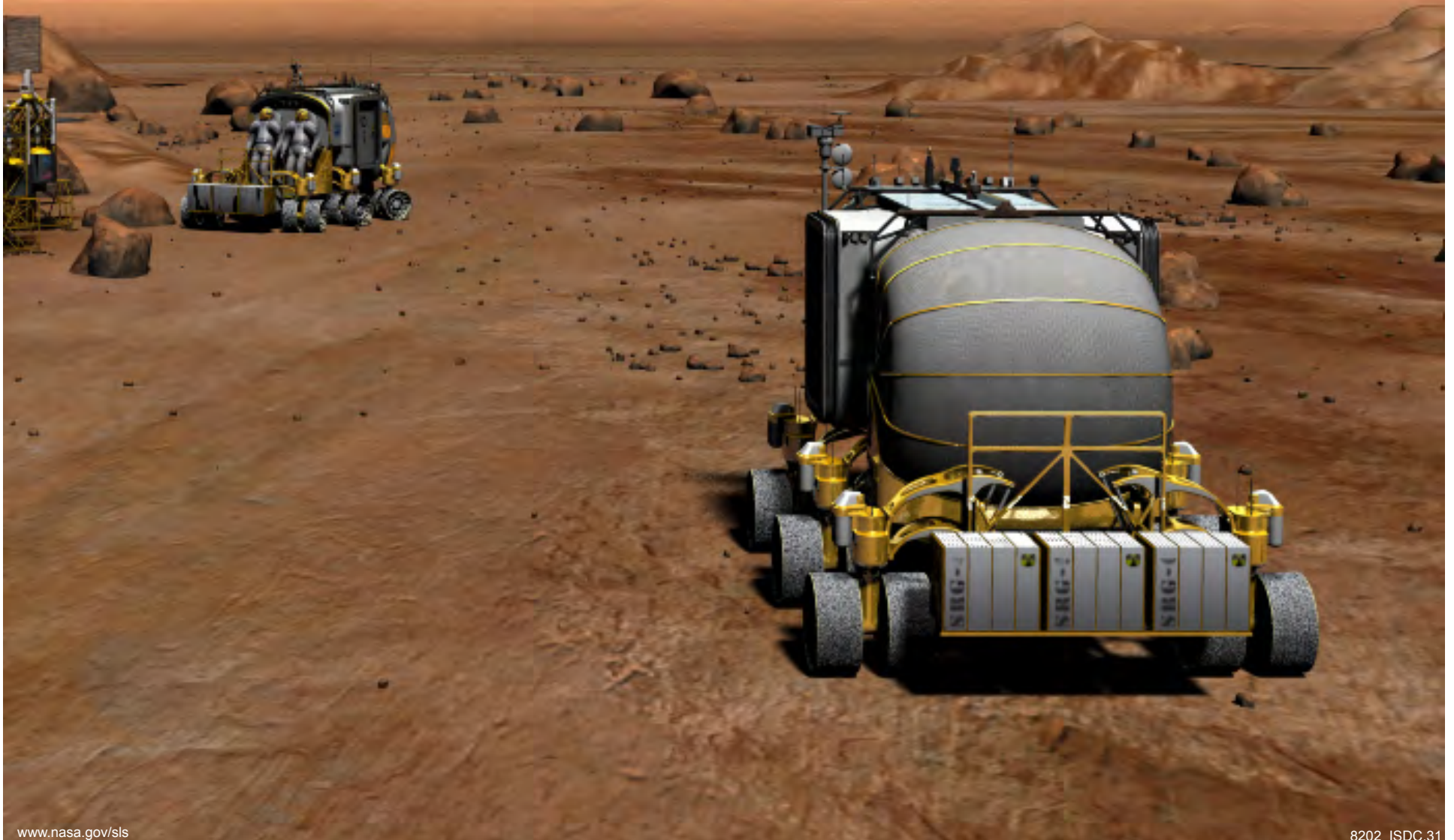


# Future Missions – Exploration



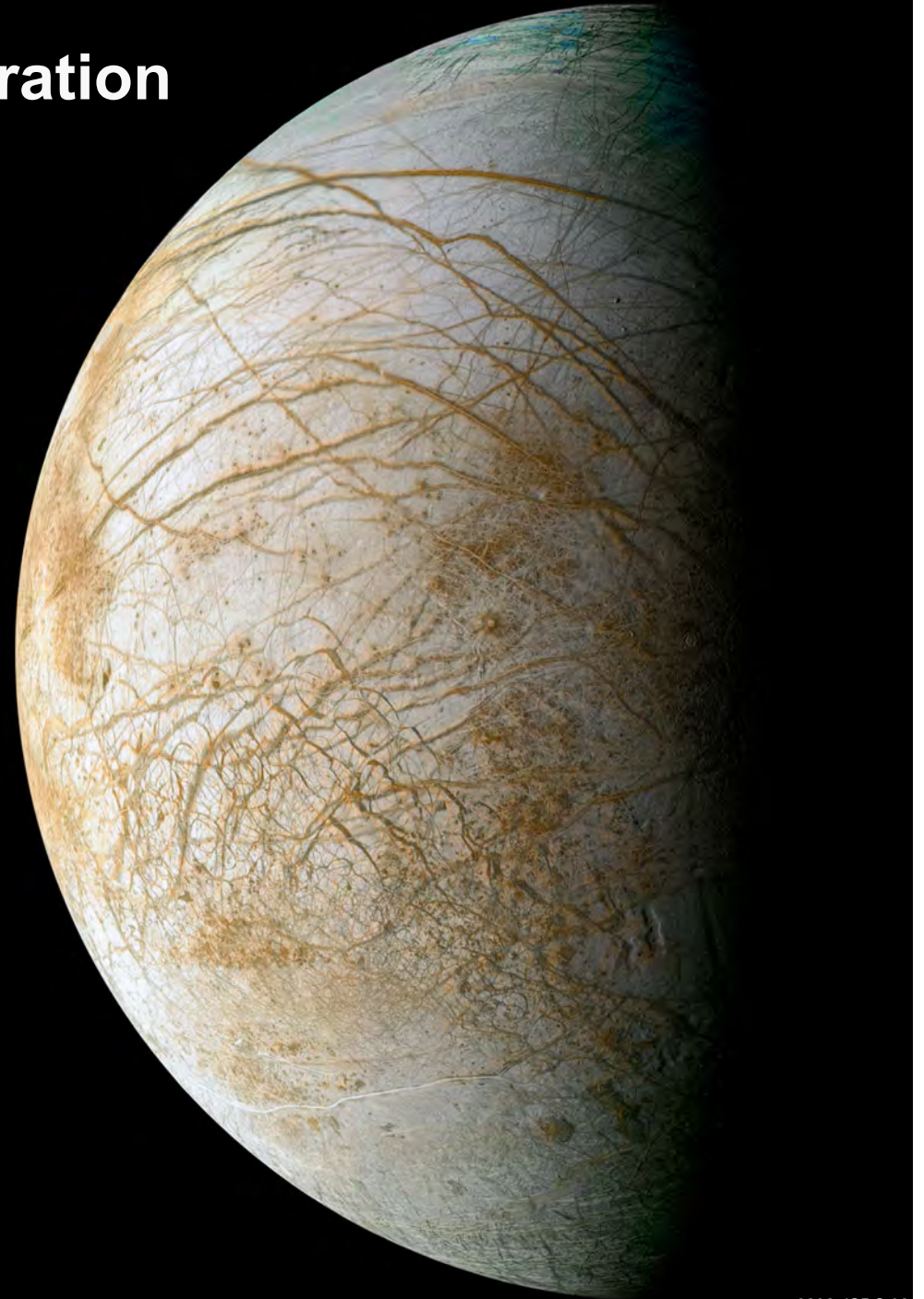


# Future Missions – Exploration



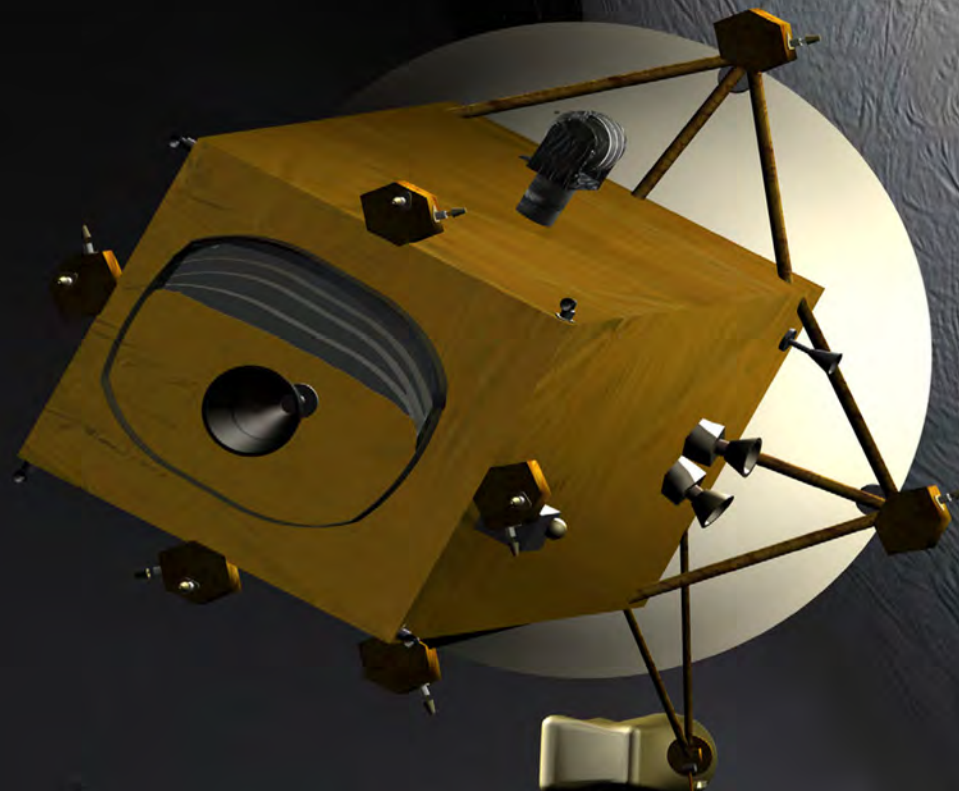


# Future Missions – Exploration





# Future Missions – Exploration





# Future Missions – Exploration



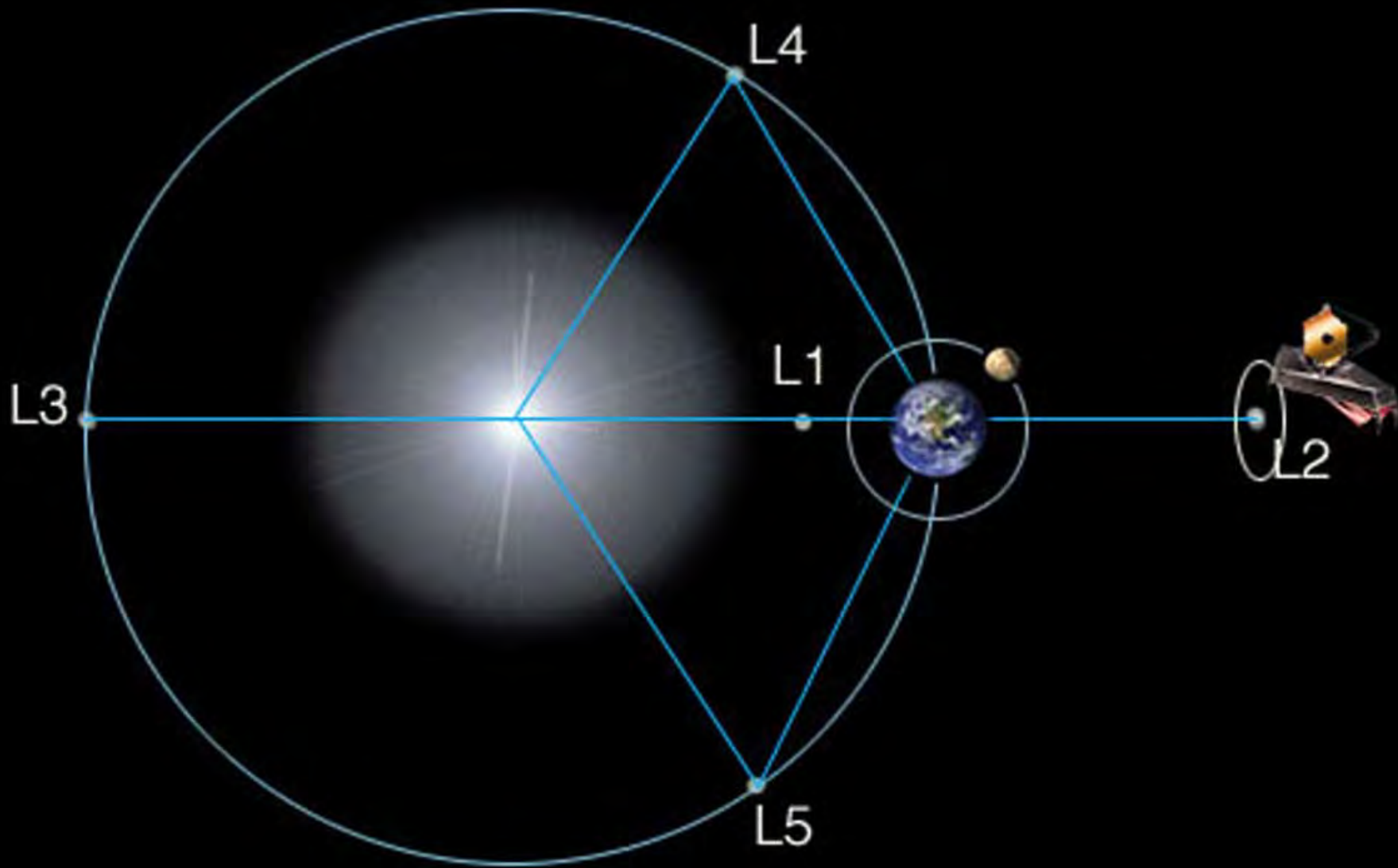


# Future Missions – Exploration



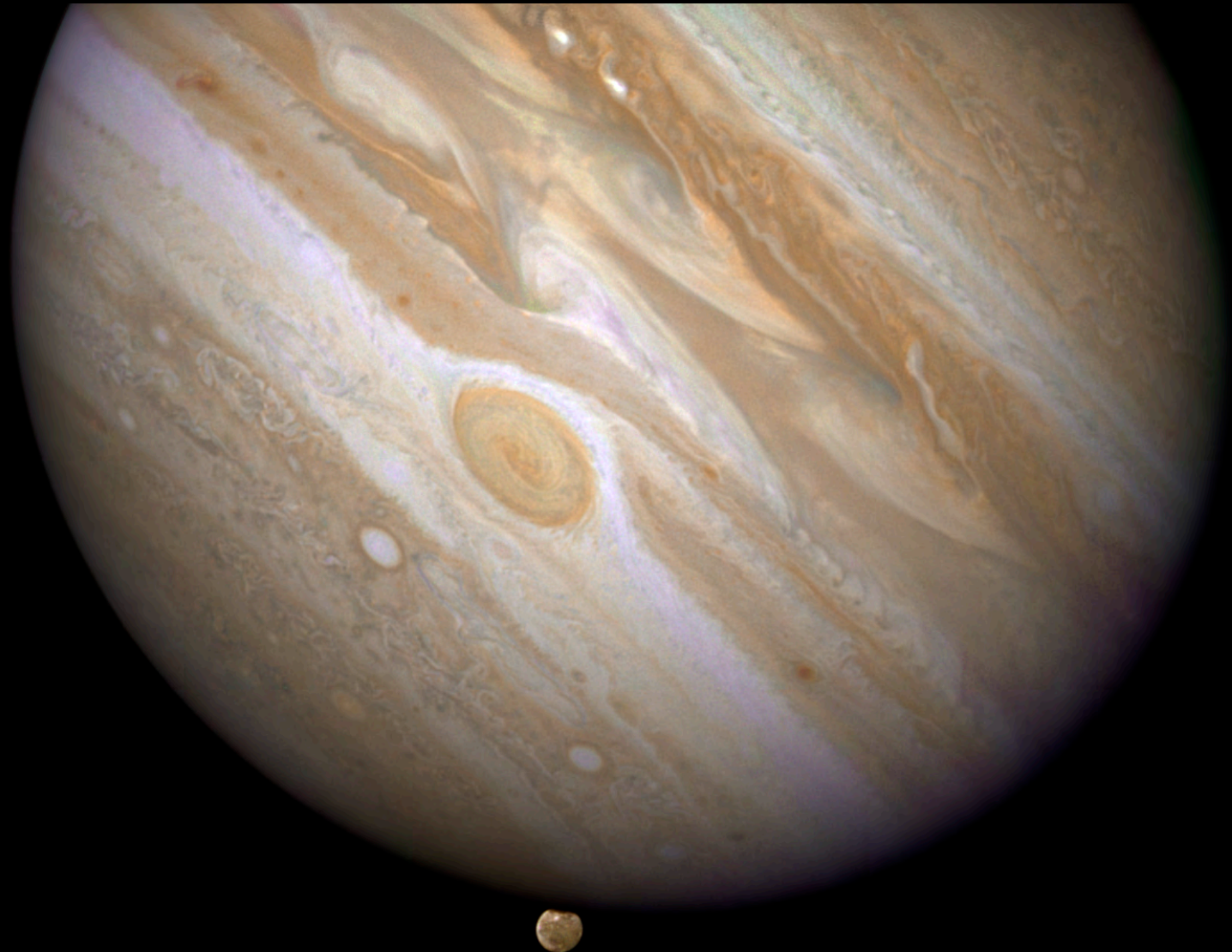


# Future Missions – Exploration



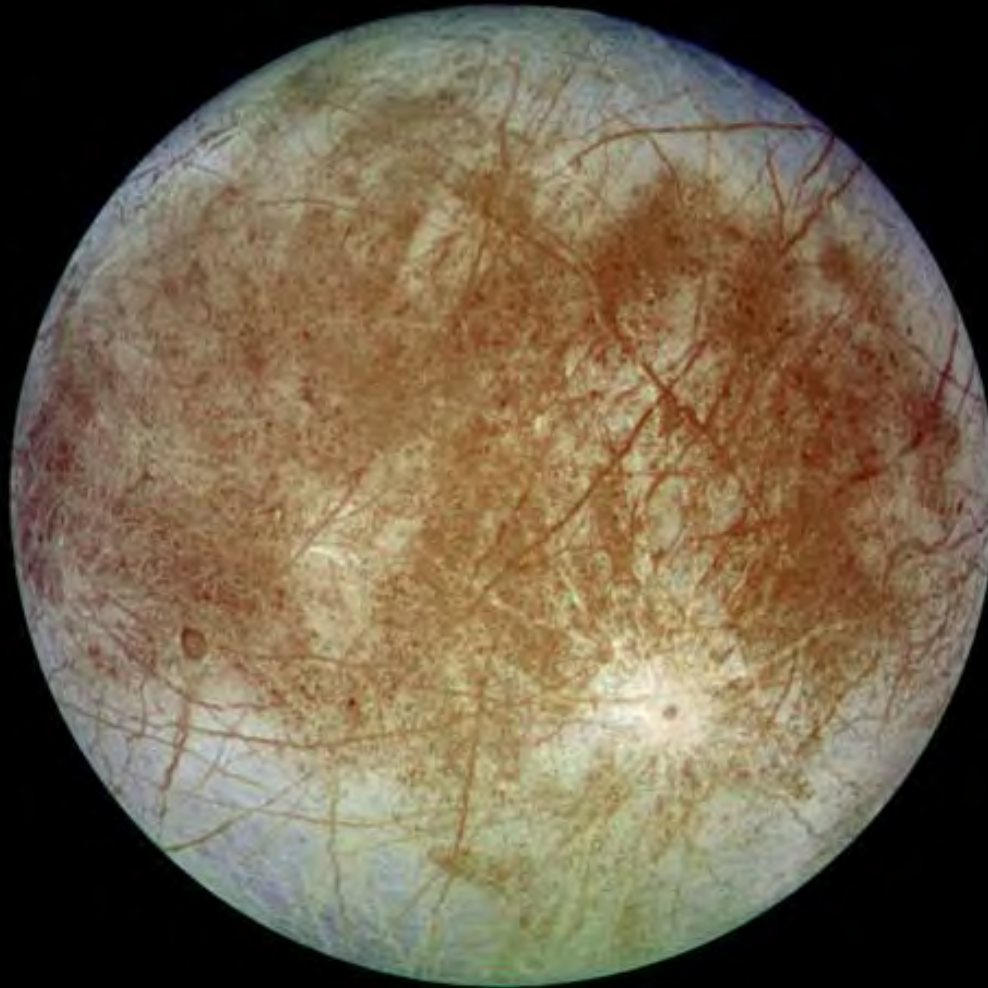


# Future Missions – Planetary





# Future Missions – Planetary



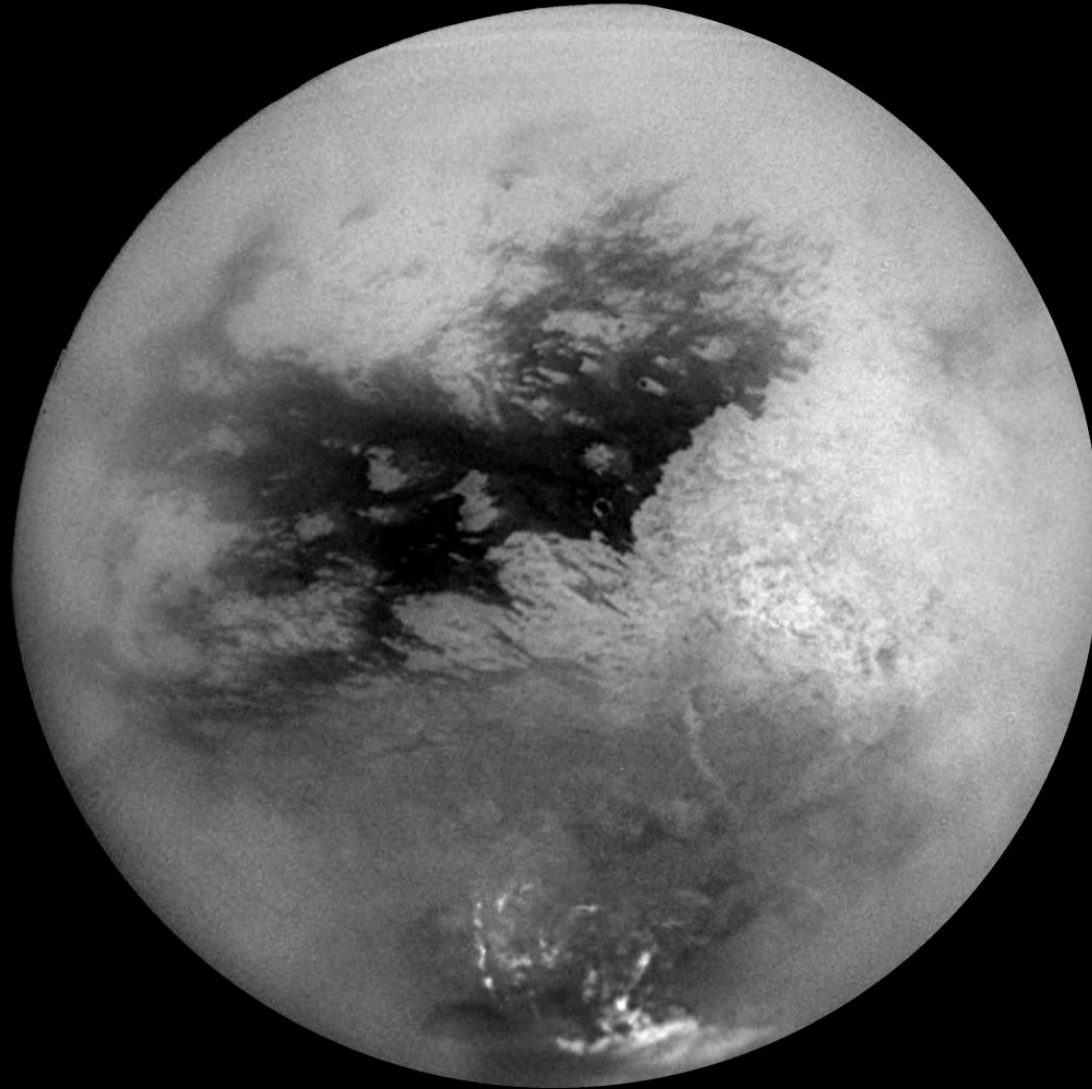


# Future Missions – Planetary



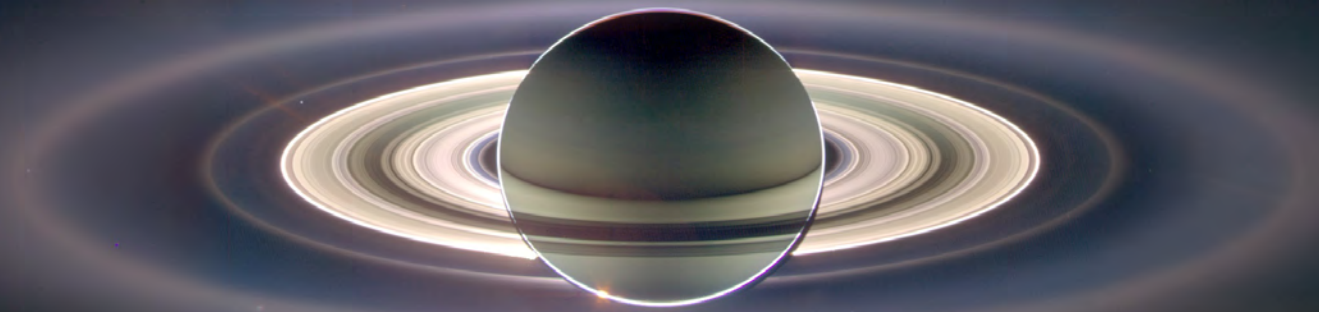


# Future Missions – Planetary



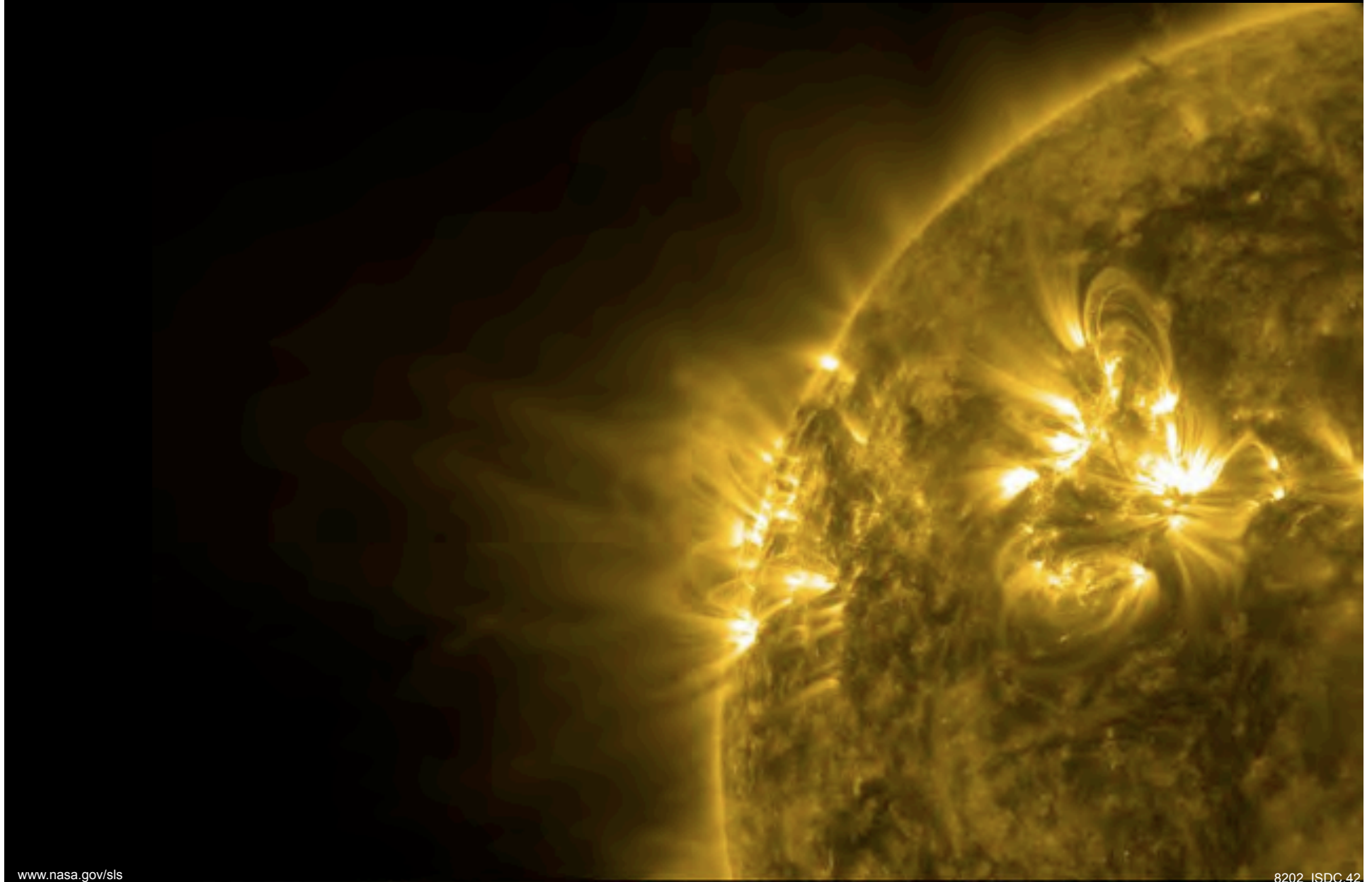


# Future Missions – Planetary





# Future Missions – Solar



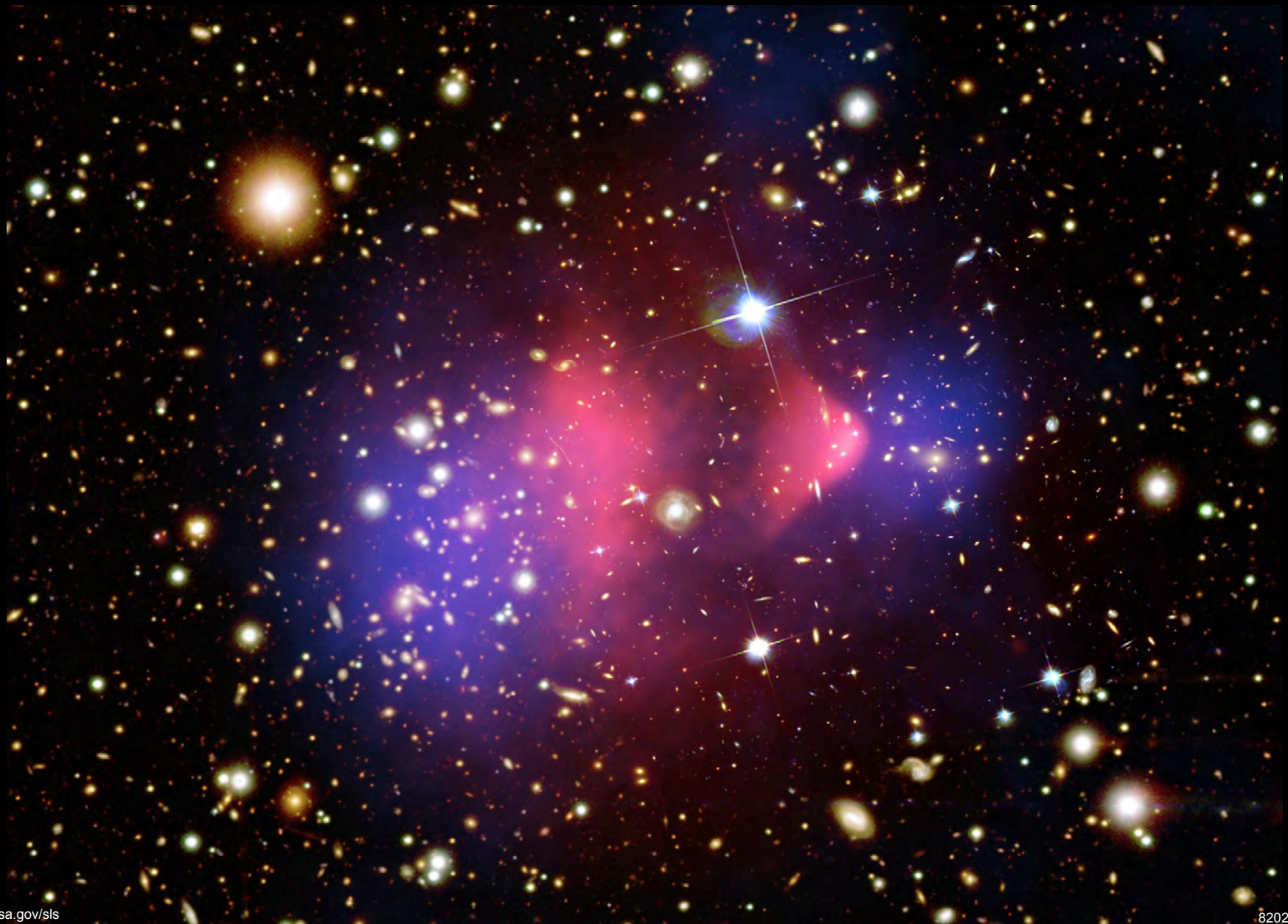


# Future Missions – Astronomy



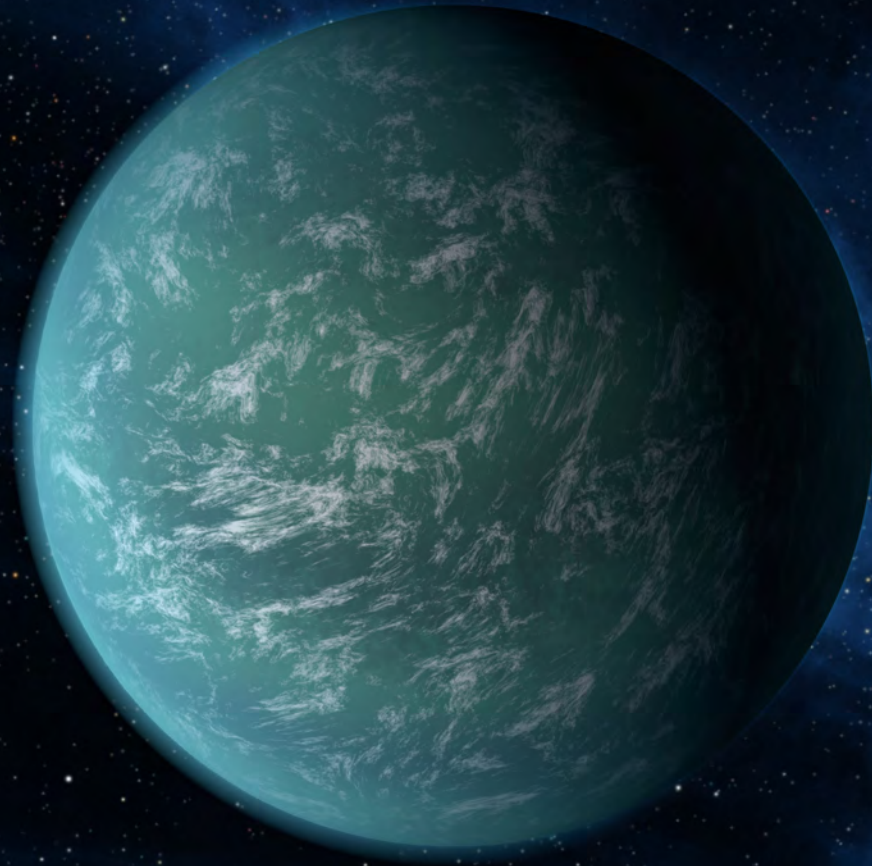


# Future Missions – Astronomy





# Future Missions – Astronomy






**For More Info: [www.nasa.gov/sls](http://www.nasa.gov/sls)**



**Building a Platform for Global Space Exploration**



A composite image of space featuring the Sun, Earth, Mars, and asteroids. The Sun is a large, bright yellow-orange sphere in the upper left. Earth is a blue and white sphere in the center. Mars is a reddish-orange sphere on the right. Numerous brown, rocky asteroids of various sizes are scattered throughout the scene, particularly in the foreground and around Mars. A small satellite with solar panels is visible near Earth. The background is a dark blue space filled with stars.

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

— Carl Sagan