



Exploring the Solar System with NASA

Presented by:

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NASA STEM Pathway Activities Consortium for Education

activities



High School
Aerospace
Scholars



High School Students
United with NASA to
Create Hardware



HISD
Aerospace
Academies



Micro-g Neutral
Buoyancy Experiment
Design Teams



Minority University
Research & Education
Program



MUREP Innovation &
Tech Transfer Idea
Competition



NASA Community
College Aerospace
Scholars



NASA Spacesuit
User Interface
Technologies for
Students



STEM in
Deep Space



STEM on
Station



HISD Aerospace Academies

- HISD is the recipient of the Magnet School Assistance Program (MSAP) grant from the U.S. Department of Education
- HISD, with NASA involvement, launched five Aerospace Academies with the intent of attracting and retaining underrepresented and underserved students to STEM disciplines

Elementary Campuses



Wesley Elementary School Grades: PreK-5
Students: 549
Where Inspired Instruction Incites
Imagination and Innovation



Davila Elementary Grades: PreK-5
Students: 404
Study Hard - Play Fair - Dream Big!

Middle School Campus

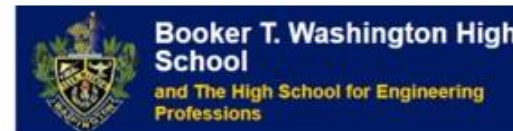


Grades: 6-8
Students: 719

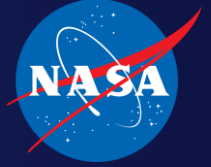
High School Campuses



Grades: 9-12
Students: 1,903



Grades: 9-12
Students: 758



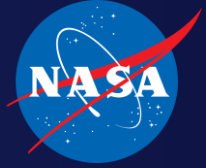
Agenda

- Padlet
- Solar System Lessons
- Tips and Tricks for Effective Virtual Learning
- Current NASA Missions

Padlet

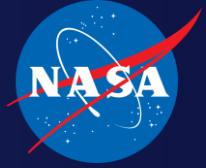


- <https://padlet.com/debramderham/4l4pfk868ixfytgi>



Solar System Scroll and Solar System Beads

- Science Topics
 - Scaled distances of orbits in the Solar System
 - Types of objects in the Solar System
 - Usefulness of models
- TEKs
 - **5-ESS1-1** Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from the Earth
 - **MS-ETS1-4** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
 - **MS-ESS1-3** Analyze and interpret data to determine scale properties of objects in the solar system.
 - **MS-ESS1-1** Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.



Solar System Scroll and Solar System Beads

- Materials Needed:
 - Solar System Scroll:
 - Strip of paper the length of a wingspan
 - Colored Pencils
 - Markers or crayons
 - Solar System Beads:
 - Large craft pony beads – 11 colors
 - String – 5 meters
 - Meter stick or ruler

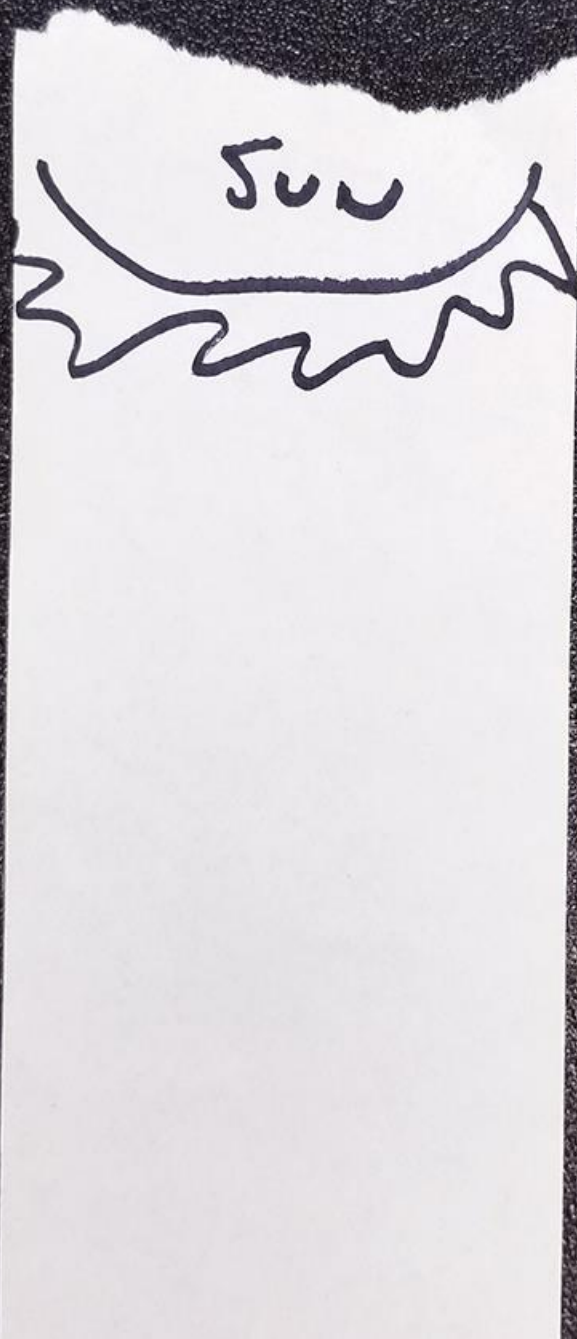
Solar System Scroll: <https://www.jpl.nasa.gov/edu/teach/activity/solar-system-scroll/>

Solar System Beads: <https://www.jpl.nasa.gov/edu/teach/activity/solar-system-bead-activity/>



Solar System Scroll





NEES

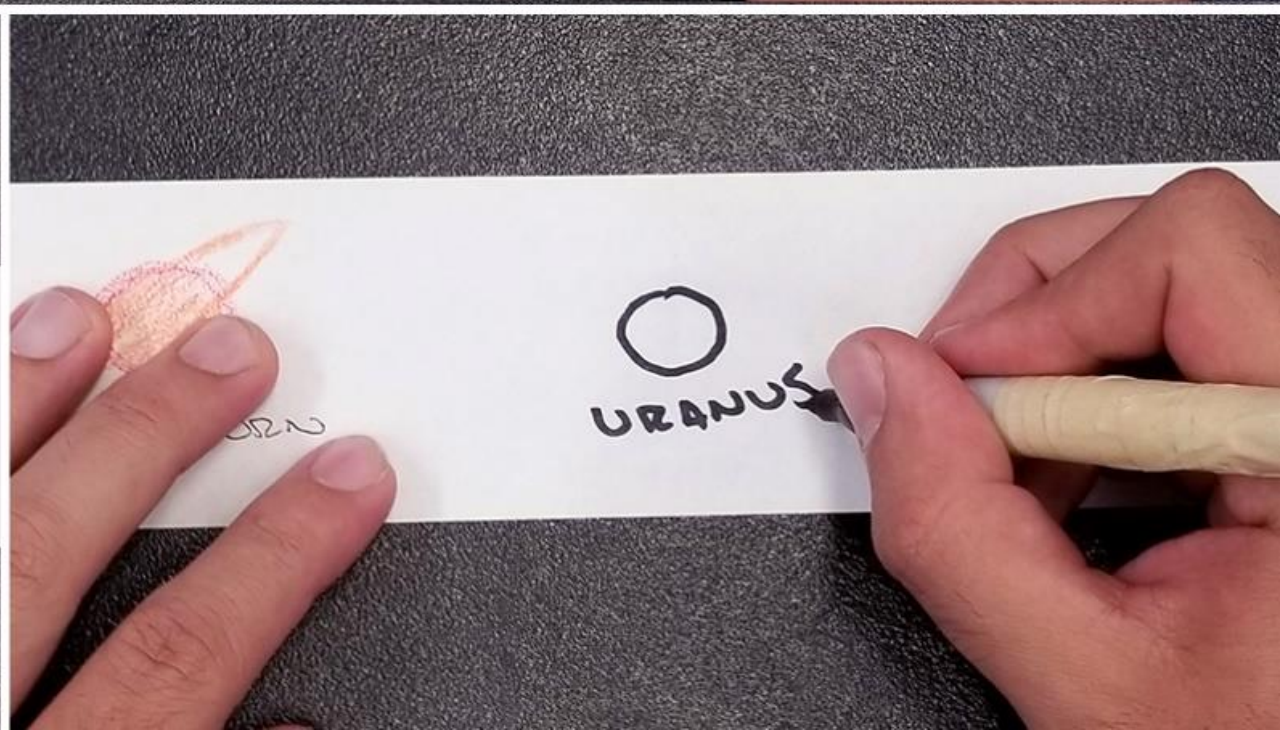
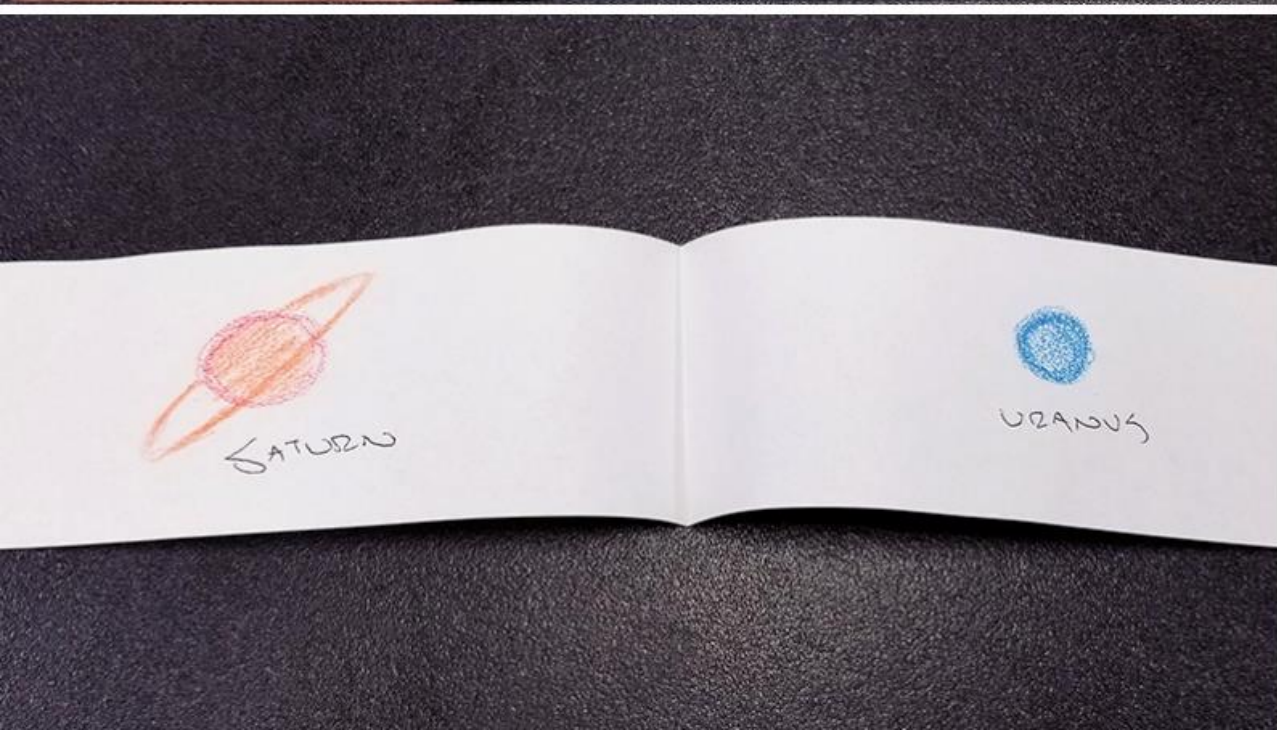
MERCURY

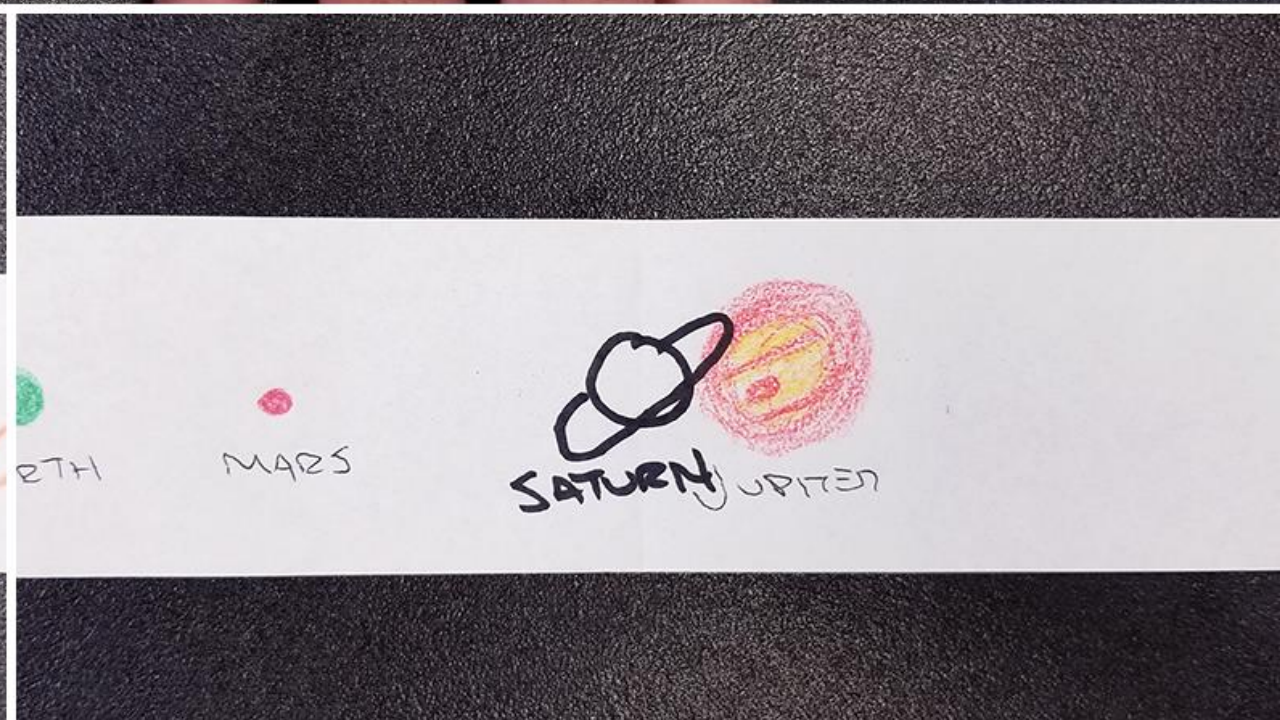
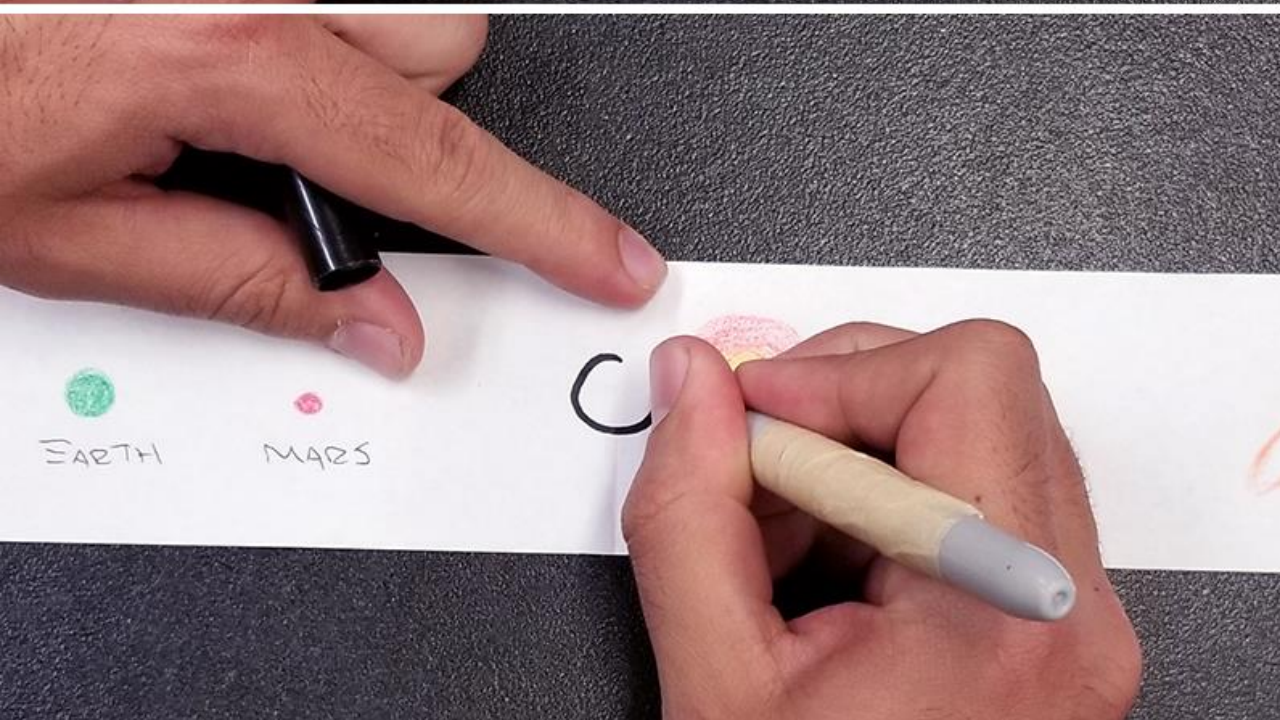
VENUS

EARTH

MARS

Awesome
TO THE





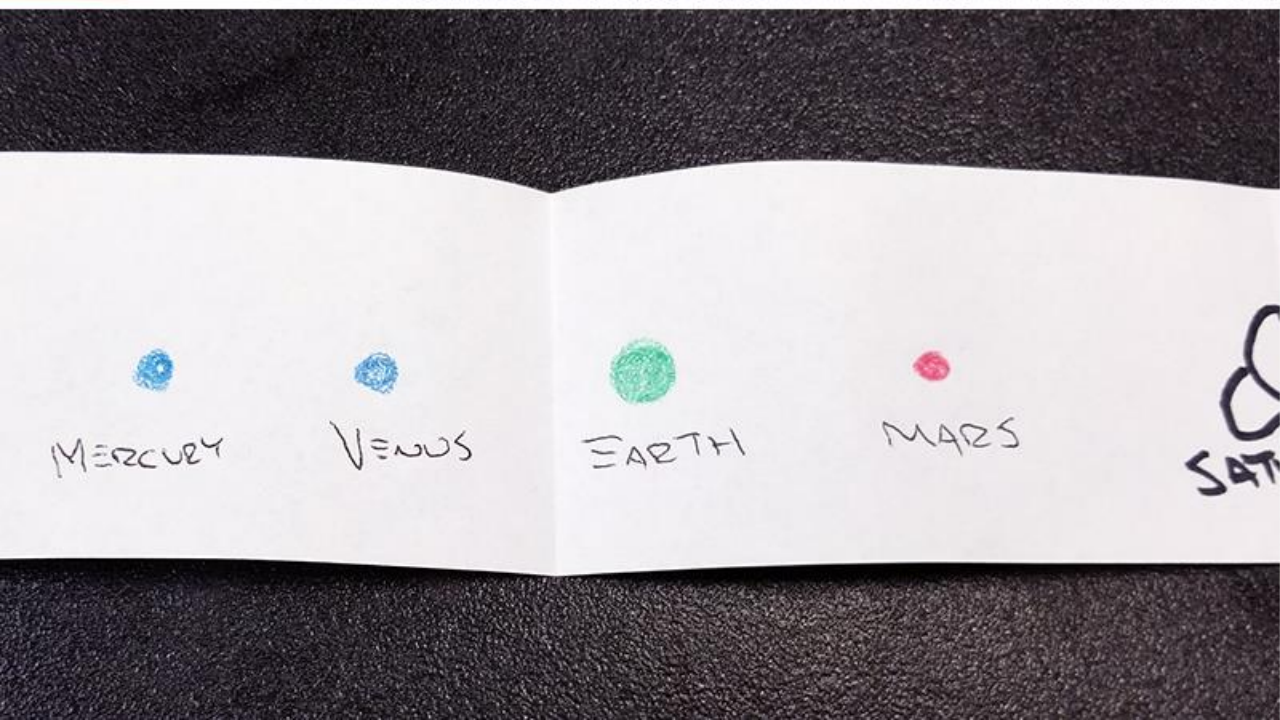


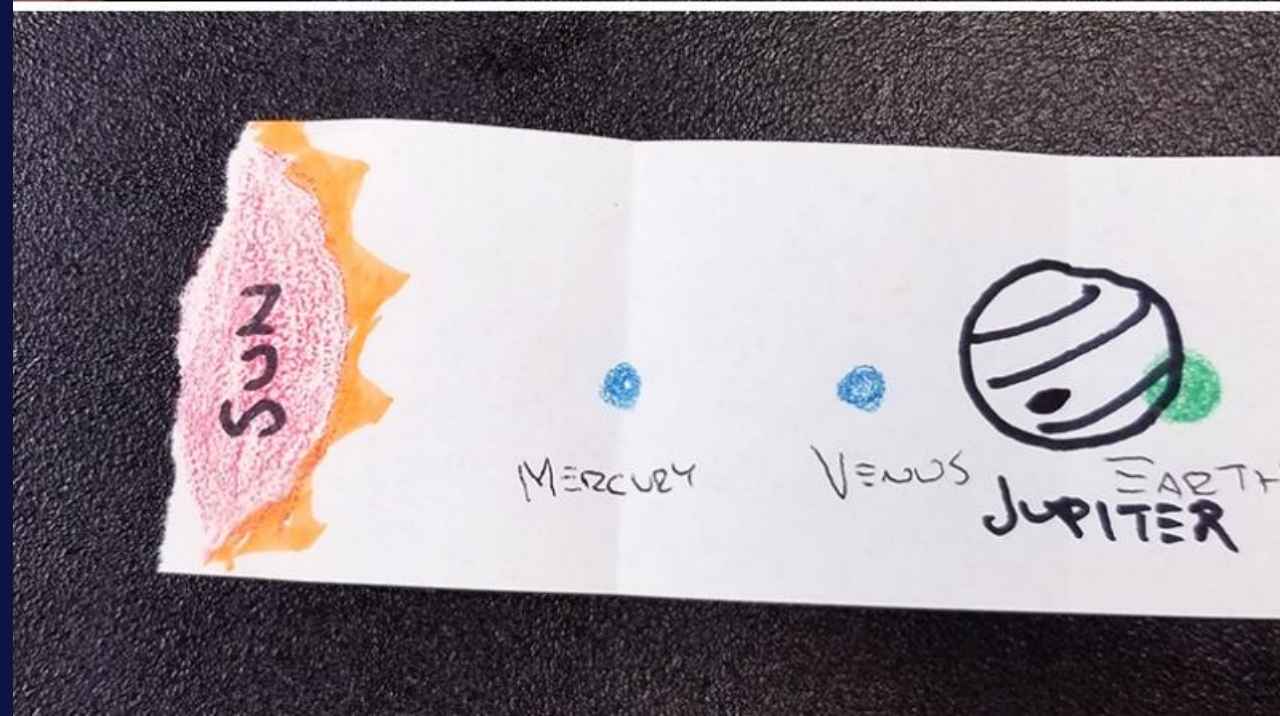
NEPTUNE

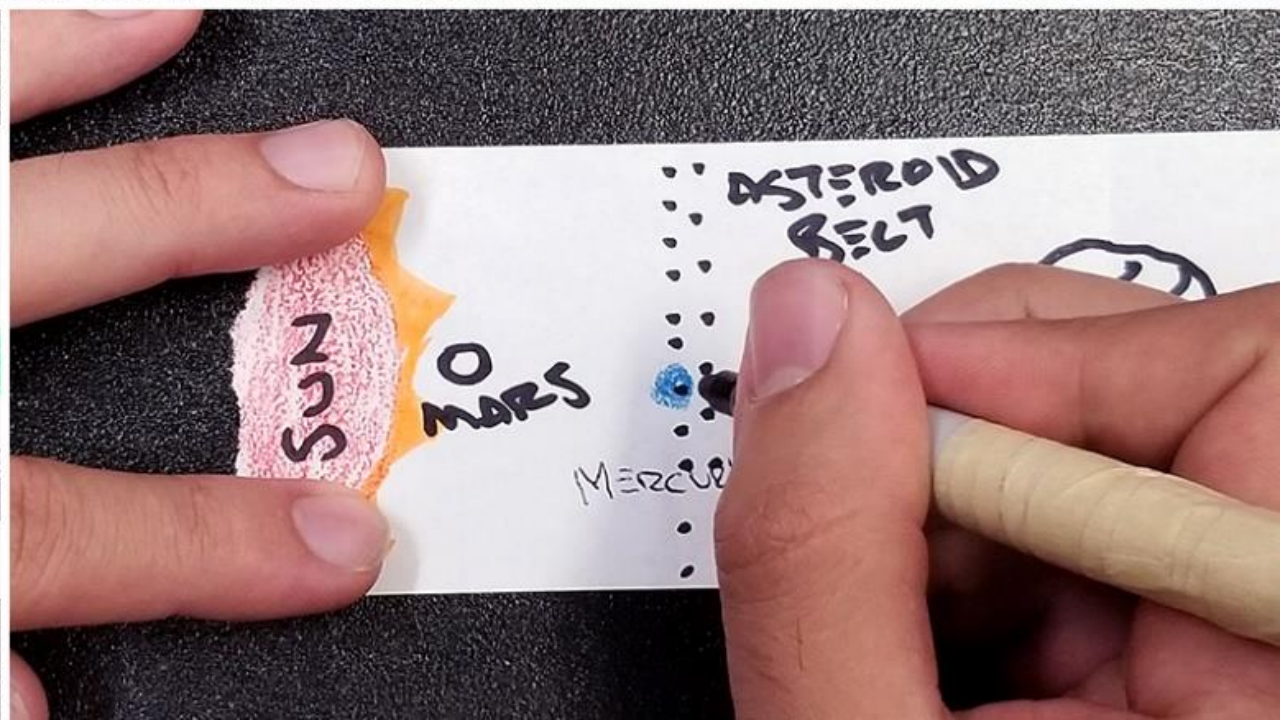


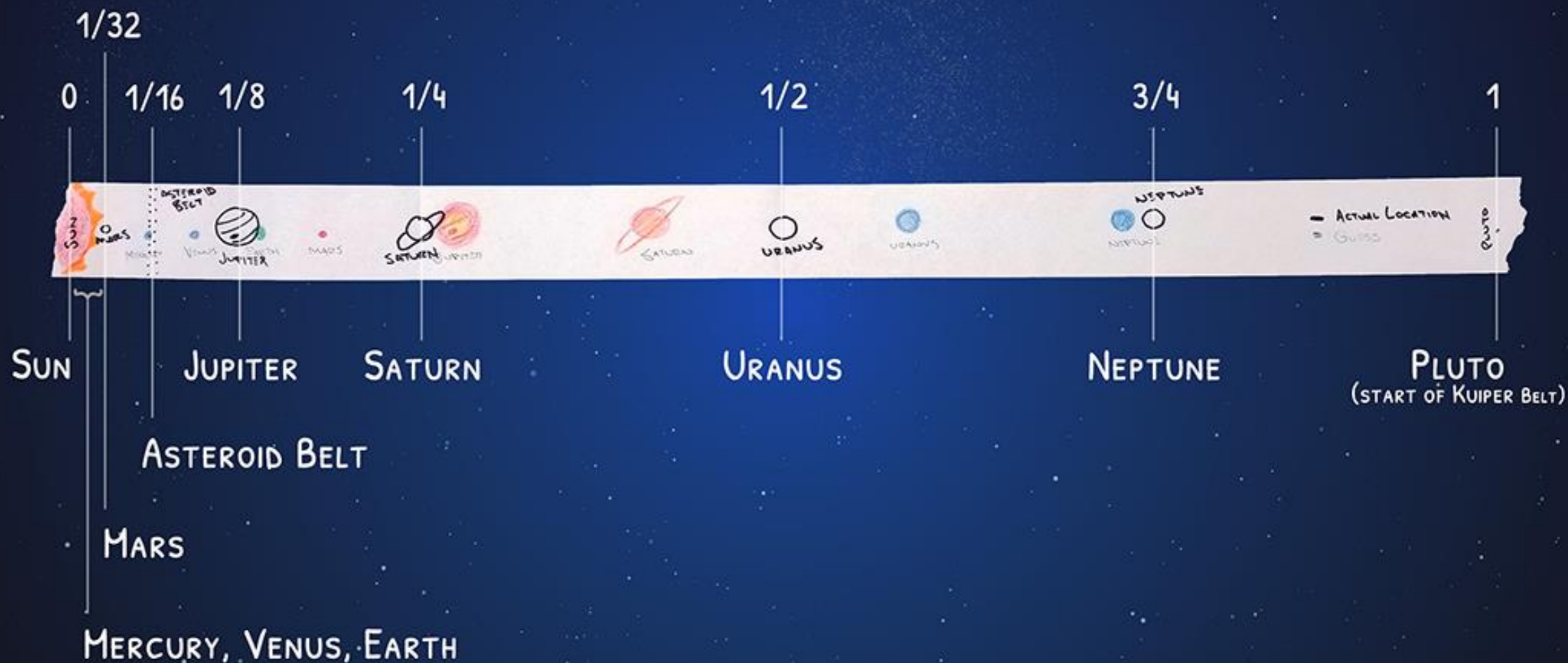
NEPTUNE

NEPTUNE





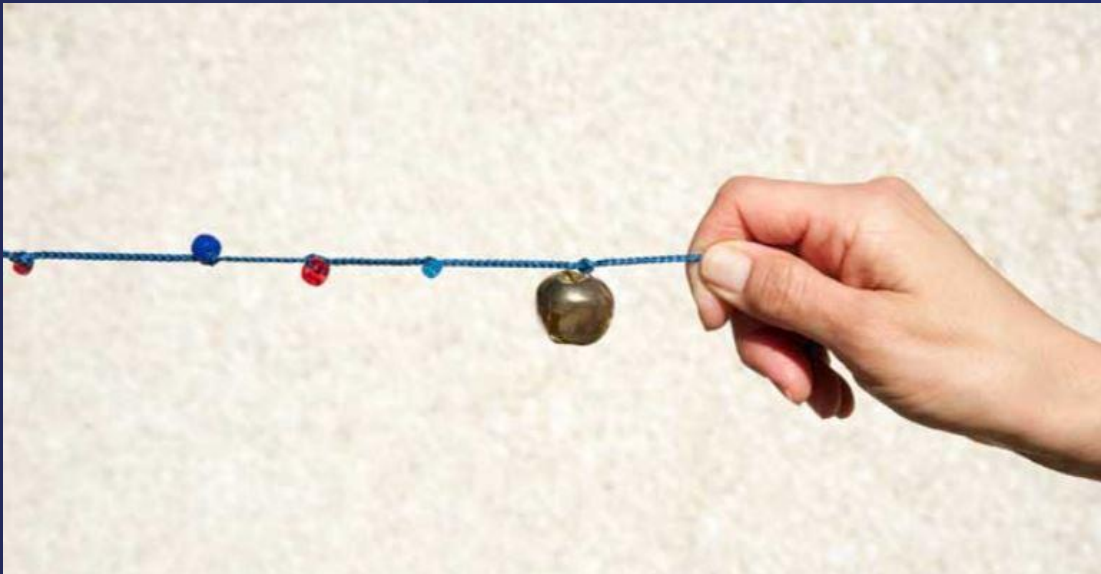
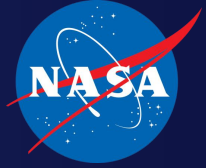






Solar System Scroll Flipped Lesson Video:
<https://screencast-o-matic.com/watch/cYf03zAulC>

Solar system beads



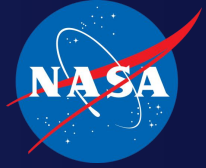
Planet	AU	Scale Value (centimeters)	Bead Color
Sun	0.0 AU	0 cm	Yellow
Mercury	0.4 AU	4 cm	Solid Red
Venus	0.7 AU	7 cm	Cream
Earth	1.0 AU	10 cm	Clear Blue
Mars	1.5 AU	15 cm	Clear Red
Asteroid Belt	2.8 AU	28 cm	Black
Jupiter	5.2 AU	52 cm	Orange
Saturn	9.6 AU	96 cm	Clear Gold
Uranus	19.2 AU	192 cm	Dark Blue
Neptune	30.0 AU	300 cm	Light Blue
Pluto (closest)	29.7 AU	297 cm	Brown
Pluto (average)	39.5 AU	395 cm	Brown
Pluto (most distant)	49.3 AU	493 cm	Brown



Tips and Tricks for Effective Virtual Learning

- Communication is key
- Make all instructions very clear
- Multiple ways to complete activities
- Interactive-Padlet, Pronto, Goosechase
- Gamify your activities- Badger
- Multi-media
- Flipped lesson videos-Asynchronous

NASA STEM Engagement Resources and Opportunities

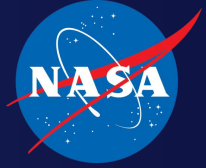


- [NASA STEM@home](#)
- [NASA Express](#)
- [Informal Education Resources](#)
- [Speaker's Bureau](#)
- [Citizen Science](#)
- [Opportunities and Challenges](#)
- [STEM on Station Resources and Downlinks](#)
- [Commercial Crew Mission Toolkit](#)
- [Museum Alliance](#)
- [Imagine the Universe](#)
- [SMD Toolkits](#)



NASA 2021





The Artemis Program

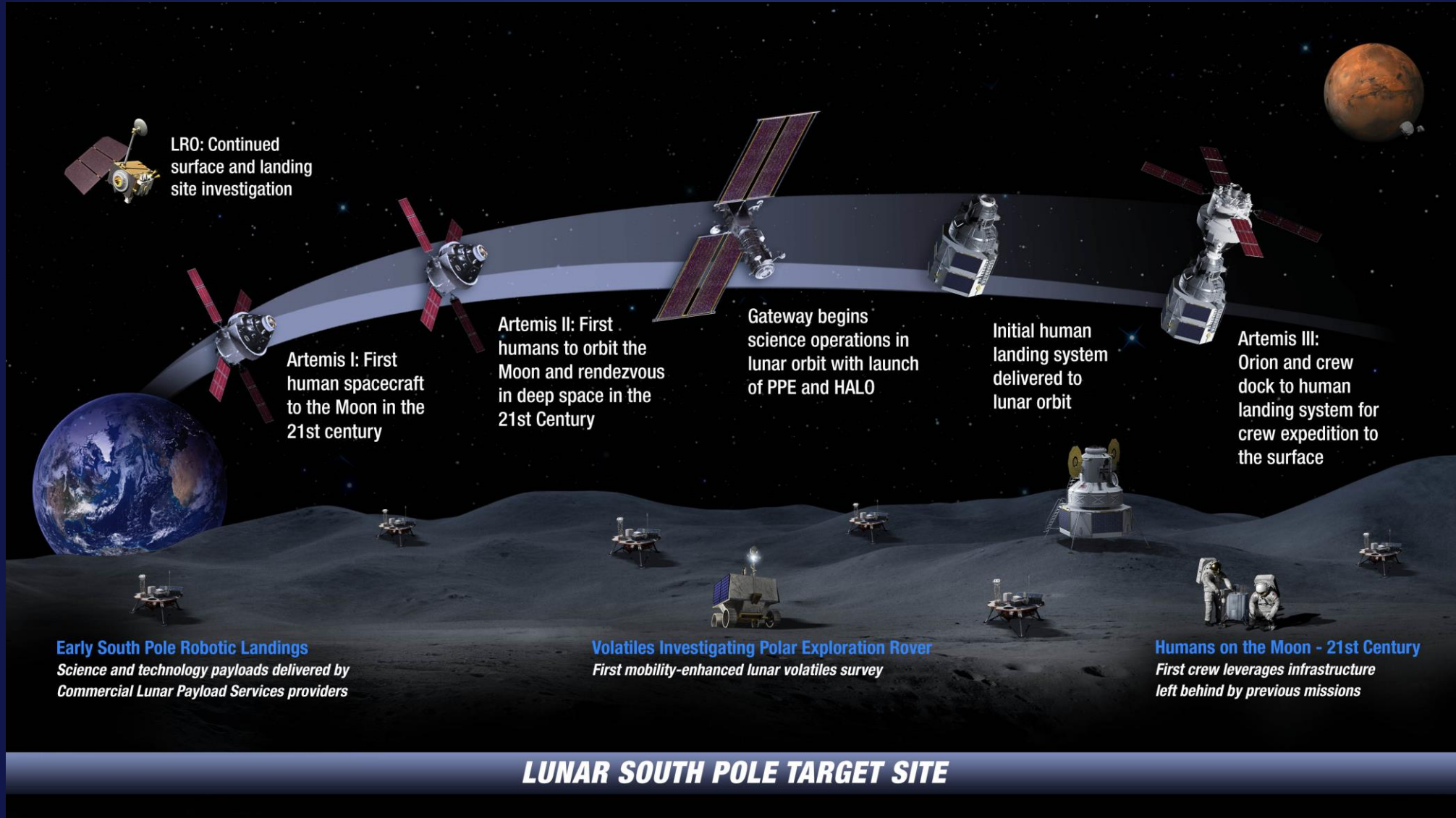
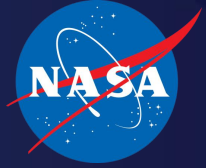
Artemis is the twin sister of Apollo and goddess of the Moon in Greek mythology. Now, she personifies our path to the Moon as the name of NASA's program to return astronauts to the lunar surface by 2024.

When they land, Artemis astronauts will step foot where no human has ever been before: the Moon's South Pole.

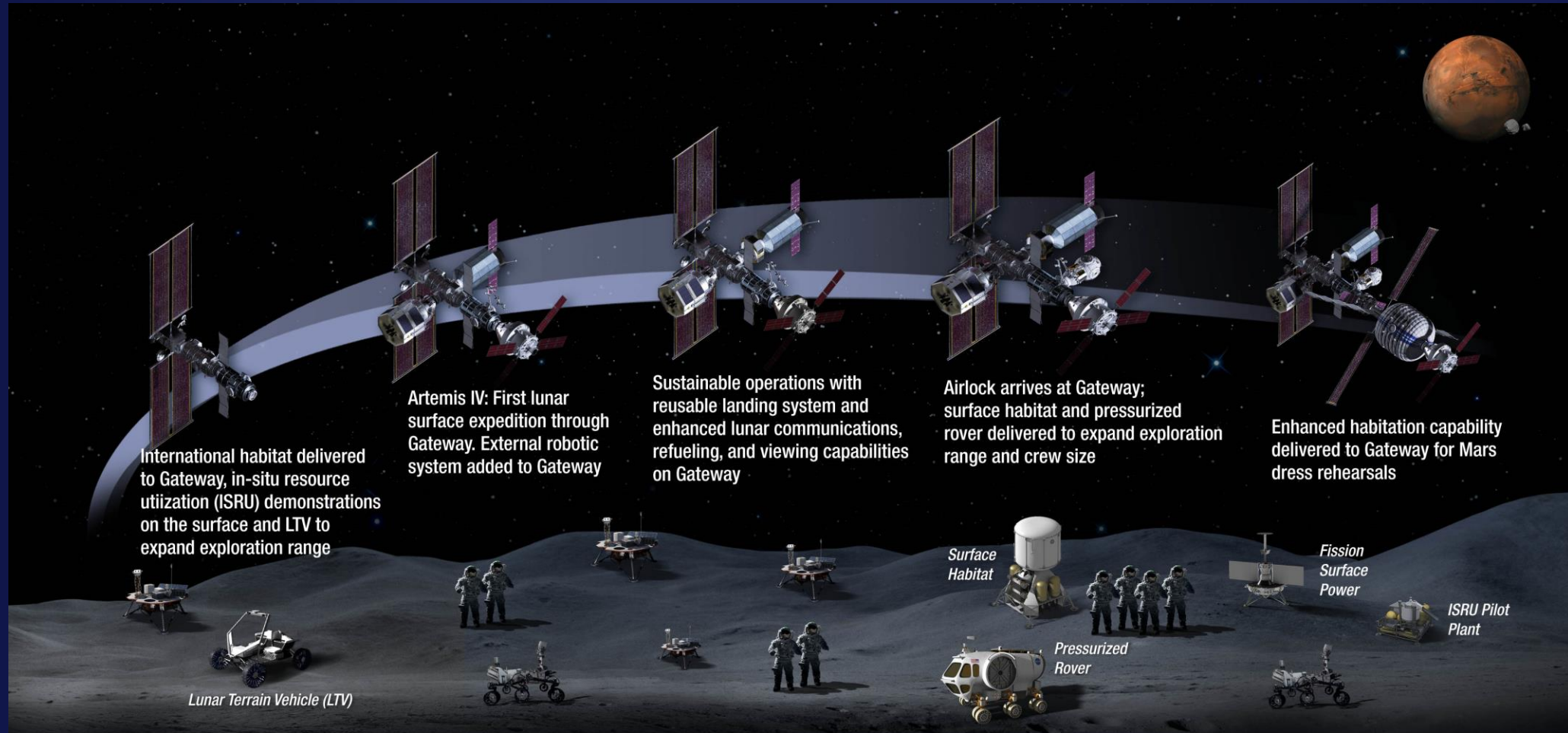
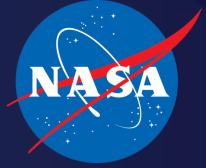
With the horizon goal of sending humans to Mars, Artemis begins the next era of exploration.



Artemis I-III



Artemis IV



SUSTAINABLE LUNAR ORBIT STAGING CAPABILITY AND SURFACE EXPLORATION

MULTIPLE SCIENCE AND CARGO PAYLOADS | U.S. GOVERNMENT, INDUSTRY, AND INTERNATIONAL PARTNERSHIP OPPORTUNITIES | TECHNOLOGY AND OPERATIONS DEMONSTRATIONS FOR MARS

All contents represent notional planning and are for discussion purposes only

LOW EARTH RETURN

3 HOURS

3,000°F

17,500 MPH

250 MILES



LUNAR RETURN

3 DAYS

5,200°F

24,700 MPH

240,000 MILES



MARS RETURN

9 MONTHS

6,200°F

26,800 MPH

39,000,000 MILES



Artemis Astronauts



Joseph Acaba



Kayla Barron



Raja Chari



Matthew Dominick



Victor Glover



Warren Hoburg



Jonny Kim



Christina H. Koch



Kjell Lindgren



Nicole A. Mann



Anne McClain



Jessica Meir



Jasmin Moghbeli



Kate Rubins



Frank Rubio



Scott Tingle



Jessica Watkins

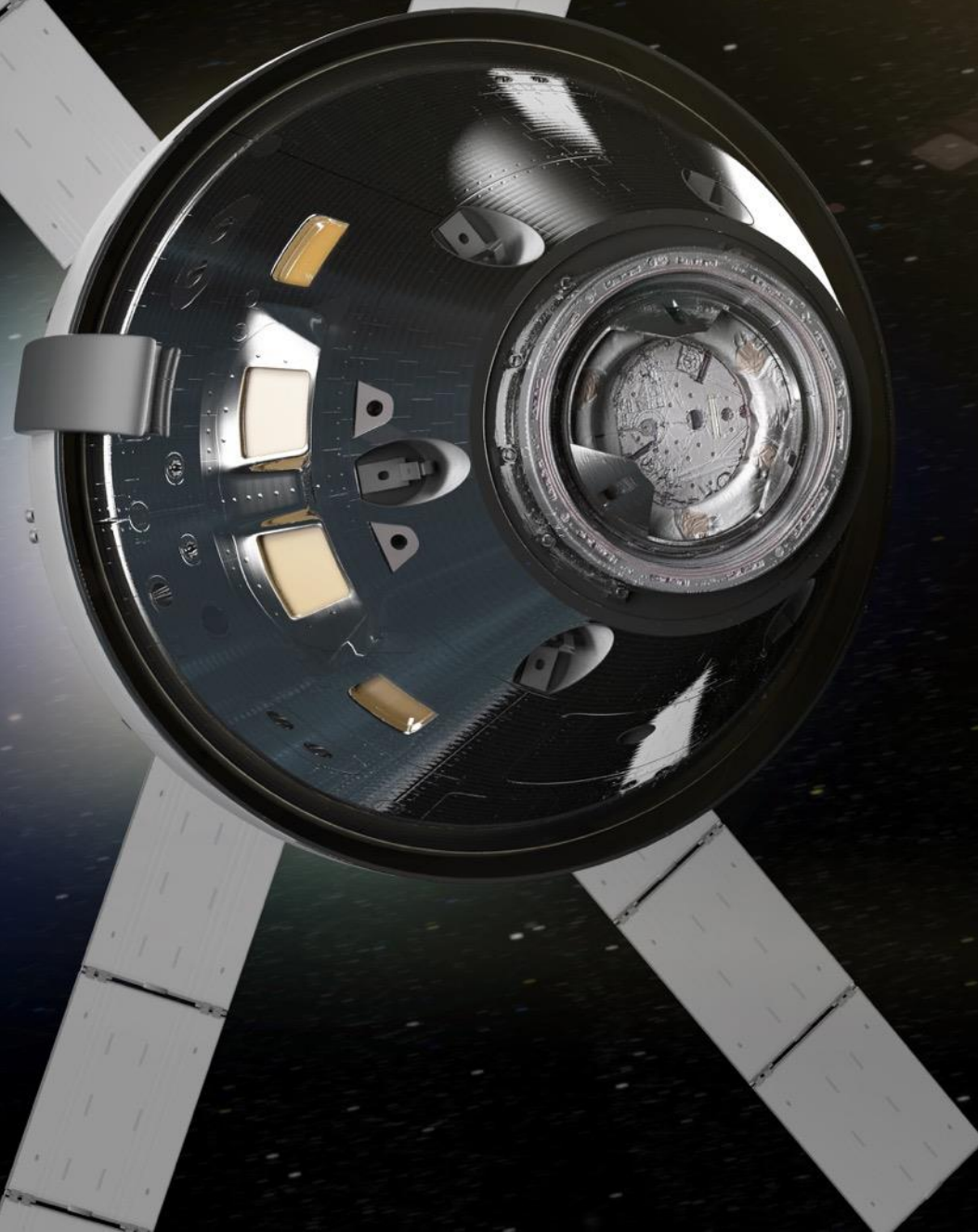


Stephanie Wilson

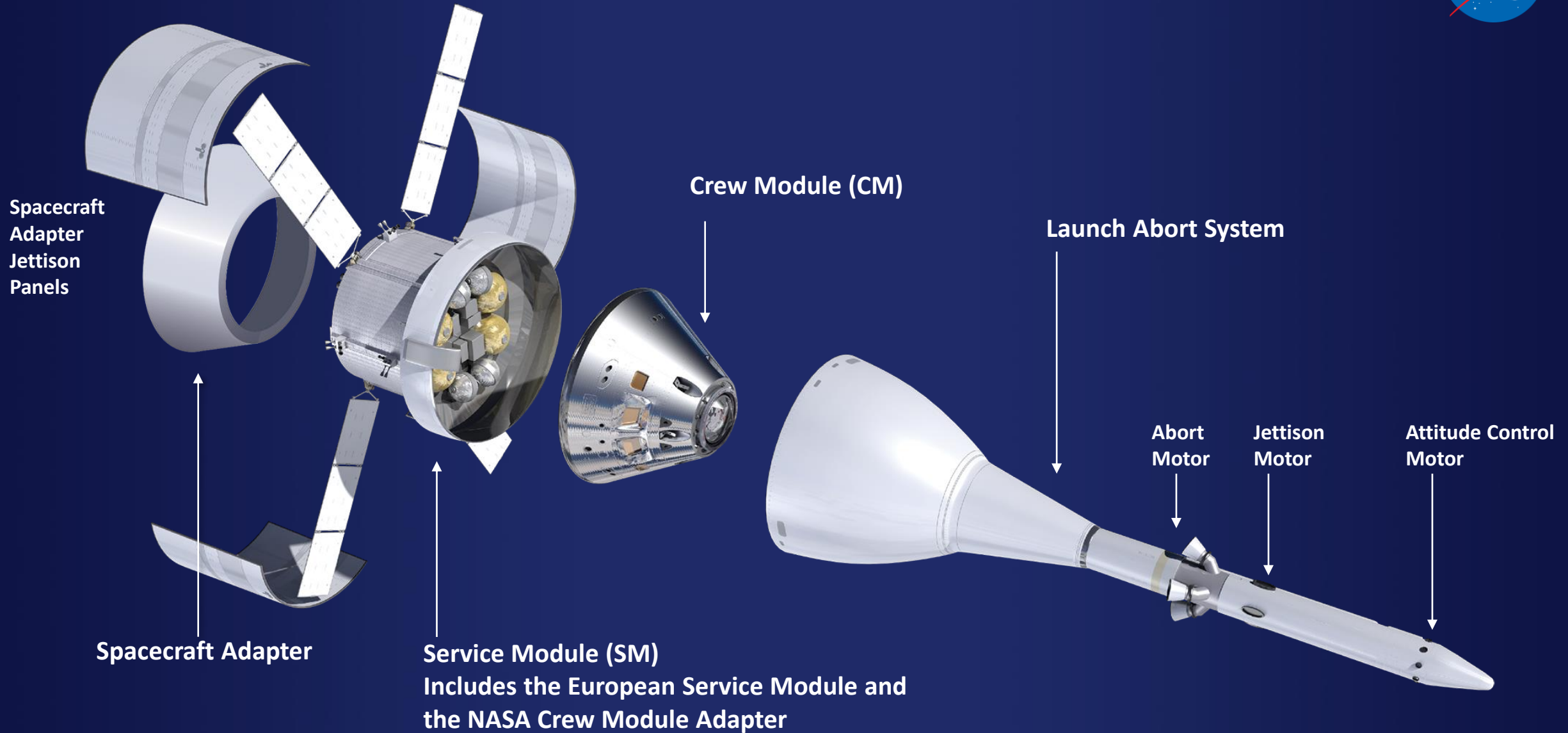
Space Launch System



Orion Spacecraft

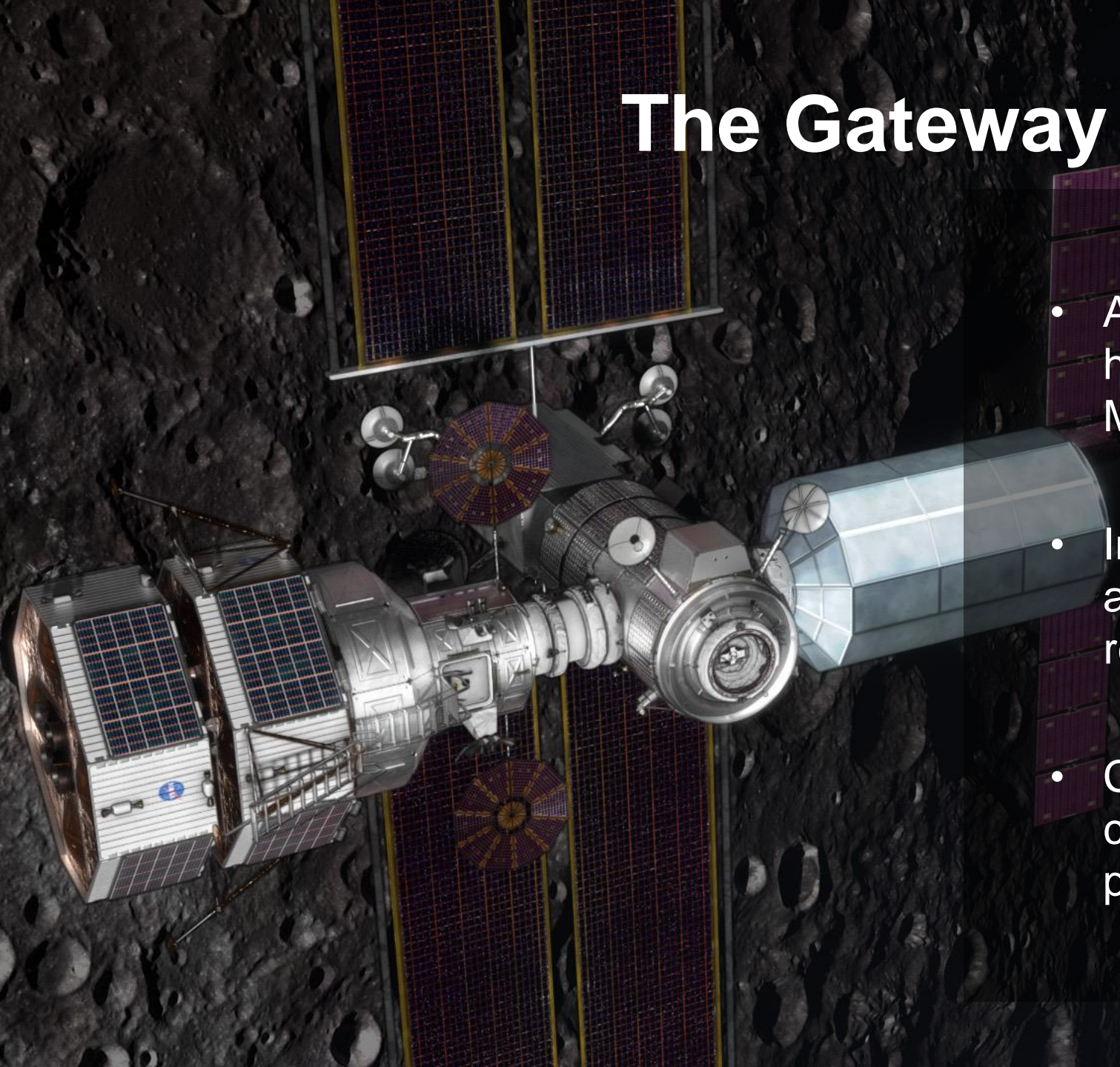


ORION SPACECRAFT OVERVIEW



The Gateway

- A platform to establish a sustained human presence on and around the Moon in this decade
- Includes living quarters for astronauts, a lab for science and research and more
- Components will be from U.S. companies, as well as international partners



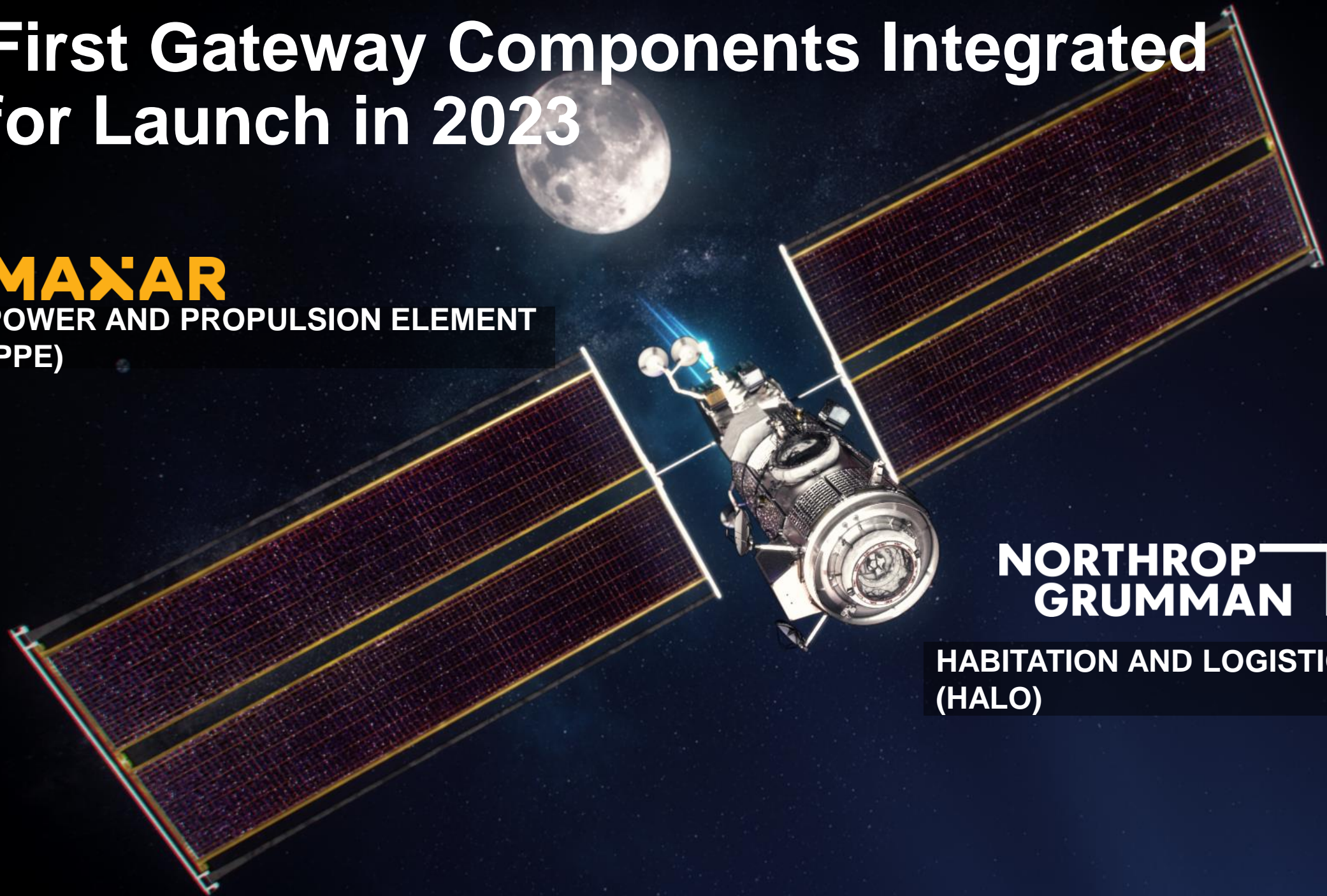
First Gateway Components Integrated for Launch in 2023

MAXAR

POWER AND PROPULSION ELEMENT
(PPE)

**NORTHROP
GRUMMAN**

HABITATION AND LOGISTICS OUTPOST
(HALO)



Gateway Logistics Services(GLS)

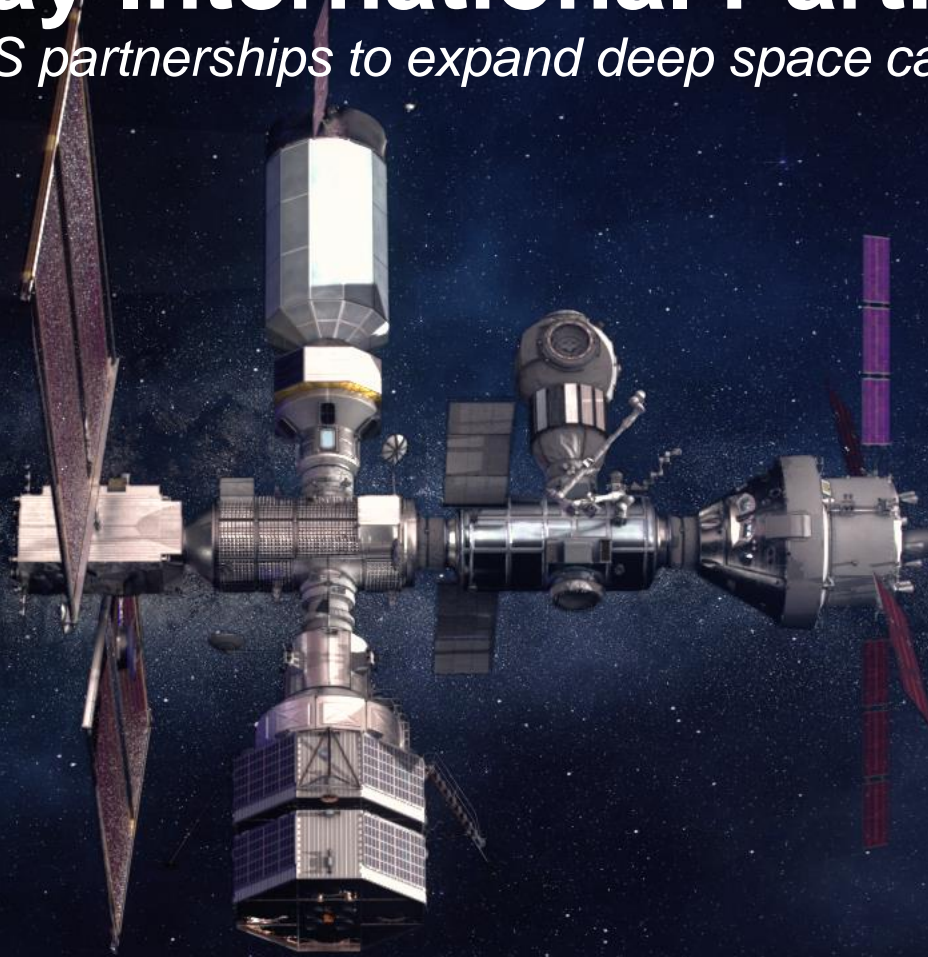
SPACEX

NASA selected SpaceX as the first U.S. commercial provider under the Gateway Logistics Services contract to deliver cargo, experiments and other supplies to the Gateway in lunar orbit.



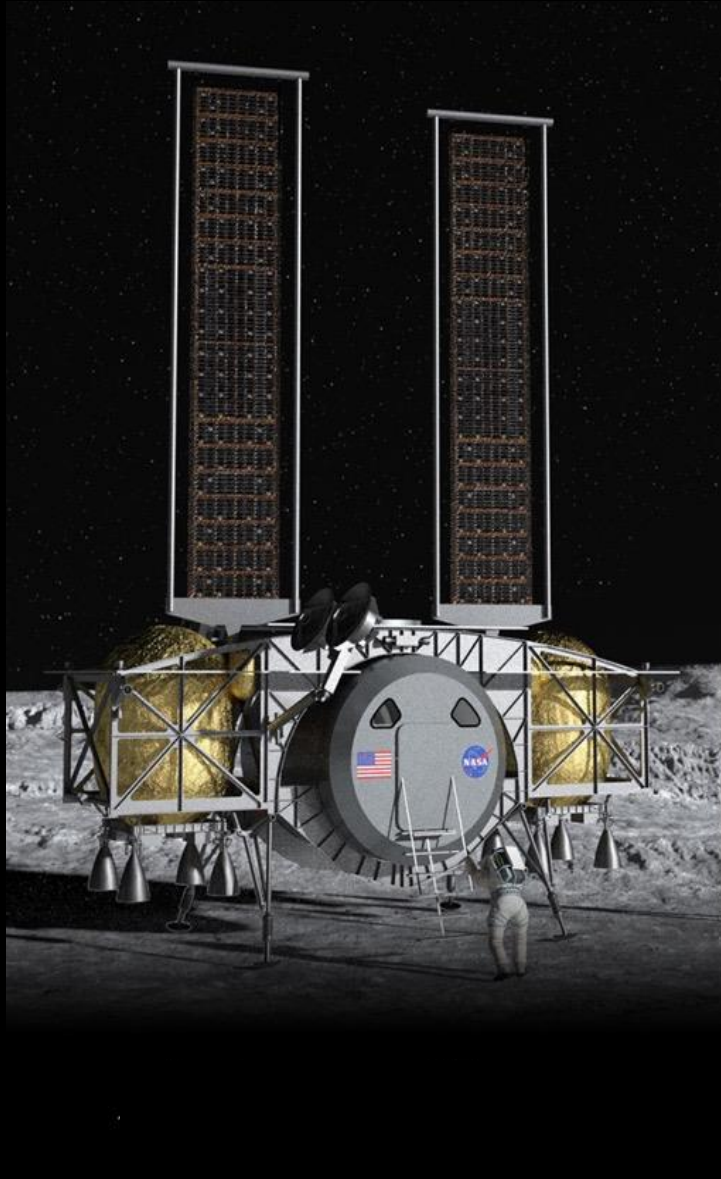
Gateway International Partners

Building on ISS partnerships to expand deep space capabilities



HUMAN LANDING SYSTEM SELECTIONS

Providing crew access to the lunar surface



VALUABLE LUNAR SCIENCE



Study of Planetary
Processes



Understanding
Volatile Cycles



Impact History of
Earth-Moon System



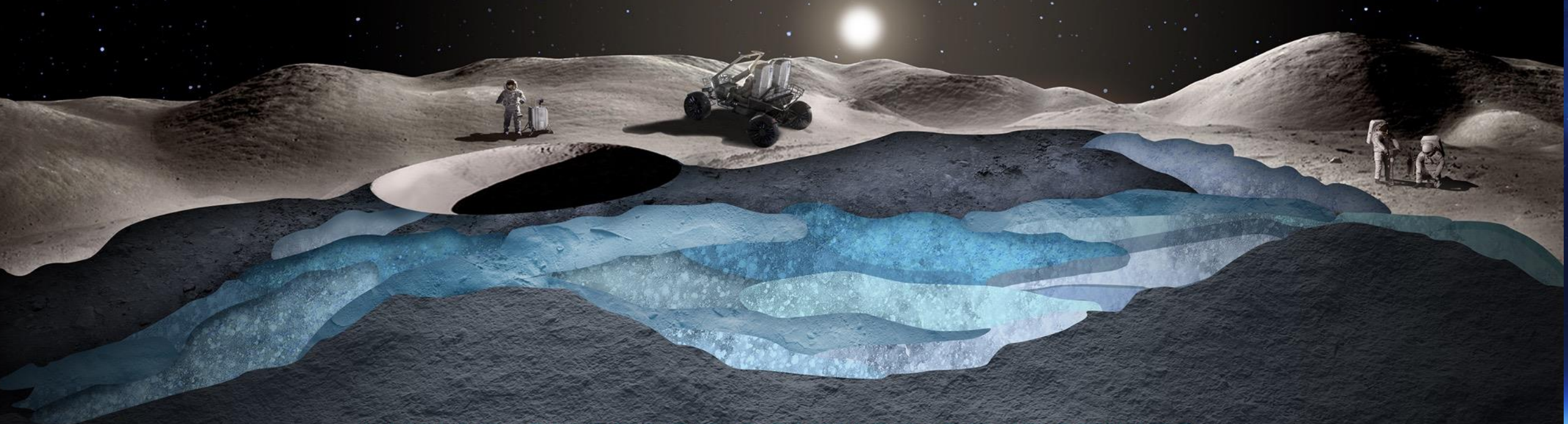
Record of the
Ancient Sun



Fundamental
Lunar Science

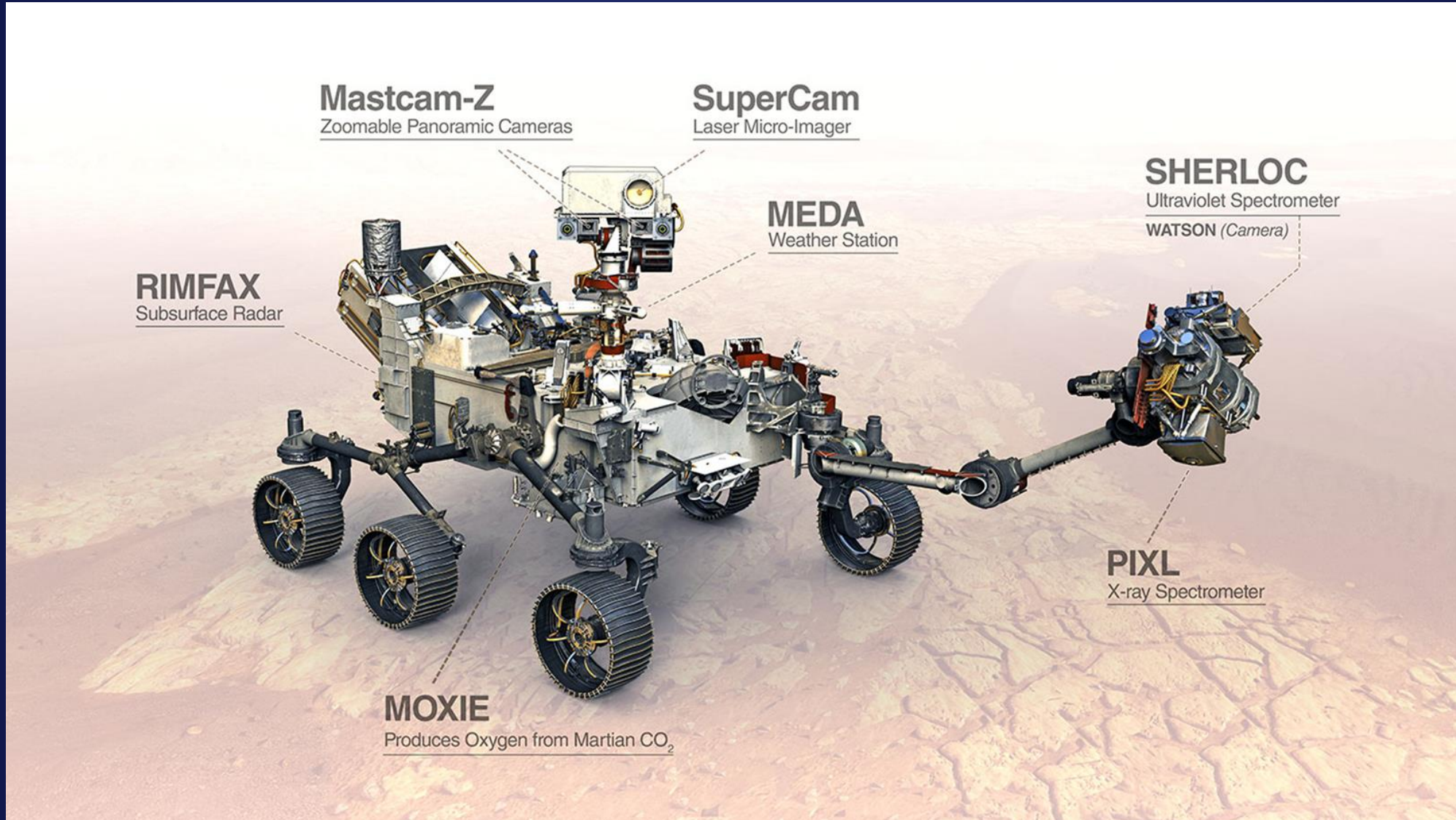


Platform to Study
the Universe

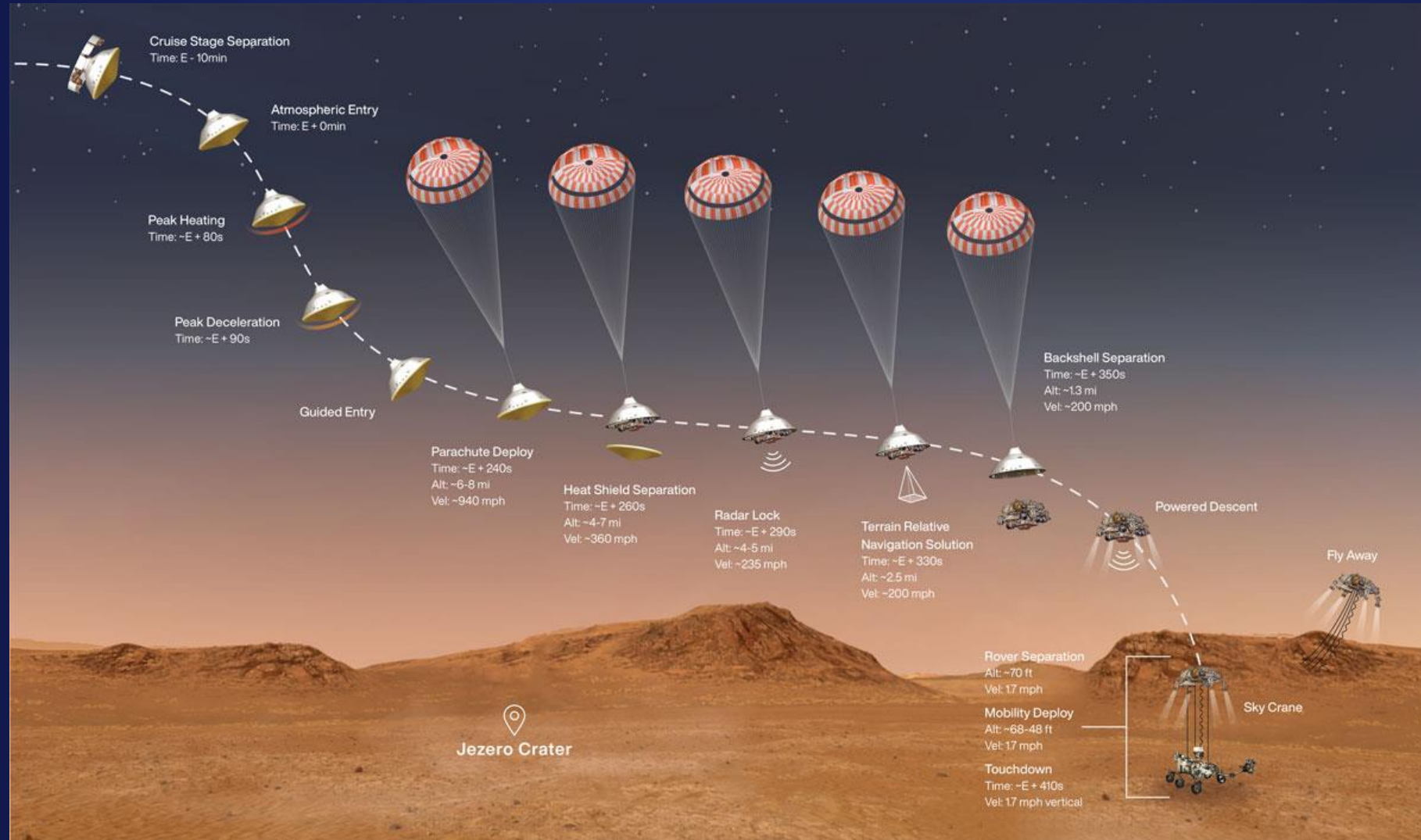


LUNAR SURFACE SCIENCE OBJECTIVES

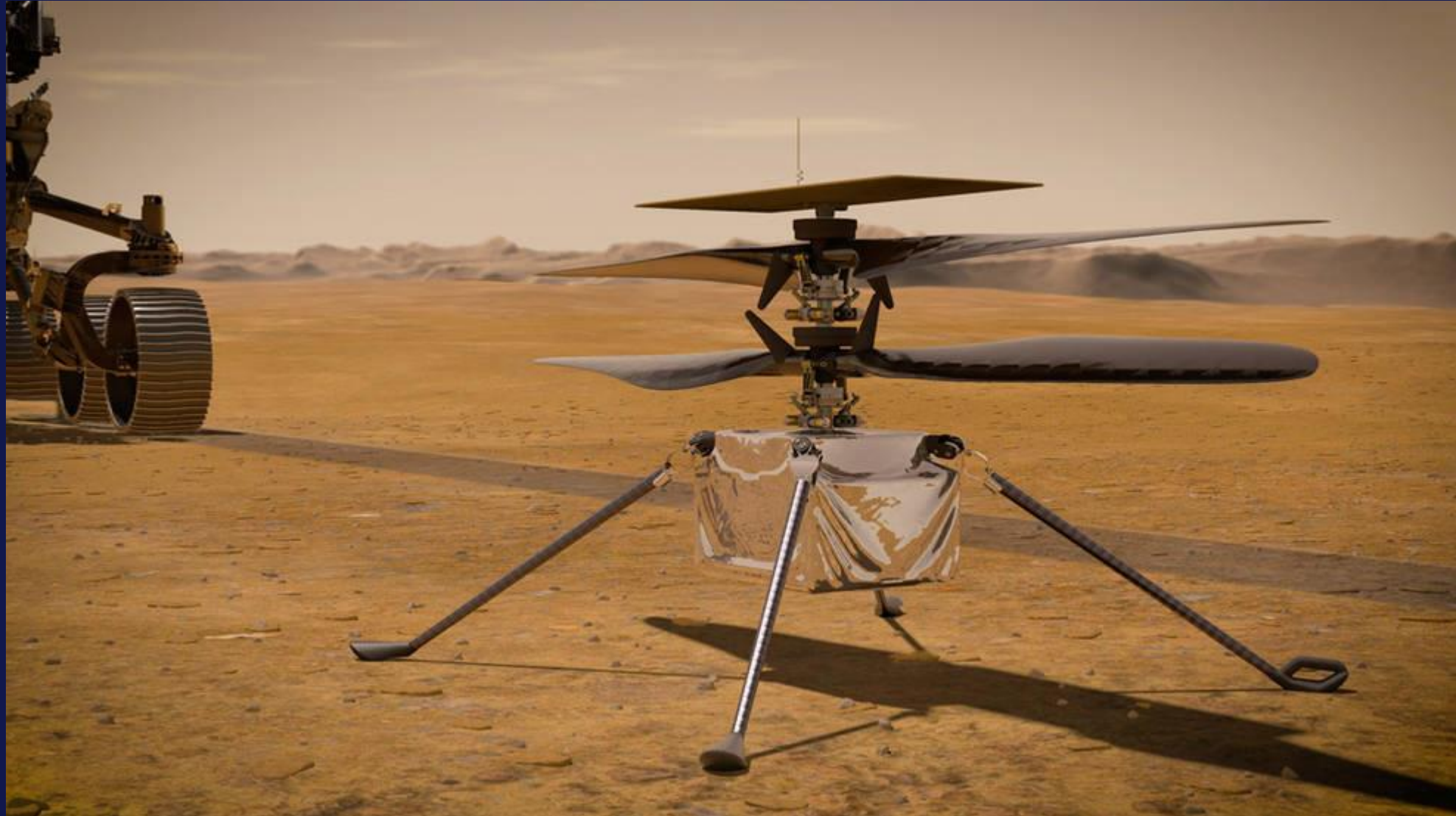
Perseverance Landing on Mars



Entry, Descent, and Landing



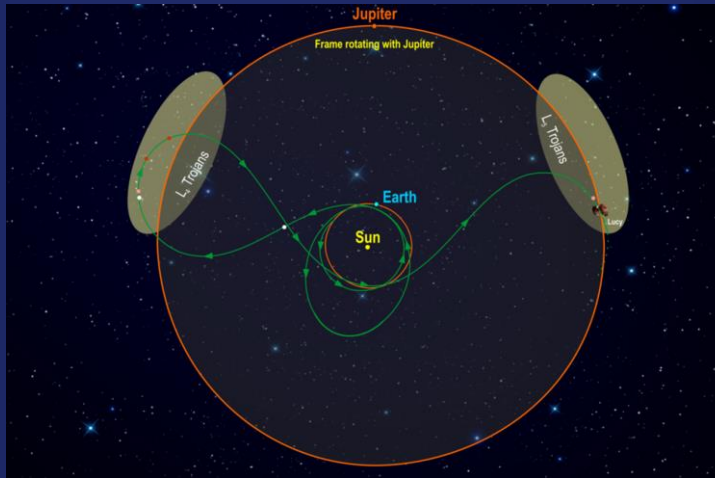
Ingenuity Mars Helicopter



Other NASA Level I Events



James Webb Telescope



Lucy



Landsat 9



Let's go. *The time is now.*

