By Leo DeGreef
Sr. Systems Engineer
The Artemis Program

To: Regis Jesuit HS
2025 – April, 25

SLS Launch
11/16/2022
1:47 AM


EFT-1 Launch
12/5/2014

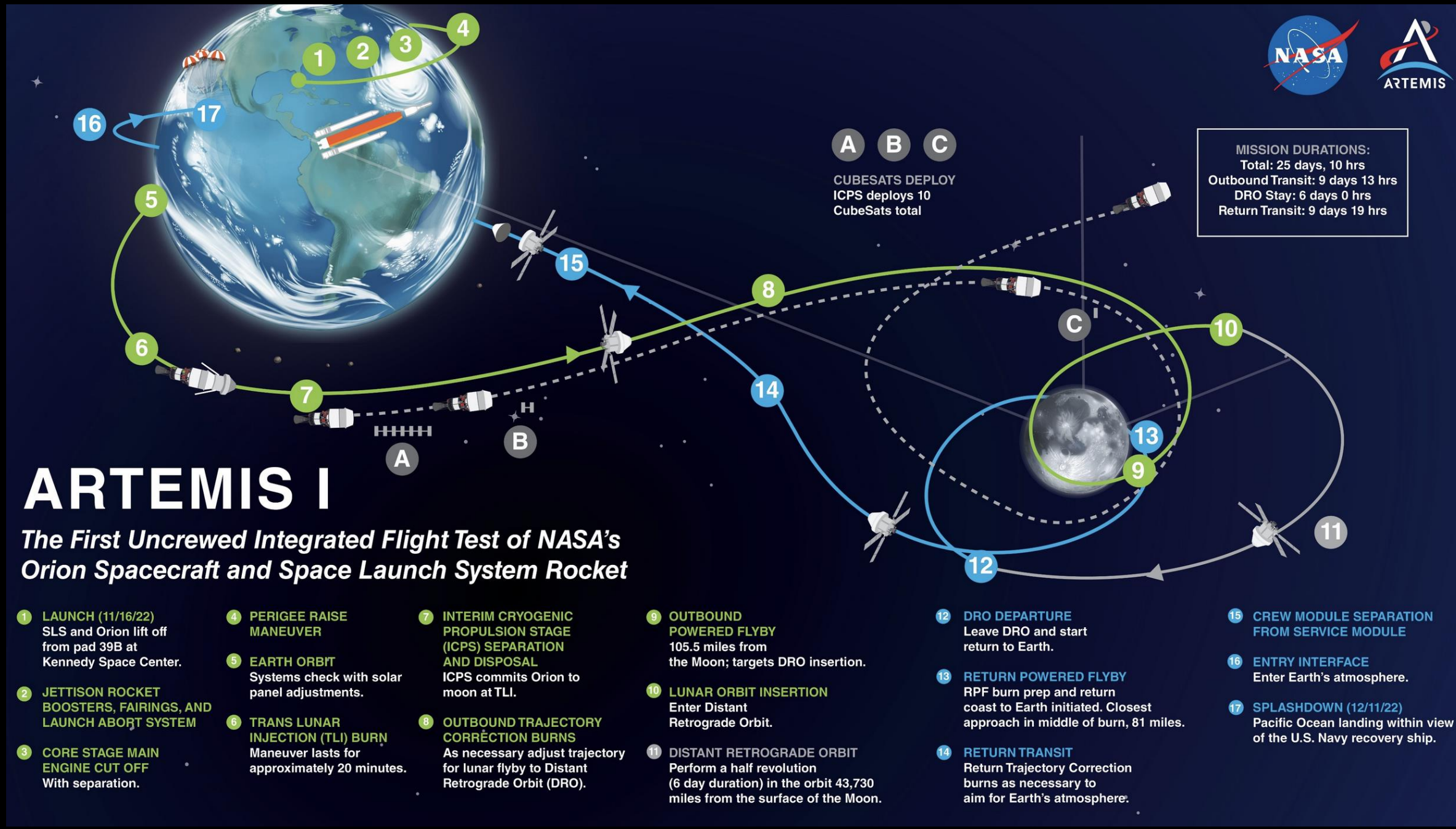

Orion
Exploration Flight Test-1
GUEST
Columbia
Orion
Exploration Flight Test-1
GUEST

Artemis 1 sits ready atop the Space Launch System (SLS) mounted on the Mobile Launcher (ML)

Artemis I

- Most powerful rocket ever to orbit
- 8.8 Million pounds of thrust
- 322 feet tall

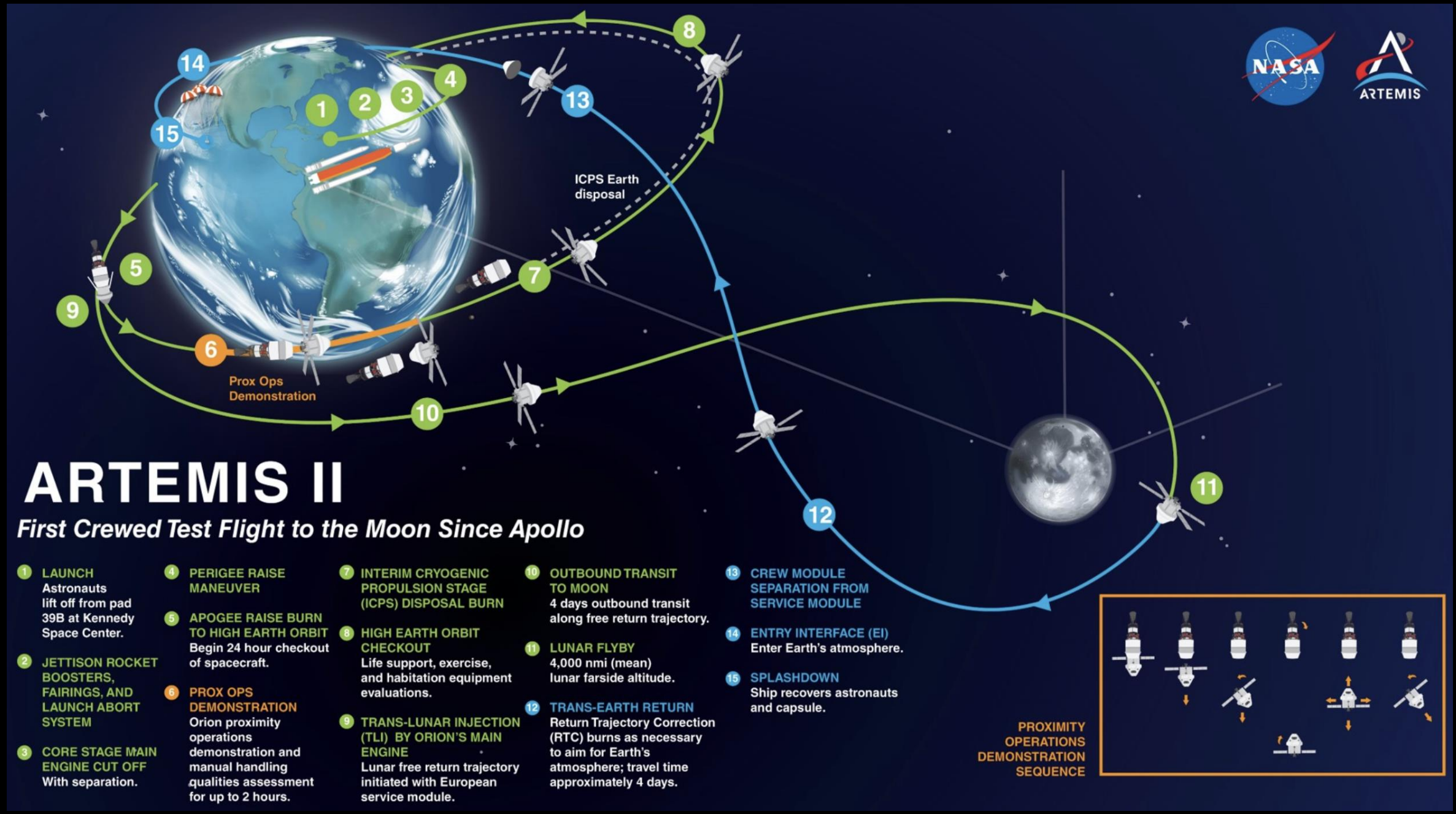
Launch Site: Launch Pad 39B at NASA's Kennedy Space Center in Florida
Launch Date: Nov. 16, 2022 at 1:47 AM EST
Mission Duration: 25 days, 10 hours, 53 minutes
Destination: Distant retrograde orbit around the Moon
Total Mission Miles: Approximately 1.4 million miles (2.3 million km)
Splashdown Site: Pacific Ocean, off the coast of San Diego
Return Speed: Up to 25,000 mph (40,000 kph)
Splashdown: Dec. 11, 2022


NASA
ARTEMIS
A B C
CUBESATS DEPLOY
ICPS deploys 10
CubeSats total
MISSION DURATIONS:
Total: 25 days, 10 hrs
Outbound Transit: 9 days 13 hrs
DRO Stay: 6 days 0 hrs
Return Transit: 9 days 19 hrs
ARTEMIS I
The First Uncrewed Integrated Flight Test of NASA's Orion Spacecraft and Space Launch System Rocket
1 LAUNCH (11/16/22)
SLS and Orion lift off from pad 39B at Kennedy Space Center.
2 JETTISON ROCKET BOOSTERS, FAIRINGS, AND LAUNCH ABORT SYSTEM
3 CORE STAGE MAIN ENGINE CUT OFF
With separation.
4 PERIGEE RAISE MANEUVER
5 EARTH ORBIT
Systems check with solar panel adjustments.
6 TRANS LUNAR INJECTION (TLI) BURN
Maneuver lasts for approximately 20 minutes.
7 INTERIM CRYOGENIC PROPULSION STAGE (ICPS) SEPARATION AND DISPOSAL
ICPS commits Orion to moon at TLI.
8 OUTBOUND TRAJECTORY CORRECTION BURNS
As necessary adjust trajectory for lunar flyby to Distant Retrograde Orbit (DRO).
9 OUTBOUND POWERED FLYBY
105.5 miles from the Moon; targets DRO insertion.
10 LUNAR ORBIT INSERTION
Enter Distant Retrograde Orbit.
11 DISTANT RETROGRADE ORBIT
Perform a half revolution (6 day duration) in the orbit 43,730 miles from the surface of the Moon.
12 DRO DEPARTURE
Leave DRO and start return to Earth.
13 RETURN POWERED FLYBY
RPF burn prep and return coast to Earth initiated. Closest approach in middle of burn, 81 miles.
14 RETURN TRANSIT
Return Trajectory Correction burns as necessary to aim for Earth's atmosphere.
15 CREW MODULE SEPARATION FROM SERVICE MODULE
16 ENTRY INTERFACE
Enter Earth's atmosphere.
17 SPLASHDOWN (12/11/22)
Pacific Ocean landing within view of the U.S. Navy recovery ship.

Artemis II Astronauts have been chosen

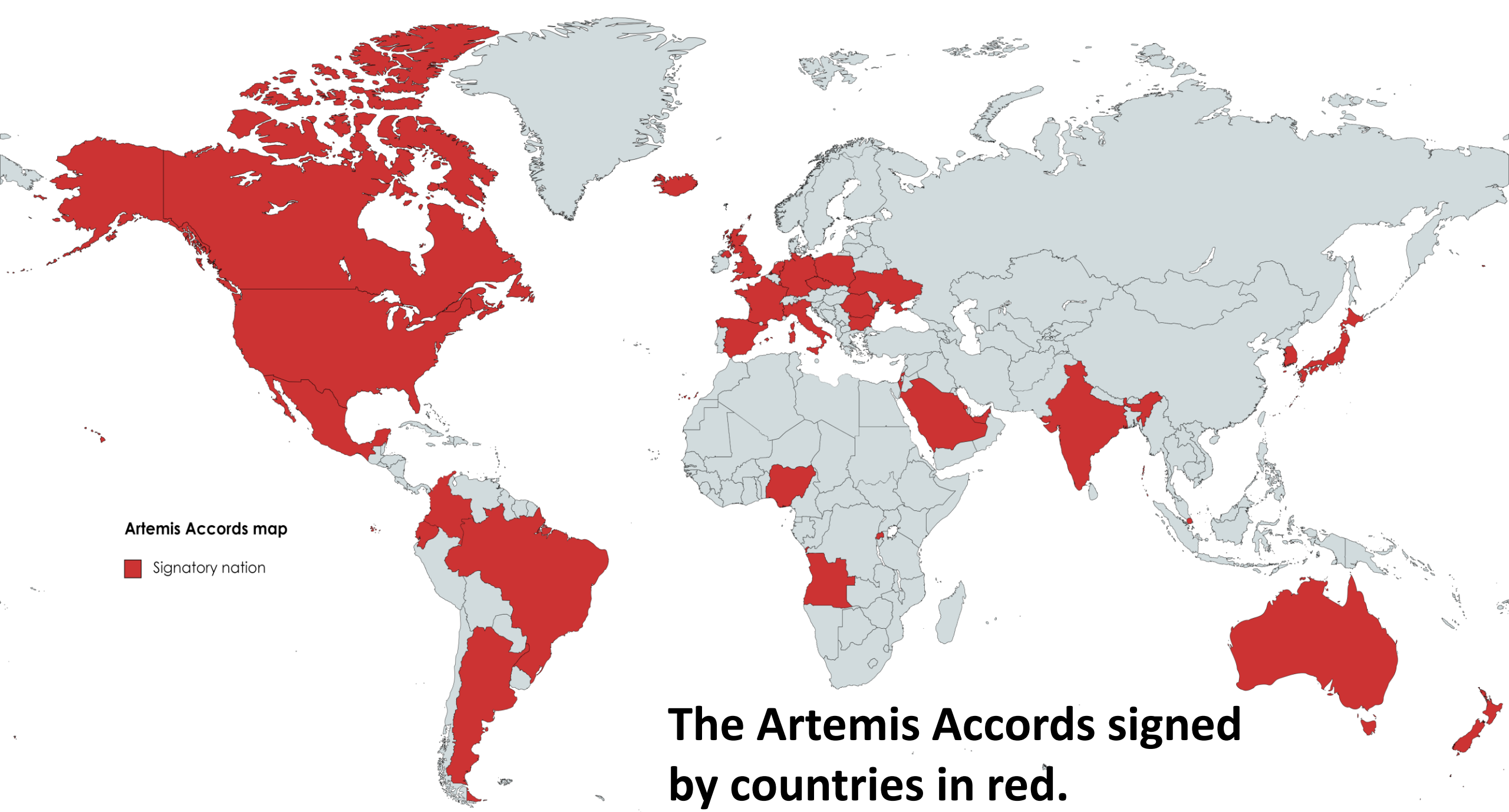
Three visited Denver

Astronauts spoke to engineers and their families.


NASA
ARTEMIS
ICPS Earth disposal
Prox Ops Demonstration
ARTEMIS II
First Crewed Test Flight to the Moon Since Apollo
1 LAUNCH
Astronauts lift off from pad 39B at Kennedy Space Center.
2 JETTISON ROCKET BOOSTERS, FAIRINGS, AND LAUNCH ABORT SYSTEM
3 CORE STAGE MAIN ENGINE CUT OFF
With separation.
4 PERIGEE RAISE MANEUVER
5 APOGEE RAISE BURN TO HIGH EARTH ORBIT
Begin 24 hour checkout of spacecraft.
6 PROX OPS DEMONSTRATION
Orion proximity operations demonstration and manual handling qualities assessment for up to 2 hours.
7 INTERIM CRYOGENIC PROPULSION STAGE (ICPS) DISPOSAL BURN
8 HIGH EARTH ORBIT CHECKOUT
Life support, exercise, and habitation equipment evaluations.
9 TRANS-LUNAR INJECTION (TLI) BY ORION'S MAIN ENGINE
Lunar free return trajectory initiated with European service module.
10 OUTBOUND TRANSIT TO MOON
4 days outbound transit along free return trajectory.
11 LUNAR FLYBY
4,000 nmi (mean) lunar farside altitude.
12 TRANS-EARTH RETURN
Return Trajectory Correction (RTC) burns as necessary to aim for Earth's atmosphere; travel time approximately 4 days.
13 CREW MODULE SEPARATION FROM SERVICE MODULE
14 ENTRY INTERFACE (EI)
Enter Earth's atmosphere.
15 SPLASHDOWN
Ship recovers astronauts and capsule.
PROXIMITY OPERATIONS DEMONSTRATION SEQUENCE


I visited SpaceX’s Starbase twice in Boca Chica, TX
STARBASE


PRIVATE
PROPERTY



The Artemis Accords signed by countries in red.

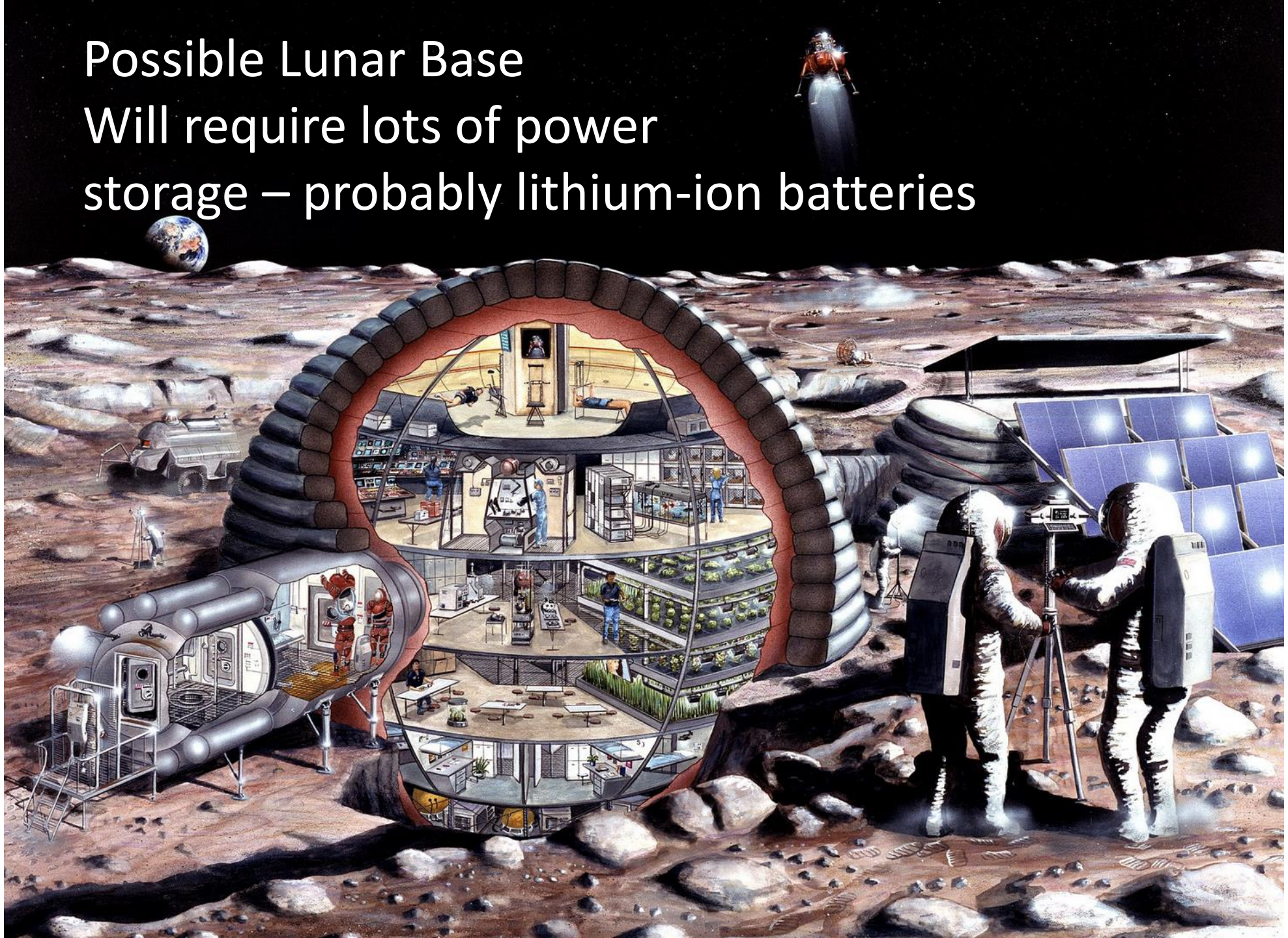
JFK

60

"We choose to go to the Moon."

Bruce McCandless
Floating in space!

Possible Lunar Base
Will require lots of power
storage – probably lithium-ion batteries




Underwriters Research Institutes
Research lithium-ion battery
safety.

Dr. Judy Jeeverajan – head of the Electrochemical Safety Research Institute worked at NASA on battery safety.

Wherever a future lunar base is developed, it will need some kind of power transmission or storage system to provide power during the lunar night. (credit: Alliance for Space Development)

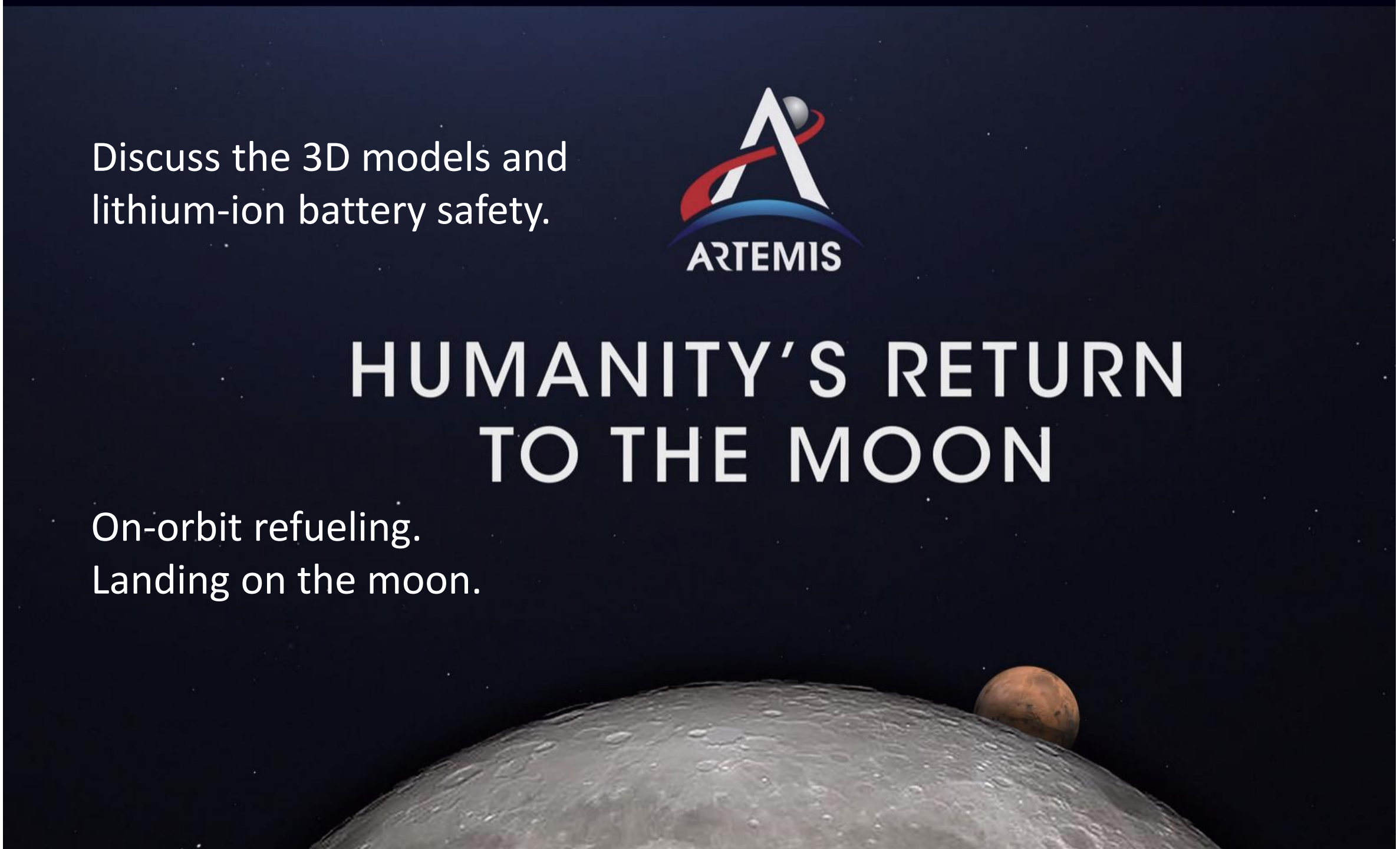

It might be up to some of you
in this room to solve the challenges of
power storage on the moon and safe
space travel with lithium-ion batteries.

Discuss the 3D models and lithium-ion battery safety.

ARTEMIS

HUMANITY'S RETURN TO THE MOON

On-orbit refueling.
Landing on the moon.



How are YOU going to solve these challenges???!!!

Backup Slides

YouTube Videos if time permits

- **Lithium Ion Batteries: Why They Explode** **3:15**
- **Dog starts fire after chewing on battery** **:26**
- **https://www.youtube.com/watch?v=Wcjw14aRm_g**

- **Fire caused by lithium-ion batteries**

Acronyms	Definition
MPCV	Multi-Purpose Crew Vehicle
SLS	Space Launch System
SRB	Solid Rocket Booster
ICPS	Interim Cryogenic Propulsion Stage
LAS	Launch Abort System
CM	Command Module
ESM	European Space Module