IEEE Tech Talk

Artemis Moon Landing

Cubesats

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@ KSF Space

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About KSF Space

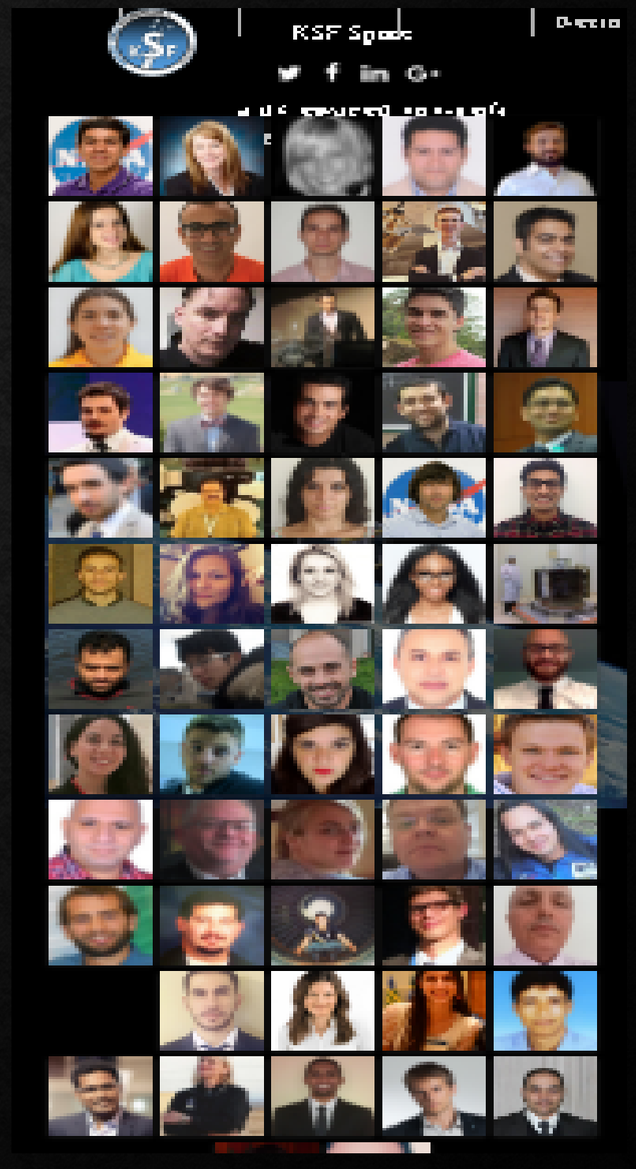
A non profit foundation registered in the USA # 10176163, the KSF Space Foundation or (KSF) was initially founded to enable cost-efficient access to low earth orbit (LEO) with zero-environmental impact flying solutions.

- ✓ The foundation encourage universities to develop R&D missions using small satellites and micro-satellites, where small satellites become one of the most important role in developing future scientific space missions.

- ✓ The foundation steered by officers and members from major space agencies and industries like NASA,ESA,JAXA,SpaceX…etc.

More about KSF activities www.ksf.space

Recent reference article by
Satellite Evolution Magazine USA
http://www.satellite-evolution.com/group/site/?p=47536



Our Core Units


NanoSatellite Engineering Professional

This is to certify that

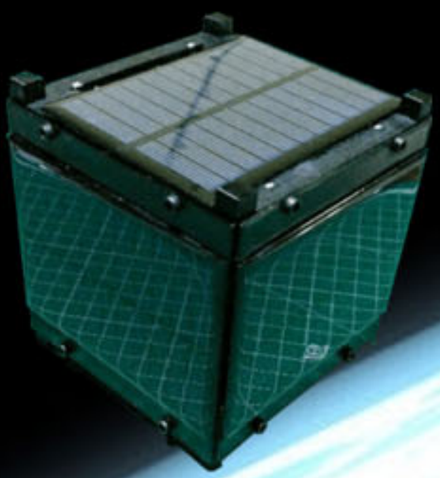
JOHN McLAREN

Has successfully completed all prescribed requirement and is hereby designated as

NanoSatellite Engineering Professional

- World's 1st Satellite Professional Certification with over 1700 candidates

- In house fabricated cheapest satellite in small sat industry



NEP Certificate

CubeSat Kit

JUPITER Rocket

MNSAT Conference

- World's 1st NGO Rocket for testing satellites in suborbital

- IEEE Aerospace Int. Conference

MNSAT

KSF SPACE READY TO FLY CUBESAT EDUCATION KIT

Register NOW
mnsat.org

MNSAT Conference

In collaboration with

AESS IEEE Aerospace

International Conference on Micro-Nano Satellites
2-3 May, 2017, Morocco

KSF

SURREY SPACE CENTRE

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KSF · SPACE FOUNDATION

www.ksf.space

JUPITER 1
2023

JUPITER 2
2025

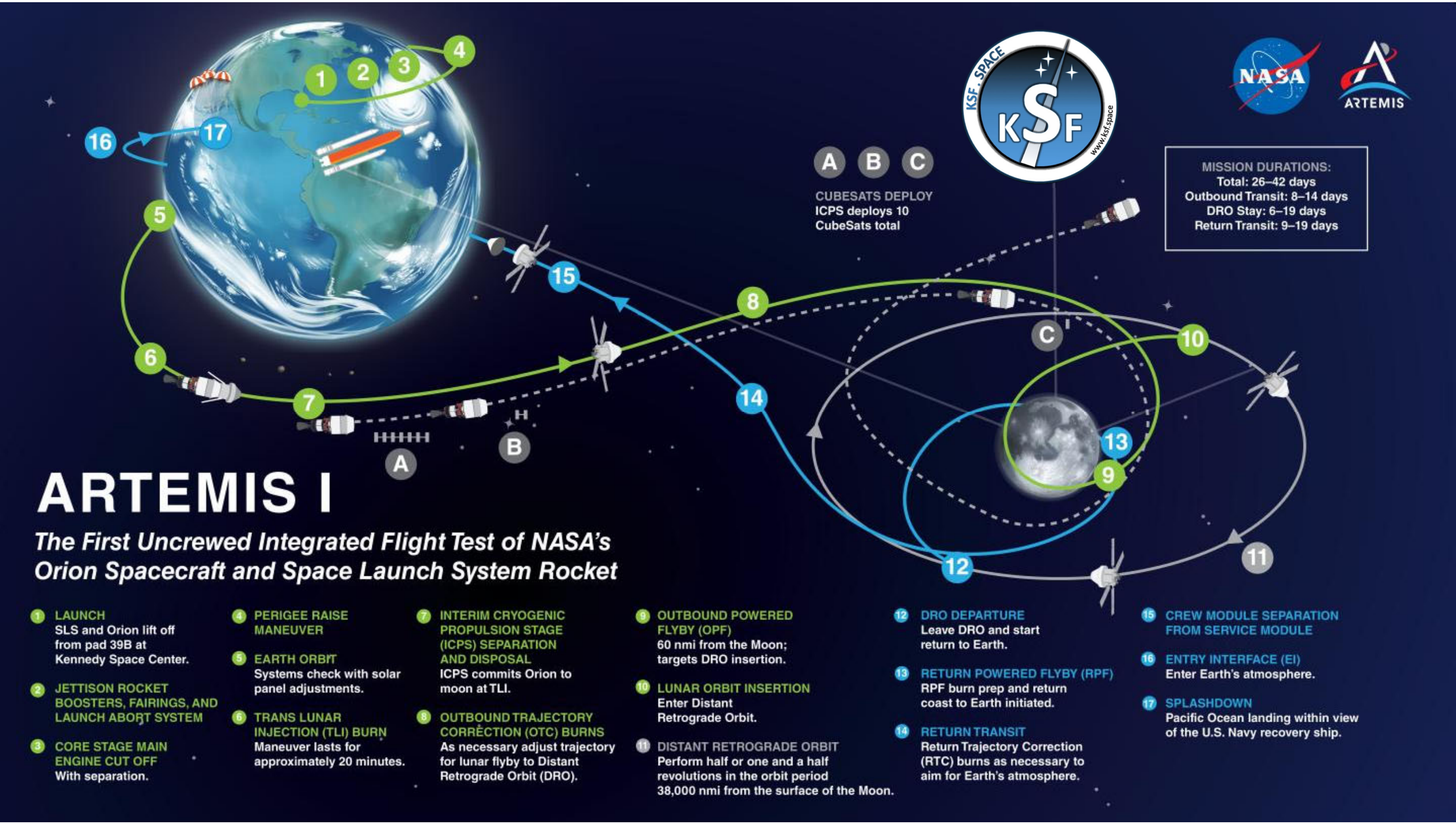
JUPITER 3
2027

KU THE UNIVERSITY OF KANSAS

JUPITER workshop facility: 2120 Learned Hall, 1530 W 15th St, Lawrence, KS 66045, USA

ARTEMIS MISSION OVERVIEW

- The Artemis program is a robotic and human Moon exploration program
- NASA and partners: ESA, JAXA, and CSA
- Purpose: Sustainable crewed lunar exploration
- Cost US$93+ billion (2012–2025) of which 53 billion in 2021-2025
- First flight: Artemis 1 (16 November 2022, 06:47:44 UTC)
- First crewed flight: Artemis 2 (TBD November 2024)
- Vehicle(s): Orion, Starship HLS, Lunar Gateway



ARTEMIS I

The First Uncrewed Integrated Flight Test of NASA's Orion Spacecraft and Space Launch System Rocket

1. **LAUNCH**
   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 (OTC) BURNS**
   As necessary adjust trajectory for lunar flyby to Distant Retrograde Orbit (DRO).
9. **OUTBOUND POWERED FLYBY (OPF)**
   60 nmi from the Moon; targets DRO insertion.
10. **LUNAR ORBIT INSERTION**
    Enter Distant Retrograde Orbit.
11. **DISTANT RETROGRADE ORBIT**
    Perform half or one and a half revolutions in the orbit period 38,000 nmi from the surface of the Moon.
12. **DRO DEPARTURE**
    Leave DRO and start return to Earth.
13. **RETURN POWERED FLYBY (RPF)**
    RPF burn prep and return coast to Earth initiated.
14. **RETURN TRANSIT**
    Return Trajectory Correction (RTC) burns as necessary to aim for Earth's atmosphere.
15. **CREW MODULE SEPARATION FROM SERVICE MODULE**
16. **ENTRY INTERFACE (EI)**
    Enter Earth's atmosphere.
17. **SPLASHDOWN**
    Pacific Ocean landing within view of the U.S. Navy recovery ship.

SPACE LAUNCH SYSTEM

ARTEMIS I

SMALL SATELLITES + BIG SCIENCE

Ten **CubeSats,** or small satellites, in the **Orion stage adapter (OSA)** will ride along to deep space. These high-risk, high-reward CubeSats will be deployed at strategic times based on mission requirements.

CubeSats

- OMOTENASHI
- Lunar IceCube
- EQUULEUS
- ArgoMoon
- BioSentinel
- NEA Scout
- LunaH-Map
- LunIR
- Team Miles
- CuSP

* All times approximate

Mission Key

- Lunar Science
- Technology Demonstration
- Radiation

www.nasa.gov/sls

Artemis Phase 1: Path to The Lunar Surface

Artemis I: First human spacecraft to the Moon in the 21st century

Artemis II: First humans to orbit the Moon in the 21st century

Artemis Support Mission: First high-power Solar Electric Propulsion (SEP) system

Artemis Support Mission: First pressurized module delivered to Gateway

Artemis Support Mission: Human Landing System delivered to Gateway

Artemis.III: Crewed mission to Gateway and lunar surface

Commercial Lunar Payload Services
- CLPS-delivered science and technology payloads

Early South Pole Mission(s)
- First robotic landing on eventual human lunar return and In-Situ Resource Utilization (ISRU) site
- First ground truth of polar crater volatiles

Large-Scale Cargo Lander
- Increased capabilities for science and technology payloads

Humans on the Moon - 21st Century
First crew leverages infrastructure left behind by previous missions

LUNAR SOUTH POLE TARGET SITE

2020 2024

ARTEMIS I
LAUNCHING
SCIENCE & TECHNOLOGY
SECONDARY PAYLOADS

1

PRIMARY MISSION

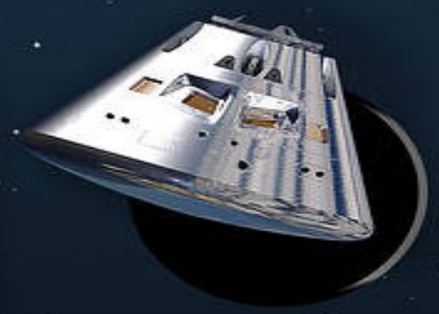
TESTING SLS AND ORION

SPACE LAUNCH SYSTEM (SLS)

LIFTS MORE THAN ANY EXISTING LAUNCH VEHICLE

ORION STAGE ADAPTER

SUPPORTS BOTH PRIMARY MISSION AND SECONDARY PAYLOADS



ORION SPACECRAFT

CARRIES 3 PRESSURIZED NON-DEPLOYED SECONDARY PAYLOADS (RADIATION EXPERIMENTS)

2

SECONDARY PAYLOADS

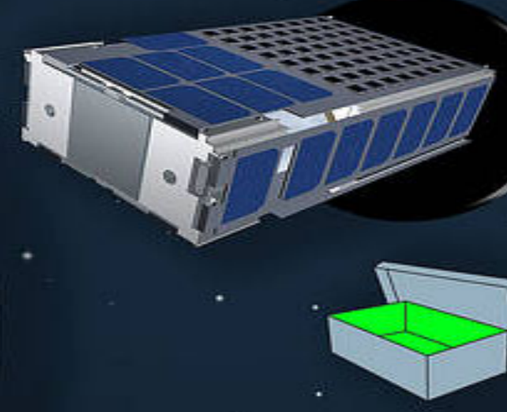
THE RING THAT WILL CONNECT THE ORION SPACECRAFT TO NASA'S SLS ALSO HAS ROOM FOR HITCHHIKER PAYLOADS

AVIONICS UNIT

(SELF-CONTAINED AND INDEPENDENT FROM THE PRIMARY MISSION) SENDS CUBESATS ON THEIR WAY

10 CUBESAT EXPLORERS

GOING TO DEEP SPACE WHERE FEW CUBESATS HAVE EVER GONE BEFORE



SHOEBOX SIZE

PAYLOADS EXPAND OUR KNOWLEDGE OF DEEP SPACE

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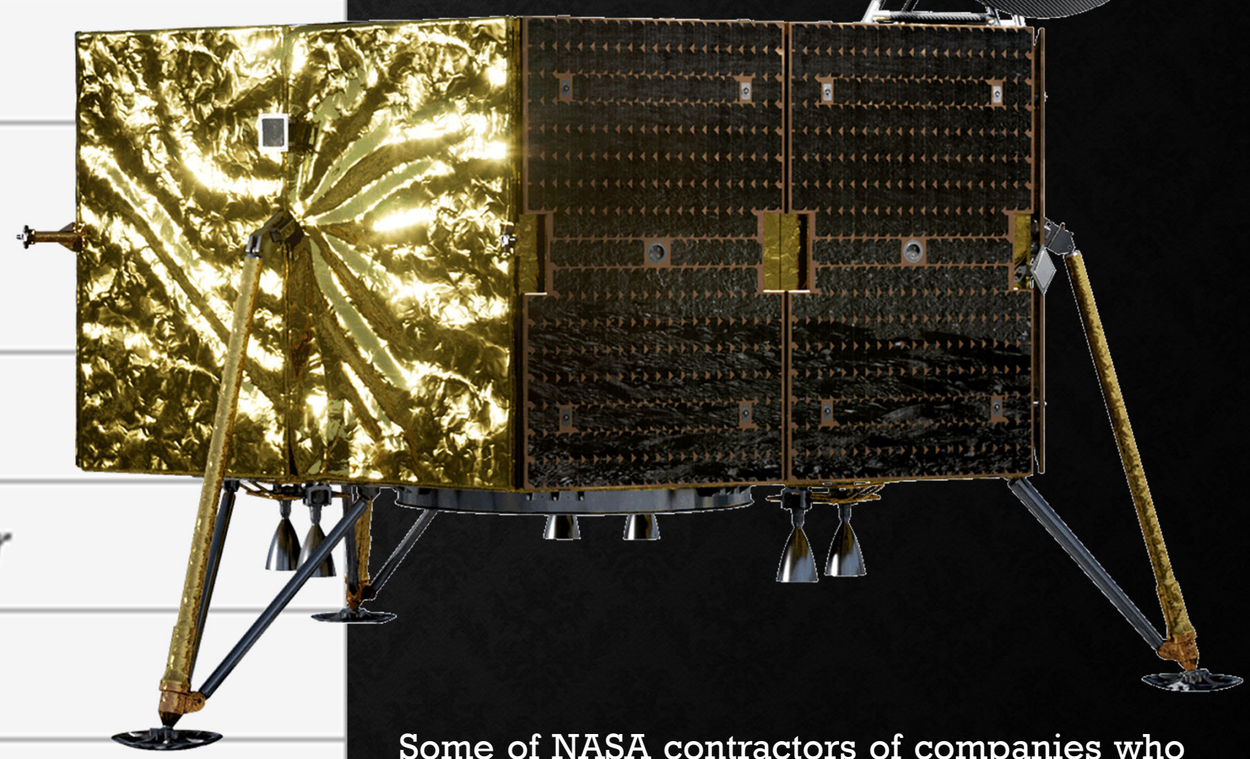
ARTEMIS

Astrobotic Technology	*Peregrine* lander
Deep Space Systems	Rover; design and development services
Draper Laboratory	*Series 2* lander
Firefly Aerospace	*Blue Ghost* lander
Intuitive Machines	*Nova-C* lander
Lockheed Martin Space	*McCandless Lunar Lander*
Masten Space Systems	*XL-1* lander
Moon Express	*MX-1*, *MX-2*, *MX-5*, *MX-9* landers; sample return.
OrbitBeyond	*Z-01* and *Z-02* landers

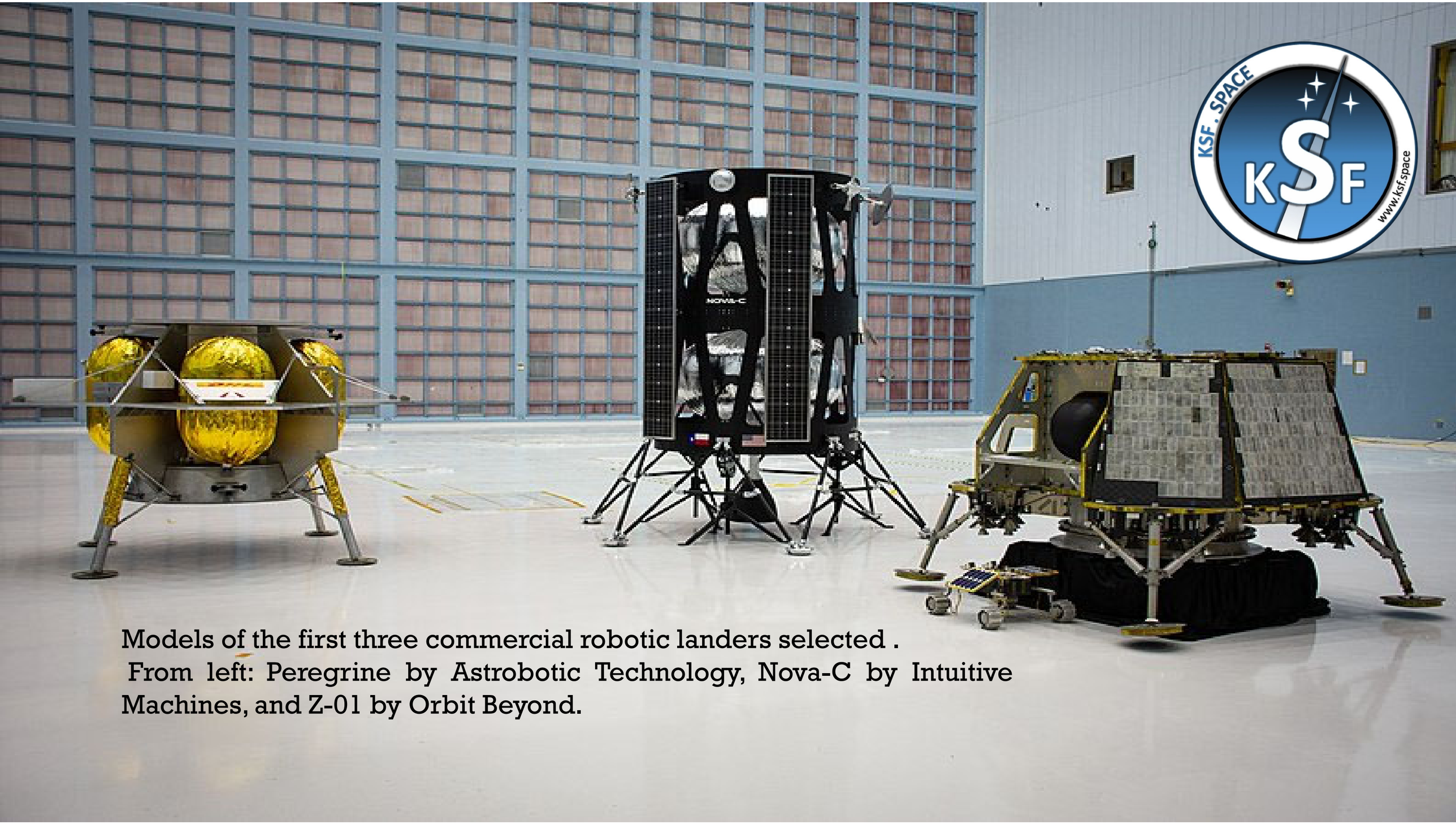
Some of winning Companies



Some of NASA contractors of companies who are eligible to bid to send large payloads to the surface of the moon: Blue Origin, Ceres Robotics, Sierra Nevada Corporation, SpaceX, and Tyvak Nano-Satellite Systems.

LUNAR Artemis Mission

- Lunar landers can accommodate a wide range of payloads, including but not limited to satellites, rovers, scientific instruments, research and development technologies.



Models of the first three commercial robotic landers selected .
From left: Peregrine by Astrobotic Technology, Nova-C by Intuitive Machines, and Z-01 by Orbit Beyond.

ARTEMIS missions timeline

Mission	Patch	Launch date	Crew	Launch vehicle	Lander vehicle	Duration	Goal	Status
Artemis 1		16 November 2022[66][4]	—	SLS Block 1	—	25 days[217]	Uncrewed lunar orbit and return	Success
Artemis 2	To be designed by the crew	November 2024[5]	Reid Wiseman Victor Glover Christina Koch Jeremy Hansen	SLS Block 1	—	~10 days	4-person lunar flyby	Planned
Artemis 3	To be designed by the crew	December 2025[15]	TBA	SLS Block 1	Starship HLS Option A [17]	~30 days	4-person lunar orbit with 2-person lunar landing.[218]	Planned

THANK YOU

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