

PERIHELION

First Launch of Orion - NASA Student Opportunity



July 2061
Ed: 20.69



Pictured: 2060 Perihelion Annual AstroPic Contest runner-up



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AROUND THE MOON WITH NASA'S FIRST LAUNCH OF SLS WITH ORION

During Artemis I, Orion will venture thousands of miles beyond the moon during an approximately four to six-week mission.

Artemis I, formerly Exploration Mission-1, will be the first integrated test of NASA's deep space exploration systems: the Orion spacecraft, Space Launch System (SLS) rocket and the ground systems at Kennedy Space Center in Cape Canaveral, Florida.

The first in a series of increasingly complex missions, Artemis I will be an uncrewed flight test that will provide a foundation for human deep space exploration, and demonstrate our commitment and capability to extend human existence to the Moon and beyond.

THE FLIGHT

During this flight, the spacecraft will launch on the most powerful rocket in the world and fly farther than any spacecraft built for humans has ever flown. It will travel 280,000 miles from Earth, thousands of miles beyond the Moon over the course of about a four to six-week mission. Orion will stay in space longer than any ship for astronauts has done without docking to a space station and return home faster and hotter than ever before.

"This is a mission that truly will do what hasn't been done and learn what isn't known," said Mike Sarafin, Artemis I mission manager at NASA Headquarters in Washington. "It will blaze a trail that people will follow on the next Orion flight, pushing the edges of the envelope to prepare for that mission." SLS and Orion will blast off from Launch Complex 39B at NASA's modernized

spaceport at Kennedy Space Center in Florida.

The SLS rocket is designed for missions beyond low-Earth orbit carrying crew or cargo to the Moon and beyond, and will produce 8.8 million pounds of thrust during liftoff and ascent to loft a vehicle weighing nearly six million pounds to orbit.

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Propelled by a pair of five segment boosters and four RS-25 engines, the rocket will reach the period of greatest atmospheric force within

ninety seconds. After jettisoning the boosters, service module panels, and launch abort system, the core stage engines will shut down and the core stage will separate from the spacecraft.

As the spacecraft makes an orbit of Earth, it will deploy its solar arrays and the Interim Cryogenic Propulsion Stage (ICPS) will give Orion the big push needed to leave Earth's orbit and travel toward the Moon.



Orion's Optical Navigation Camera captures Earth on the second day of the Artemis I mission. Credits: NASA



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 PERIGEE RAISE MANEUVER
- 3 EARTH ORBIT
Systems check with solar panel adjustments.
- 4 TRANS LUNAR INJECTION (TLI) BURN
Maneuver lasts for approximately 20 minutes.
- 5 INTERIM CRYOGENIC PROPULSION STAGE (ICPS) SEPARATION AND DISPOSAL
ICPS commits Orion to moon at TLI.
- 6 OUTBOUND TRAJECTORY CORRECTION BURNS
As necessary adjust trajectory for lunar flyby to Distant Retrograde Orbit (DRO).
- 7 OUTBOUND POWERED FLYBY
105.5 miles from the Moon; targets DRO insertion.
- 8 LUNAR ORBIT INSERTION
Enter Distant Retrograde Orbit.
- 9 DISTANT RETROGRADE ORBIT
Perform a half revolution (6 day duration) in the orbit 43,730 miles from the surface of the Moon.
- 10 DRO DEPARTURE
Leave DRO and start return to Earth.
- 11 RETURN POWERED FLYBY
RPF burn prep and return coast to Earth initiated. Closest approach in middle of burn, 81 miles.
- 12 RETURN TRANSIT
Return Trajectory Correction burns as necessary to aim for Earth's atmosphere.
- 13 CREW MODULE SEPARATION FROM SERVICE MODULE
- 14 ENTRY INTERFACE
Enter Earth's atmosphere.
- 15 SPLASHDOWN (12/11/22)
Pacific Ocean landing within view of the U.S. Navy recovery ship.

From there, Orion will separate from the ICPS within about two hours after launch. The ICPS will then deploy a number of small satellites, known as CubeSats, to perform several experiments and technology demonstrations.

As Orion continues on its path from Earth orbit to the Moon, it will be propelled by a service module provided by the European Space Agency, which will supply the spacecraft's main propulsion system and power (as well as house air and water for astronauts on future missions). Orion will pass through the Van Allen radiation belts, fly past the Global Positioning System (GPS) satellite constellation and above communication satellites in Earth orbit. To talk with mission control in Houston, Orion will switch from NASA's Tracking and Data Relay Satellites system and communicate through the Deep Space Network.

From here, Orion will continue to demon-

strate its unique design to navigate, communicate, and operate in a deep space environment.

The outbound trip to the Moon will take several days, during which time engineers will evaluate the spacecraft's systems and, as needed, correct its trajectory. Orion will fly about 62 miles (100 km) above the surface of the Moon, and then use the Moon's gravitational force to propel Orion into a new deep retrograde, or opposite, orbit about 40,000 miles (70,000 km) from the Moon.

The spacecraft will stay in that orbit for approximately six days to collect data and allow mission controllers to assess the performance of the spacecraft. During this period, Orion will travel in a direction around the Moon retrograde from the direction the Moon travels around Earth.

THE RETURN

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another close flyby that takes the spacecraft demonstrate its unique design to navigate, communicate, and operate in a deep space environment.

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THE RETURN

For its return trip to Earth, Orion will do another close flyby that takes the spacecraft within about 60 miles of the Moon's surface, the spacecraft will use another precisely timed engine firing of the European-provided service module in conjunction with the Moon's gravity to accelerate back toward Earth. This maneuver will set the spacecraft on its trajectory back toward Earth to enter our planet's atmosphere traveling at 25,000 mph (11 kilometers per second), producing temperatures of approximately 5,000 degrees Fahrenheit (2,760 degrees Celsius) – faster and hotter than Orion experienced during its 2014 flight test.

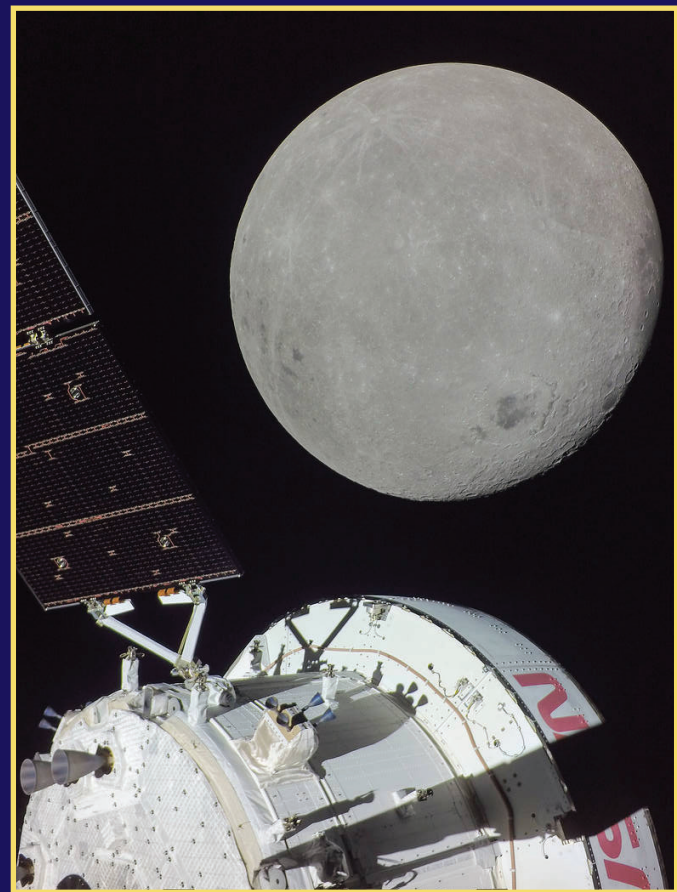
After about four to six weeks and a total distance traveled exceeding 1.3 million miles, the mission will end with a test of Ori-

on's capability to return safely to the Earth as the spacecraft makes a precision landing within eyesight of the recovery ship off the coast of Baja, California.

Following splashdown, Orion will remain powered for a period of time as divers from the U.S. Navy and operations teams from NASA's Exploration Ground Systems approach in small boats from the waiting recovery ship. The divers will briefly inspect the spacecraft for hazards and hook up tending and tow lines, and then engineers will tow the capsule into the well-deck of the recovery ship to bring the spacecraft home.

THE MISSION

With this first exploration mission, NASA is leading the next steps of human exploration into deep space where astronauts will build and begin testing the systems near the Moon needed for



*Orion approaches Moon for an outbound powered flyby.
Credits: NASA*

This Month



17th

The famous Leonid Meteor Showers have a particularly spectacular run in 1966.

20th

Edwin Hubble born in 1889 in Missouri. Hubble is known for his work in extragalactic astronomy and observational cosmology.



In History

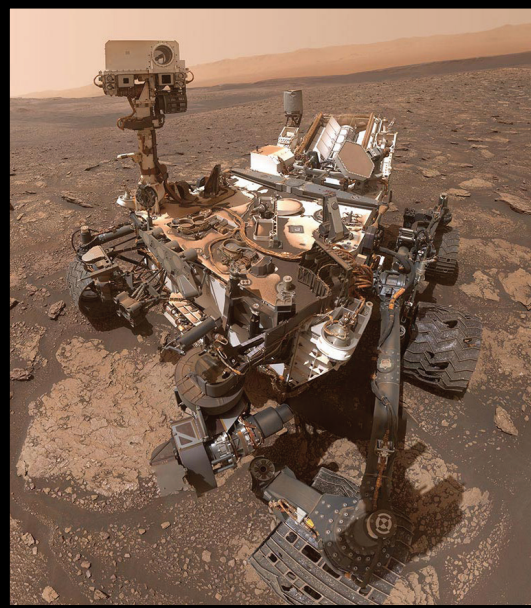


The first successful Mars flyby mission is launched in 1964.

28th

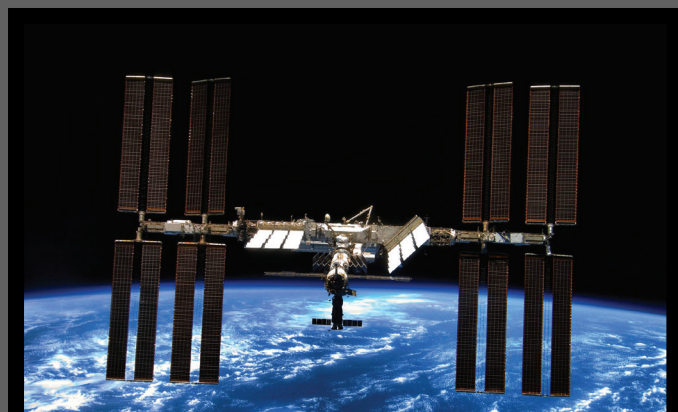
26th

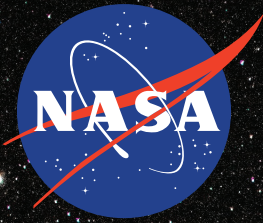
The Mars Curiosity Rover is launched in 2011.



Also on the 20th, in 1998, the International Space Station is launched, and has been orbiting ever since.

20th





2023 High-Altitude Student Platform Opportunity

Student teams from U.S. community colleges and universities are invited to develop experiments to fly to the edge of space on a NASA high-altitude research balloon.

The High-Altitude Student Platform project provides near-space access for 12 student experiments.

Flights typically last 15 to 20 hours and reach an altitude of 122,000 feet. There is no cost for launch and flight operations. Student teams must raise funds to support payload development and travel, if necessary.



A notice of intent to participate must be submitted no later than
Dec 2.

