

# Exploration Systems Development Mission Directorate Status



**Catherine Koerner**

Associate Administrator  
Exploration Systems Development Mission Directorate  
NASA Headquarters | Washington, DC

NASA Advisory Council  
Human Exploration and Operations Committee  
August 29, 2024



# Artemis II

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**Victor Glover**  
Pilot

**Christina Koch**  
Mission Specialist

**Reid Wiseman**  
Commander

**Jeremy Hansen**  
Mission Specialist

## ARTEMIS FIRSTS:

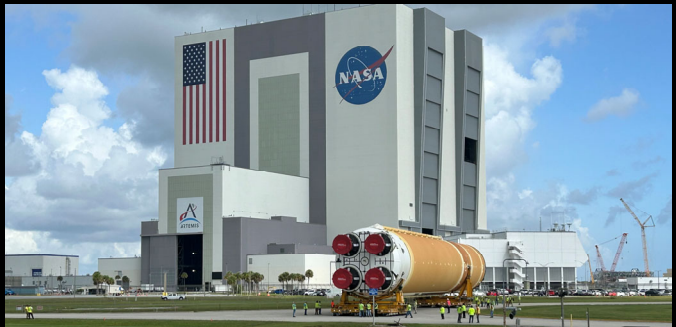
- Crewed integrated flight test of the Space Launch System (SLS) rocket, Orion spacecraft, and Exploration Ground Systems (EGS) at NASA's Kennedy Space Center
- Active Orion Launch Abort System (LAS)
- Demonstration of Orion life-support systems
- Proximity operations demonstrations
- Human data collection in transit to and from the Moon, in lunar orbit, and through reentry and splashdown
- Conducting orbital science and technology demonstrations

## NEW ELEMENTS:

- Orion life-support systems
- Launch Complex 39B emergency egress system for crew and a new liquid hydrogen system



# Artemis II Progress



Artemis II core stage arrives at Kennedy Space Center



Mobile launcher 1 preparations for Artemis II launch



Artemis II crew practice maneuvers inside Orion mock-up



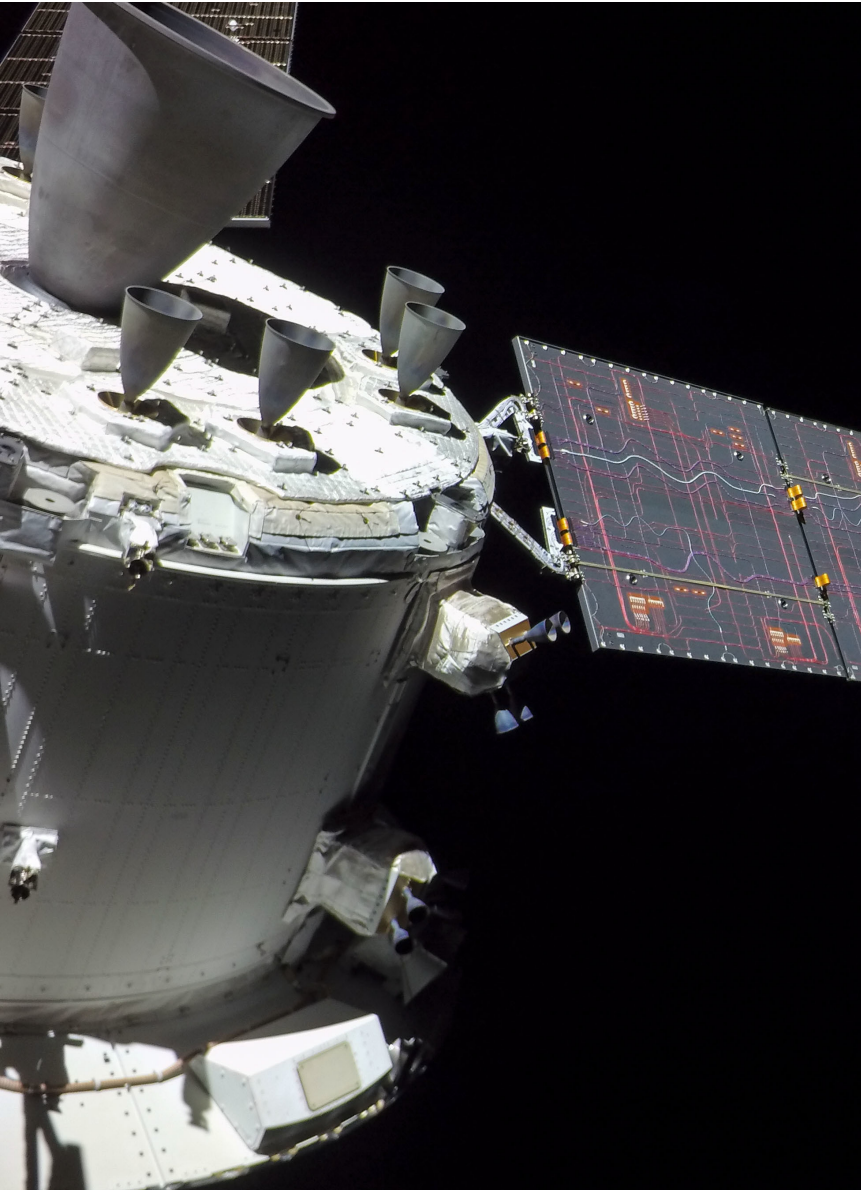
EGS teams test four emergency egress baskets at Launch Complex 39B



Launch vehicle stage adapter (LVSA), which connects SLS core stage to upper stage, en route to Kennedy



Andre Douglas, NASA's backup astronaut for Artemis II



# Artemis III

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## ARTEMIS FIRSTS:

- Human landing in lunar South Pole region and return
- Orion to human landing system direct mission, including crew docking activity
- Use of Near Rectilinear Halo Orbit (NRHO)
- Four astronauts to lunar orbit
- Two astronauts to lunar surface to collect scientific samples and data
- New science and technology demonstrations

## NEW ELEMENTS:

- Orion full-up rendezvous, proximity operations, and docking systems
- Starship human landing system
- Advanced spacesuits and tools to explore the surface and collect samples



# Artemis II Progress



NASA astronauts Andre Douglas, right, and Kate Rubins participate in JETT 5



SpaceX's Starship Flight 4 test from Starbase at Boca Chica Beach, Texas, on June 6, 2024



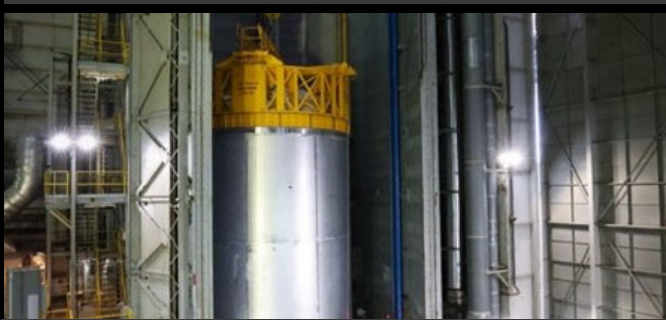
Interim cryogenic propulsion stage final testing and checkout



Astronauts in pressurized spacesuits interact with full-scale mock-up of SpaceX Starship HLS airlock



RS-25 flight set completes processing



Core stage liquid oxygen tank at Vertical Assembly Center at Michoud

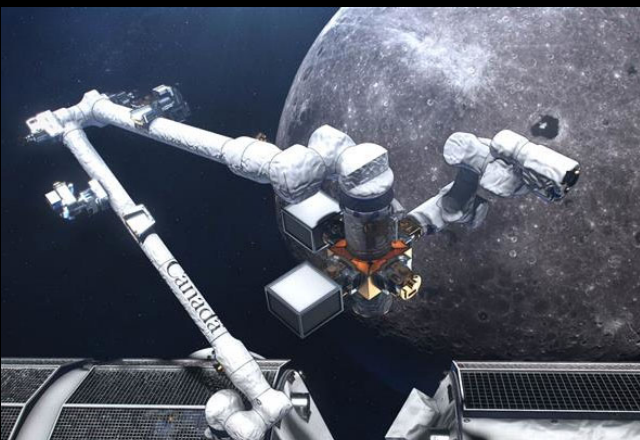
# Gateway Progress



Maxar technicians install xenon tanks into Power and Propulsion Element (PPE) central cylinder for Gateway



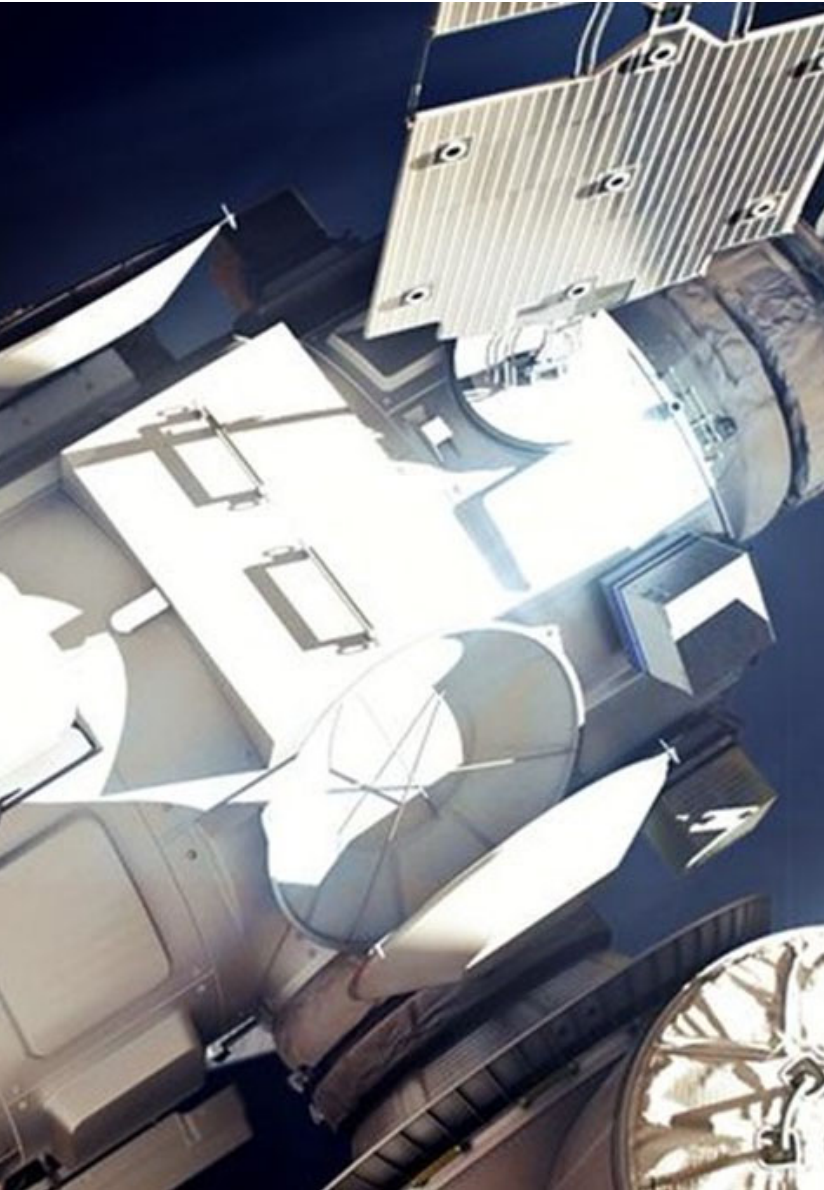
Gateway Habitation and Logistics Outpost (HALO) undergoes stress testing at Thales Alenia Space facility on June 10



Work begins on the new Canadarm3 robotic arm on June 27, to launch no earlier than 2029



NASA astronaut Nicole Mann participates in virtual reality testing of Gateway to ensure its comfort and safety



# Artemis IV



## ARTEMIS FIRSTS:

- Crewed mission to Gateway space station
- Launch, delivery, and integration of a Gateway module
- Crew transfer from Orion to human landing system (HLS) via Gateway
- Deep Space Logistics flight to Gateway
- Conducting new science and technology demonstrations

## NEW ELEMENTS:

- Space Launch System rocket Block 1B configuration, Mobile Launcher 2 with supporting ground systems
- Gateway modules: Power and Propulsion Element (PPE) and Habitation and Logistics Outpost (HALO) pre-staged in orbit; International Habitat (launched on SLS Block 1B alongside the crew aboard Orion); Deep Space Logistics

# Artemis IV Progress



Mobile Launcher 2 'Jack and Set' milestone



Liquid hydrogen tank for core stage in progress



Progress on the ML2 base build-out as seen from above as of August 20, 2024



All four universal stage adapter structural qualification article panels are aligned and loaded on Vertical Assembly Tool



# Artemis V



A rendering of Blue Origin's Blue Moon human landing system



Artist's concept of Intuitive Machines' Moon RACER LTV



Artist's concept of Lunar Outpost's Lunar Dawn LTV



Artist's concept of Venturi Astrolab's FLEX LTV

## ARTEMIS FIRSTS:

- Pre-positioned lunar terrain vehicle (LTV) to access more of the lunar surface and collect diverse scientific samples
- Second lunar lander design
- New RS-25 engines
- Conducting new science and technology demonstrations

## NEW ELEMENTS:

- Blue Moon human landing system
- Gateway modules: ESPRIT Refueling Module (European System Providing Refueling Infrastructure and Telecommunications), Canadarm3 robotic arm



# Artemis V+ Progress



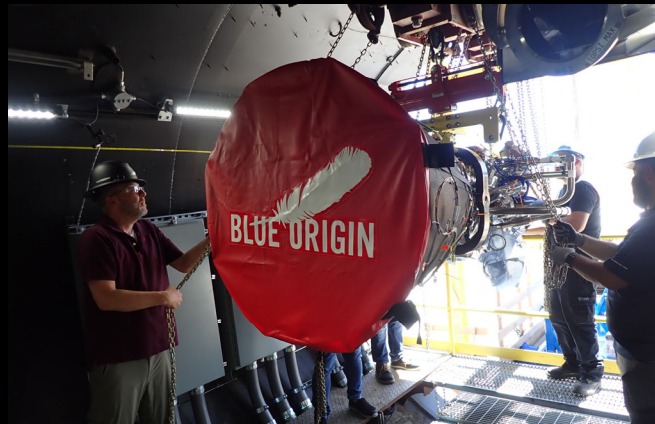
Japan will design, develop, and operate the enclosed and pressurized rover



New Glenn's first stage test of its six landing legs prior to first launch later this year



Trial Booster Obsolescence and Life Extension (BOLE) composite case winding toward SLS Block 2



Blue Moon HLS's in-space engine BE-7 hotfire test in a vacuum cell at Edwards Air Force Base

# International Collaborations | Global Partners

PEOPLE



Artemis II will be the first to send crew around the Moon and will include a Canadian crew member



NASA's annual Moon to Mars Architecture Workshops engage space agencies from around the world. In 2024, 18 countries were represented

HARDWARE



Artist's concept of Gateway, including Canadarm3 and United Arab Emirates Artemis Lunar Gateway Airlock



European Service Module for Orion, provided by the European Space Agency, involving 10 European countries

LUNAR SCIENCE



NASA completes agreement with Japan for the provision of the Pressurized Rover, which will also host multiple science instruments

PAYLOADS



Several international partner science payloads were flown on Artemis I; NASA currently negotiating with several entities, including international partners, to again fly CubeSats

SPACE COMMUNICATIONS AND NAVIGATION



Deep Space Station 53 is a new waveguide antenna that went online in February 2022 at NASA's Deep Space Network's ground station in Madrid

# ARTEMIS ACCORDS



United for Peaceful Exploration of Deep Space



**For the benefit of humanity.**

# Back-up Charts

# ESDMD Goals 2024-2025



- Execute NASA's Artemis missions
- Evolve a sustainable architecture to meet Moon to Mars objectives
- Enable a national deep space transportation capability
- Enhance affordability of all exploration systems
- Expedite toward a yearly mission cadence

## To accomplish these goals, we will continue to:

- Foster high standards of program and project management
- Balance funding profile, mission dates, and risks
- Lead international and commercial exploration partnerships
- Collaborate with centers to maintain highly skilled workforce & capabilities
- Communicate clear status and plans for all stakeholders

*Note: Mission Safety and Success are not listed as a goal because they are an inherent mandate*