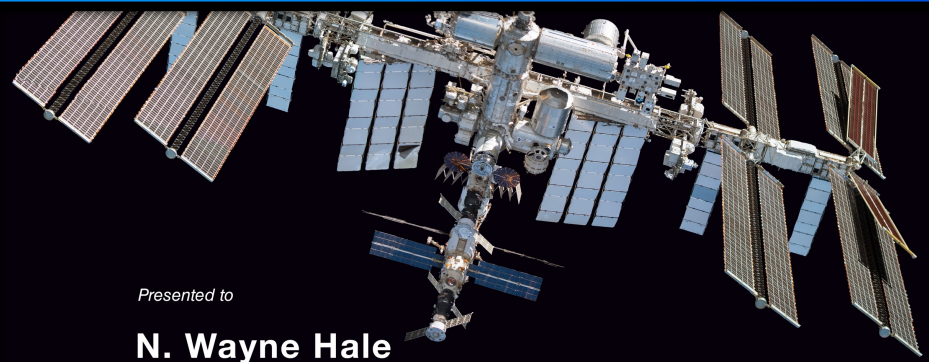
November 17, 2023

National Aeronautics and Space Administration

ESDMD Update

Jim Free, Associate Administrator
Exploration Systems Development
Mission Directorate



National Aeronautics and Space Administration

Presented to

N. Wayne Hale

Chair, Human Exploration and Operations Committee
NASA Advisory Council

In recognition of your distinguished service as Chair of the Human Exploration and Operations Committee supporting the advisory needs of the NASA Administrator, the Exploration Systems Development Mission Directorate, and Space Operations Mission Directorate.

Thank you for your wealth of experience and expertise that has helped shaped the future of human space exploration.

James M. Free, Associate Administrator
Exploration Systems Development
Mission Directorate

Kenneth D. Bowersox, Associate Administrator
Space Operations Mission Directorate

This Artemis patch flew over 1.4 million miles to the Moon and back on Artemis I.

This International Space Station patch was flown aboard the Space Shuttle Atlantis during mission STS–135, the final flight of the Space Shuttle Program. STS–135 launched on July 8, 2011, and landed on July 21, 2011, after traveling more than 5.2 million miles and completing 200 orbits of the Earth.

Artemis II Progress

Crew Module ECLSS Bay Components Installed

Heatshield Thermal Test Complete

Crew Module Adapter and European Space Module Mate

Crew Module Prop and ECLSS Tanks Installed and Welded

Artemis II Side Hatch in Acceptance Testing

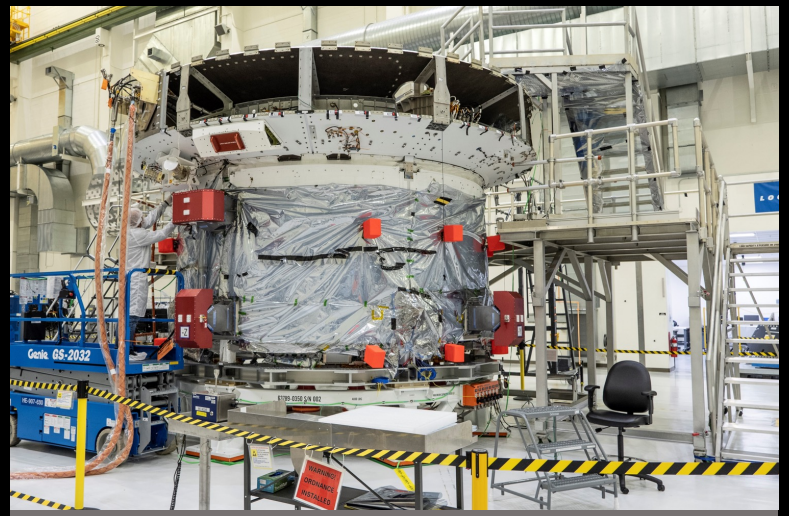
Artemis II Launch Abort System 0 Degree Ogive in Protoqual Testing

Artemis II Launch Abort System Hatch Completing Production

Forward Bay Cover Tile and FRSI Bonding Complete

Artemis II Progress

Artemis II Crew Module Kennedy Space Center



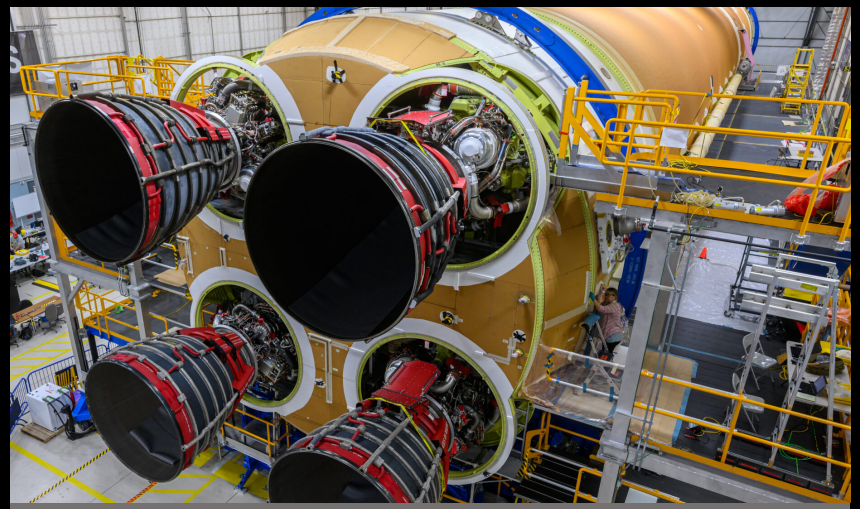
Artemis II Service Module Kennedy Space Center

Integration of Crew and Service Modules for the Artemis II Orion Spacecraft Complete

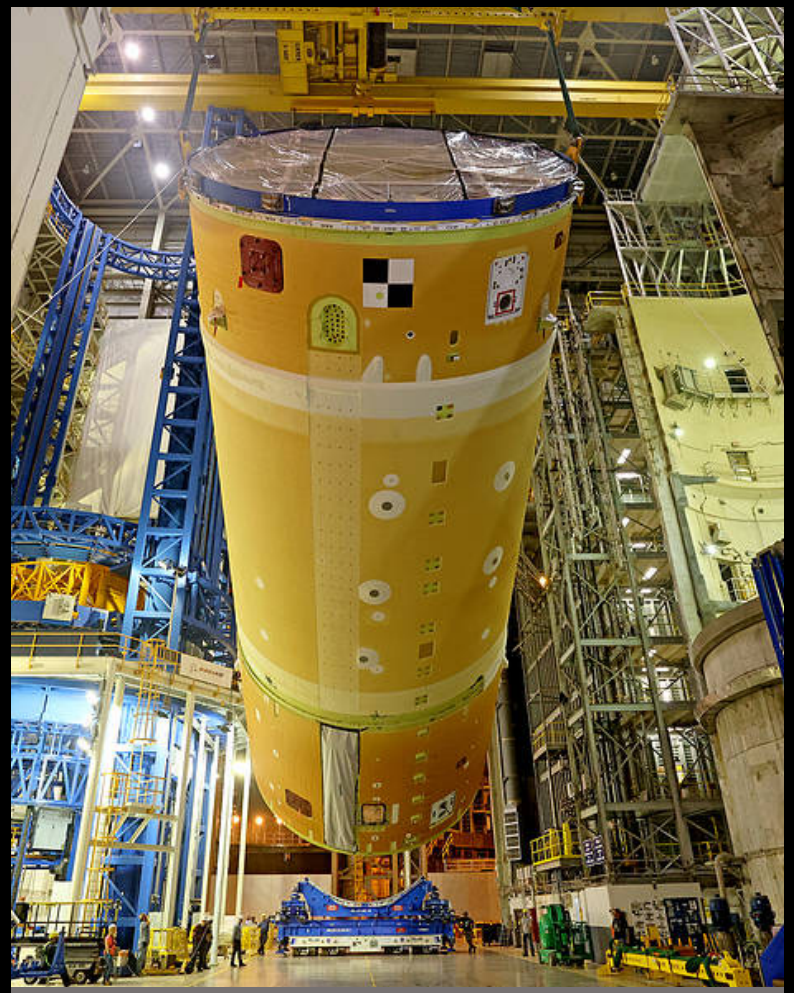
Artemis II Booster Motor Segments Complete

The Ten Booster Motor Segments for the Artemis II Space Launch System Rocket Arrive at Kennedy Space Center

Artemis II Progress



All Four RS-25 Engines Complete and Installed onto the Artemis II Space Launch System Rocket Core Stage



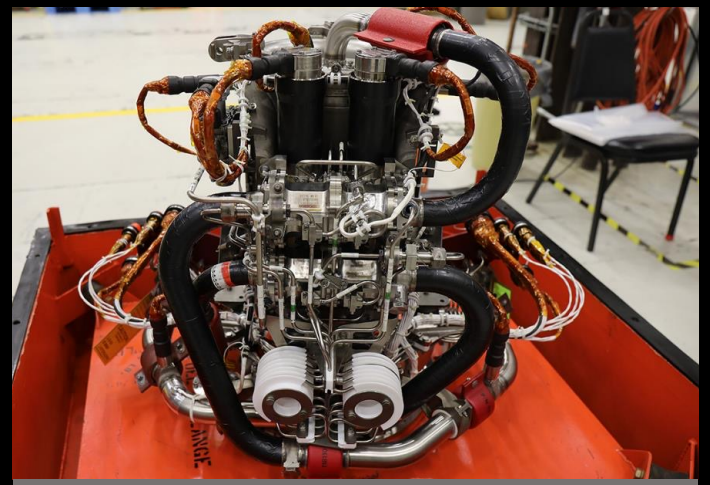
Five Major Structures of the Artemis II Space Launch System Rocket Core Stage are Connected

Artemis II Mobile Launcher at Launch Pad 39B for Ground Tests

Artemis II Spacecraft Adapter Jettison Panels at Michoud Assembly Facility

New LH2 Sphere at the Pad for Artemis II

Artemis III Progress

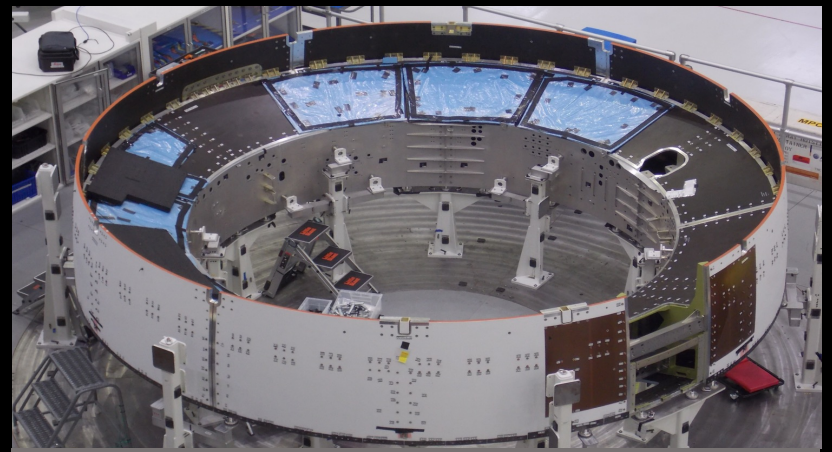


Artemis III OMS-E at
Johnson Space Center

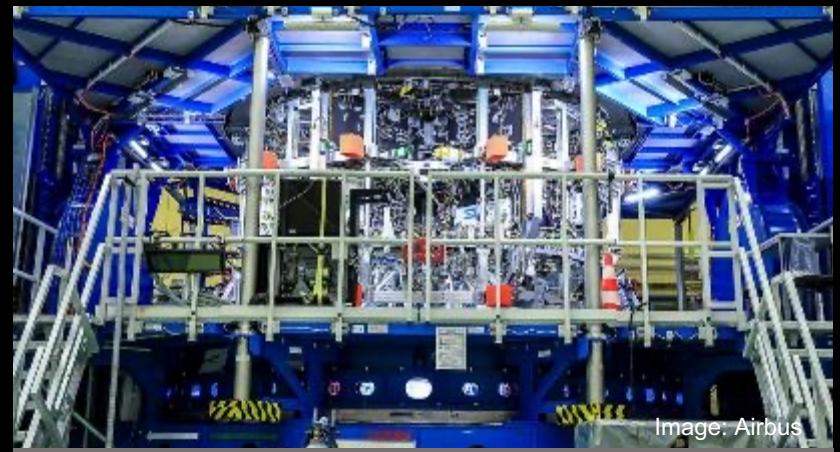
Artemis III Orion Heat Shield Delivery
to Kennedy Space Center

Artemis III Orion Heat Shield Kennedy Space Center

Artemis III Crew Module at
Kennedy Space Center



Artemis III Crew Module Adapter



Artemis III European Service Module
Integration in Bremen, Germany

Artemis III Progress

Artemis III RS-25 Flight Engine Processing

Thermal Protection Applied to Launch Vehicle Stage Adapter

Artemis III Space Launch System Core Stage Liquid Hydrogen Tank

Starship First Integrated Flight Test

Artemis III Booster Segments

Artemis III Interim Cryogenic Propulsion Stage, Staged for Mating

Artemis III Spacesuit Prototype, the AXEMU

Artemis III Progress

Starship Test Flight SN8 Launch

Starship Test Flight SN15 Landing

Pressure Testing of NASA's
Fully Assembled Exploration Spacesuit

Artemis IV Progress

Exploration Upper Stage Umbilical

Exploration Upper Stage Structural Test Article

Artemis IV Space Launch System Engine Section

Ignition Overpressure/Sound Suppression System
for Mobile Launcher 2

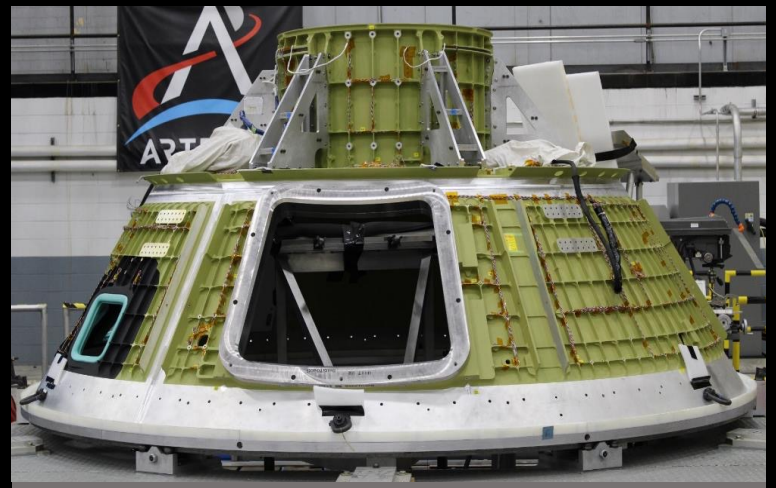
Artemis IV Progress

Artemis IV Space Launch System Engine Section

Artemis IV Crew Module Pressure Vessel
at Michoud Assembly Facility

Artemis IV Crew Module Pressure Vessel
at Kennedy Space Center

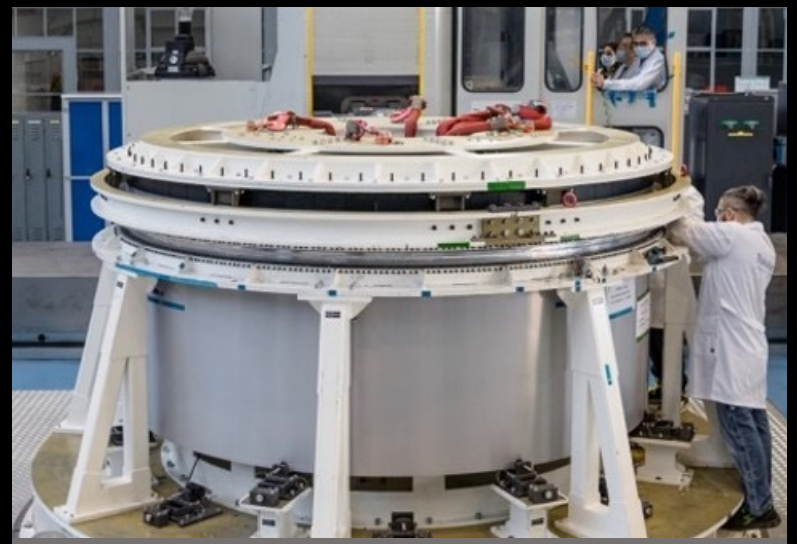
Artemis IV European Service Module in Bremen, Germany



Artemis IV Crew Module Pressure Vessel
at Michoud Assembly Facility

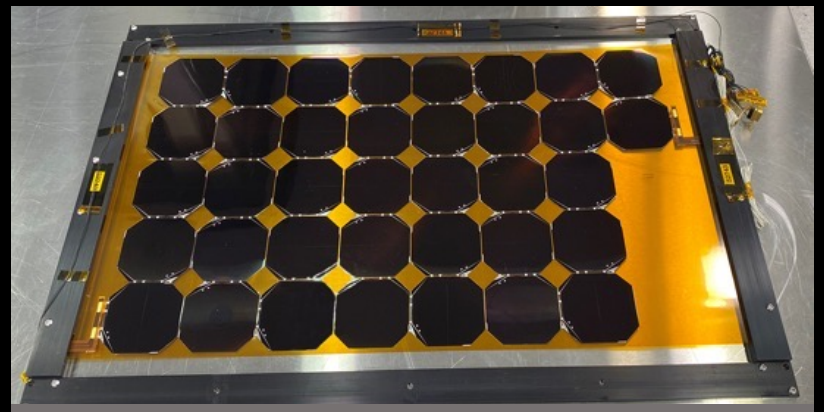
Gateway Progress

Habitation and Logistics Outpost Mockup



Habitation and Logistics Outpost
Primary Structure Assembly

Initial Welds on Gateway I-Hab
Primary Structure



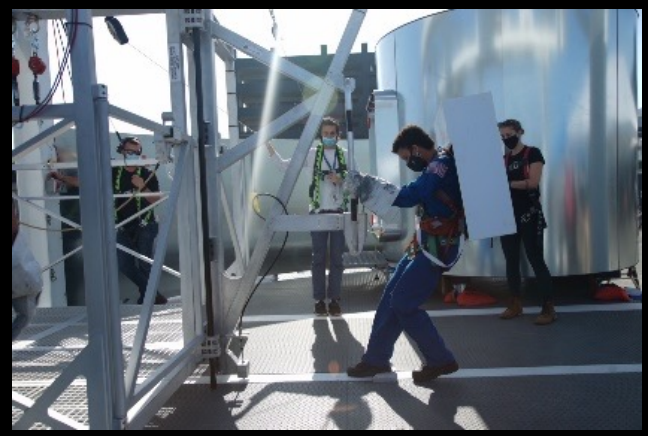
Power and Propulsion Element (PPE)
Solar Array Power Module

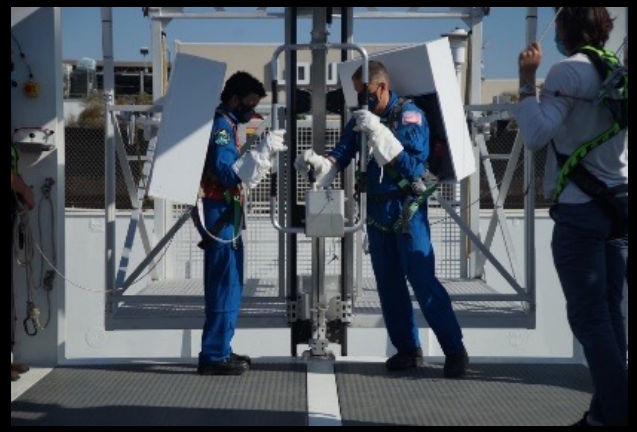
PPE Roll Out Solar
Array (ROSA) Boom

Power and Propulsion Element 12-kilowatt
Solar Electric Propulsion Test

Starship Human Landing System Progress

Image Credit: SpaceX





Crew and Cargo Elevator

Crew Cabin Virtual Reality Evaluation

Airlock

Starship Human Landing System Progress

April 20, 2023 – First fully integrated Starship and Super Heavy Booster lifting off for the first time. We learned a tremendous amount about the vehicle and ground systems during Starship's first flight test.

July 28, 2023 – Full pressure test of the newly installed Starship flame deflector, part of the redesigned orbital pad at SpaceX's Starbase in Boca Chica, Texas.

August 28, 2023 – Super Heavy Booster 9 static fire successfully lit all 33 Raptor engines, with all but two running for the full duration. The test produced approximately 7.9 million lbf of thrust (~3,600 metric tons) and utilized the newly installed Starship flame deflector.

Aug 18, 2023 - Vented interstage and heat shield installed atop Super Heavy Booster 9, an upgrade for a new separation method called hot staging, where Starship's second stage engines will ignite to push the Starship away from the Super Heavy Booster.

October 24, 2023 - Starship and Super Heavy loaded with more than 10 million pounds of propellant in a flight like rehearsal ahead of second test flight of a fully integrated Starship.

Blue Moon Human Landing System Progress

September 12, 2023
John Couluris, Blue Origin Senior Vice President for Lunar Transportation, and Lisa Watson-Morgan, NASA HLS Program Manager, stand in front of a New Glenn fairing at Blue Origin's facility in Cape Canaveral, Florida. New Glenn will be the launch vehicle used in Blue Origin's HLS mission architecture.