



2023 KENNEDY SPACE CENTER

Annual Report



COVER PHOTOS

Cover:

At 12:40 p.m. EST, Dec. 11, 2022, NASA's Orion spacecraft for the Artemis I mission splashed down in the Pacific Ocean after a 25.5 day mission to the Moon.

Photo credit: NASA/Josh Valcarcel

Back Cover:

NASA's Space Launch System rocket with the Orion spacecraft aboard is seen atop the mobile launcher at Launch 39B at NASA's Kennedy Space Center in Florida.

Photo credit: NASA/Eric Bordelon

BACKGROUND

An American bald eagle is perched high in a tree above its nest at NASA's Kennedy Space Center in Florida on April 10, 2023. Below is its baby eagle, looking up from the nest located off of Kennedy Parkway, about two miles from the Vehicle Assembly Building. The adult eagle is part of a mated pair that recently built a new home in this tree after storms badly damaged their original nest located about 50 yards away. That nest was built in 1973 and had been used by eagles almost every year since 1975. Kennedy currently is home to approximately 20 nesting pairs of bald eagles.

Photo credit: NASA/Ben Smegelsky



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Guests watch the launch of NASA's Space Launch System rocket carrying the Orion spacecraft on the Artemis I flight test, Wednesday, Nov. 16, 2022, from Operations and Support Building II at NASA's Kennedy Space Center in Florida. Photo Credit: NASA/Bill Ingalls

CENTER DIRECTOR WELCOME



It's the end of another fiscal year at America's premier spaceport and an exciting time to look back at all we have accomplished at NASA's Kennedy Space Center in Florida. The following pages will give you a deeper insight into the programs and organizations that are igniting space exploration and discovery for all.

For decades, Kennedy Space Center has been synonymous with space exploration. We launched missions that first sent humans to the Moon, enabled the assembly and long-term use of the International Space Station, and offered revolutionary insight into Earth, our neighboring planets, and our solar system. As we step into the Artemis era, Kennedy is once again playing a pivotal role. We face a world of possibilities that await humankind as we return to the Moon and set our sights on Mars.

Kennedy proudly remains the agency's main launch site as well as the world's premier spaceport. Working with more than 90 commercial partners

and engaging in nearly 250 partnership agreements, our mission is to provide continuous access to space using the same creativity and innovation that have become the hallmark of our agency.

The regular cadence of launches from the Space Coast is a testament to the success of our transformation from a government-only facility to the world's leading spaceport. But our work isn't finished. We are looking ahead to a future with a robust space economy in low Earth orbit - as well as on and around the Moon. Kennedy is positioning itself to continue providing the highest level of support to this growing demand.

This report details 12 months of dedication and determination, and behind each of these accomplishments are the people of Kennedy who embrace the ambitious goals ahead of us and lend their passion and perseverance to the NASA mission. They are the reason Kennedy has ranked among the Best Places to Work in Federal Government for five years in a row, proving that this center truly has the best of the best. Together, we are launching humanity's future.

Embrace the Challenge.

Janet Petro

VISION

Igniting space exploration and discovery for all.

MISSION

Provide continuous access to space from Earth's premier spaceport through creativity and innovation.

Launching Humanity's Future

TOP 20 SIGNIFICANT EVENTS

OCTOBER 2022 Crew-5 Launches from Kennedy

NASA astronauts Nicole Aunapu Mann and Josh Cassada, along with JAXA (Japan Aerospace Exploration Agency) astronaut Koichi Wakata and Roscosmos cosmonaut Anna Kikina blasted off from Kennedy Space Center on NASA's SpaceX Crew-5 mission to the International Space Station at 12 p.m. EDT on Oct. 5.



OCTOBER Crew-4 Splashes Down off Florida Coast

NASA's SpaceX Crew-4 astronauts aboard the Dragon spacecraft safely splashed down off the coast of Jacksonville, Florida, on Oct. 14, completing the agency's fourth commercial crew mission to the International Space Station. The international crew of four spent 170 days in orbit.



NOVEMBER Artemis Arrives at LC 39B for Historic Mission

At approximately 8:30 a.m. EDT on Nov. 4, NASA's Space Launch System rocket and Orion spacecraft for the Artemis I mission arrived at Launch Pad 39B at the agency's Kennedy Space Center in Florida after a nearly nine-hour journey atop the mobile launcher from the iconic Vehicle Assembly Building.



NOVEMBER JPSS-2 off to Study Weather

National Oceanic and Atmospheric Administration's JPSS-2 (Joint Polar Satellite System-2) satellite, with NASA's LOFTID (Low-Earth Orbit Flight Test of an Inflatable Decelerator) technology demonstration on board, lifted off from Space Launch Complex-3 at Vandenberg Space Force Base in California at 1:49 a.m. PST on Nov. 10. The launch was powered by a United Launch Alliance Atlas V 401 rocket's RD-180 engine.



NOVEMBER NASA's Moon Rocket Roars off the Pad

NASA's Space Launch System rocket, carrying the uncrewed Orion spacecraft, lifted off from Launch Complex 39B in Florida at 1:47 a.m. EST on Nov. 16. Artemis I's primary goal was to test the integrated systems before crewed missions by launching and operating the spacecraft in a deep space environment.



DECEMBER Orion Splashdown Concludes Historic Artemis I Mission

NASA's Orion spacecraft successfully completed a parachute-assisted splashdown in the Pacific Ocean off the Baja California peninsula of Mexico at 12:40 p.m. EST on Dec. 11 as the final major milestone of the Artemis I mission. Orion's record-breaking journey covered more than 1.4 million miles on a path around the Moon, the farthest a spacecraft designed to carry humans has traveled from our home planet.



NOVEMBER CRS-26 Marks 2022's Final Dragon Launch

Several thousand pounds of research, crew supplies, and hardware were delivered to crew members aboard the International Space Station following the 2:20 p.m. EST launch of NASA's SpaceX 26th commercial resupply mission from Kennedy Space Center in Florida on Nov. 26.



DECEMBER SWOT Journeys to Study Earth's Oceans

At 3:46 a.m. PST on Dec. 16, SpaceX's Falcon 9 rocket blasted off from Vandenberg Space Force Base's Space Launch Complex-4 East in California, carrying the first satellite to survey nearly all water on Earth's surface. SWOT (Surface Water and Ocean Topography) marks the 101st primary mission for NASA's Launch Services Program.



TOP 20 SIGNIFICANT EVENTS



JANUARY 2023
Day of Remembrance Marks 20th Anniversary of Columbia Tragedy
 NASA senior management and guests paid tribute to the crew members of space shuttle Columbia, as well as other astronauts who have perished in the line of duty, at the Kennedy Space Center Visitor Complex during the agency's Annual Day of Remembrance.



JANUARY
Facilities, Spacecraft Prepped for Artemis II Mission
 Teams with Exploration Ground Systems began upgrading and modifying facilities at Kennedy to support Artemis II, paving the way for human exploration to the Moon and Mars. Artemis II will be the first crewed flight of the agency's Space Launch System rocket and Orion spacecraft.



FEBRUARY
New Orion Test Article Makes a Splash
 NASA's Landing and Recovery team completed a rigorous round of testing on the new mock-up of the agency's Orion spacecraft. This test article will be used to train NASA, Navy, and other Department of Defense personnel to retrieve astronauts from the Pacific Ocean after splashing down on Artemis Moon missions.



FEBRUARY
'Famous' Eagles Build New Nest at Kennedy
 When storms badly damaged their original nest near Kennedy Parkway, a well-known pair of American bald eagles built a new home nearby at the Florida spaceport, providing a magnificent view of the majestic birds in their natural habitat.



FEBRUARY
NASA's SpaceX Crew-6 Preflight
 A SpaceX Falcon 9 rocket with the company's Dragon spacecraft on top is seen at sunset on the launch pad at Launch Complex 39A as preparations continue for the Crew-6 mission, Saturday, Feb. 25, 2023.



MARCH
Crew-5 Back on Earth After 157 Days in Space
 NASA astronauts Nicole Mann and Josh Cassada, JAXA (Japan Aerospace Exploration Agency) astronaut Koichi Wakata, and Roscosmos cosmonaut Anna Kikina splashed down safely aboard the SpaceX Dragon Endeavour in the Gulf of Mexico off the coast of Tampa, Florida, at 9:02 p.m. EST March 11, after 157 days in space.



MARCH
CRS-27 Launches to the Space Station
 At 8:30 p.m. EDT March 14, SpaceX's Falcon 9 rocket rumbled off the pad at Launch Complex 39A, starting Dragon's two-day journey to the International Space Station to deliver new science investigations, supplies, and equipment for Expedition 68 and 69 crews aboard the orbiting laboratory.



MAY
Astronauts Complete Second All-Private Mission
 A crew of four completed a successful Axiom Mission 2, the second all-private astronaut mission to the International Space Station. Axiom Space private astronauts Peggy Whitson, John Shoffner, Ali Alqarni, and Rayyanah Barnawi spent 10 days on the orbiting laboratory after lifting off at 5:37 p.m. EDT on May 21 from Launch Complex 39A at Kennedy Space Center.

TOP 20 SIGNIFICANT EVENTS

JUNE Solar Arrays Delivered on CRS-28

Several thousand pounds of important research, crew supplies, and hardware, including new solar arrays, were delivered to the space station following the June 5 launch of SpaceX's 28th commercial resupply services mission for NASA from Kennedy's Launch Complex 39A.



JULY Artemis Crews Get New Ride to the Pad

Teams from manufacturer Canoo Technologies Inc. of Torrance, California, delivered three specially designed, fully electric, environmentally friendly crew transportation vehicles to Kennedy on July 11. The vehicles will take Artemis crews on the final Earth-bound leg of their journey to the Moon before boarding their rocket and spacecraft.



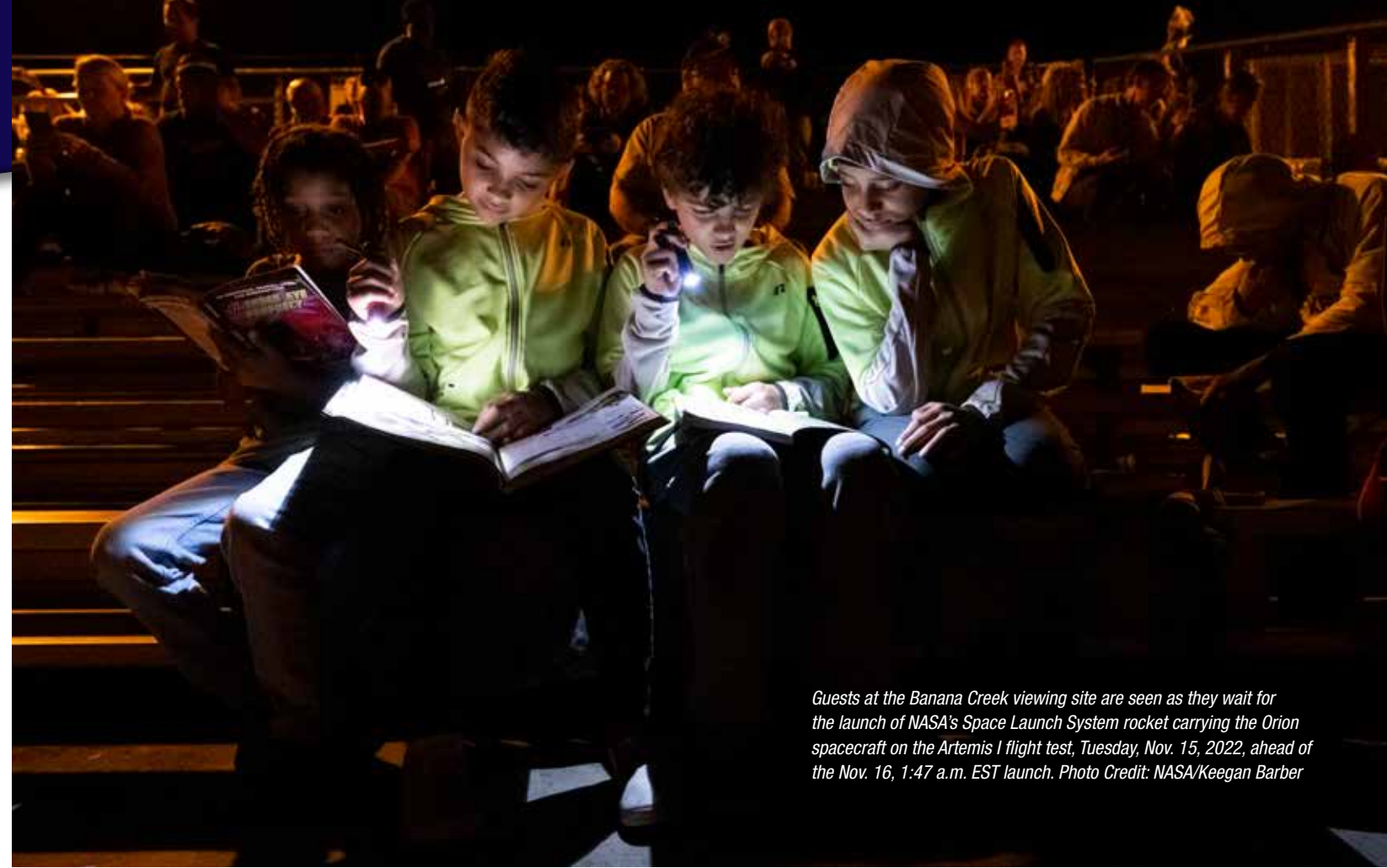
AUGUST Crew-7 Carries International Crew to Space Station

A Dragon spacecraft named Endurance launched atop a Falcon 9 rocket, carrying NASA astronaut Jasmin Moghbeli, ESA astronaut Andreas Mogensen, JAXA astronaut Satoshi Furukawa, and Roscosmos cosmonaut Konstantin Borisov to the International Space Station on NASA's SpaceX Crew-7 mission. Liftoff occurred at 3:27 a.m. EDT on Aug. 26.



SEPTEMBER Crew-6 Returns to Earth

NASA astronauts Stephen Bowen and Woody Hoburg, along with UAE astronaut Sultan Alneyadi and Roscosmos cosmonaut Andrey Fedyaev splashed down safely in SpaceX's Dragon spacecraft, named Endeavour, in the Atlantic Ocean off the coast of Jacksonville, Florida, at 12:17 a.m. EDT on Sept. 24, after 186 days in space.



Guests at the Banana Creek viewing site are seen as they wait for the launch of NASA's Space Launch System rocket carrying the Orion spacecraft on the Artemis I flight test, Tuesday, Nov. 15, 2022, ahead of the Nov. 16, 1:47 a.m. EST launch. Photo Credit: NASA/Keegan Barber



Framed by wildflowers, a tricolored heron wades in a waterway at NASA's John F. Kennedy Space Center in Florida on May 19, 2023. The center shares a border with the Merritt Island National Wildlife Refuge. More than 330 native and migratory bird species call Kennedy and the wildlife refuge home. Photo credit: NASA/Frank Michaux

TITUSVILLE



America's Premier Multiuser SPACEPORT

98 ACTIVE PARTNERS
243 AGREEMENTS AND COUNTING

NOTICE OF AVAILABILITY

Kennedy Space Center's Notice of Availability remains open for undeveloped land identified in the Master Plan to support activities in launch operations, assembly, testing and processing, renewable energy, research and development, support services, and vertical launch and landing. The announcement is part of Kennedy's multiuser spaceport objectives and is based on effectively using land suitable for new development. This notice is open through June 1, 2024. Interested parties can respond anytime during the open period.

INDIAN RIVER BRIDGE OPENING

The major roadway that serves as the primary entrance and exit to Kennedy Space Center for employees and visitors received a major upgrade in June 2023. Through an agreement with Kennedy Space Center, the Florida Department of Transportation opened the first of two new high-rise bridges connecting Kennedy and Cape Canaveral Space Force Station to the mainland via State Road 405/NASA Causeway in Titusville. The new high-rises are designed to support the space efforts of NASA and its commercial partners. Construction on the second high-rise bridge is underway and scheduled for completion in 2026.

KSC MASTER PLAN

Kennedy's updated Master Plan will build off the center's 2021 Future Development Concept that identified projects to support the immediate success of NASA programs while enabling the agency's long-term future missions. While the concept consists of larger-scale strategies to support NASA and commercial partner operations over the next 20 years, the updated Master Plan will provide a more detailed regulatory framework that can serve as a blueprint to continue the center's evolution as Earth's premier spaceport. Area Development Plans are currently being created for the Vehicle Assembly Building, Exploration Launch, and Central Campus/Processing Districts. The Master Plan update is expected to be complete in December 2024.

LAUNCH VEHICLE MANUFACTURING

Kennedy Space Center executed an Enhanced Use Lease with Space Florida, which enabled expansion of Blue Origin's launch vehicle manufacturing operations near Kennedy's Exploration Park.

INFRASTRUCTURE

Kennedy Space Center executed an Enhanced Use Lease with Florida Power and Light for a new power substation. The substation will provide electricity to new facilities planned for development at the Launch and Landing Facility currently leased by Space Florida.

LC-39B

VAB

VEHICLE ASSEMBLY BUILDING HIGH BAY AVAILABILITY

Kennedy Space Center published an announcement seeking proposals from U.S. commercial launch providers interested in using the Vehicle Assembly Building High Bay 1 for launch operations, including ground operations, prelaunch integration, checkout, and spacecraft or payload testing. NASA selected a proposal and is working with the selectee to coordinate shared use and requirements for facility modifications.

SPACE LIFE SCIENCE RESEARCH

Kennedy Space Center developed a new research agreement with Winston Salem State University (WSSU), a historically Black College and University, for collaboration on plant life sciences. The agreement focuses on growing crops in simulated lunar and Martian regolith and publishing data in a publicly accessible database to further plant life science. This is an expansion of a longstanding successful partnership with WSSU.

National Park Service
Playalinda Beach

SMALL CLASS LAUNCH VEHICLE OPERATIONS

In support of the expanding small-class launch vehicle industry, Kennedy Space Center released a Request For Information (RFI) for Launch Complex 48 to identify potential launch site operators and launch vehicle providers interested in using this capability. Results from the RFI will be used to develop the long-term strategy for small class vehicle launch processing operations.

KENNEDY SPACE CENTER

Kennedy Space Center
VISITOR COMPLEX

Gate 3

KSC Industrial Area

Banana River Bridge

US 1

Indian River

SR 3

MERRITT ISLAND

Banana River

Cape Canaveral Space Force Station



COMMERCIAL CREW PROGRAM



A SpaceX Falcon 9 rocket carrying the company's Crew Dragon spacecraft is launched on NASA's SpaceX Crew-5 mission to the International Space Station with NASA astronauts Nicole Mann and Josh Cassada, Japan Aerospace Exploration Agency (JAXA) astronaut Koichi Wakata, and Roscosmos cosmonaut Anna Kikina onboard, Oct. 5, 2022, at NASA's Kennedy Space Center in Florida. Photo Credit: NASA/Joel Kowsky

Fiscal year 2023 saw the successful continuation of NASA's Commercial Crew Program (CCP) delivering safe, reliable, and cost-effective human space transportation to and from the International Space Station from America's premier spaceport.

With its Boeing and SpaceX commercial partners, NASA completed three long-duration crew missions and continued preparations for a crewed flight test that anchors the program's commitment to maximize station utilization and supports the agency as it prepares for a human presence on the Moon and beyond, leveraging the station as a critical testbed for NASA to understand and overcome the challenges of long-duration spaceflight.

CCP will continue to manage the Commercial Crew Transportation Capabilities (CCTCap) contracts, including providing technical oversight and managing modifications and upgrades to both crew transportation systems and potentially certifying new launch vehicles or spacecraft to other low Earth orbit destinations in the future.

SpaceX maintained a steady cadence of crewed missions to the space station and achieved several firsts. At the end of the fiscal year, the company had launched seven crewed rotational missions for NASA and continued to see more reused components on Dragon certified by Commercial Crew.

Launching on Oct. 5, 2022, Crew-5 became the first flight to carry a Roscosmos cosmonaut for CCP and led to NASA astronaut Nicole Mann becoming the first Native American woman to fly to space. Mann also was the first female commander of a commercial crew mission. After spending 170 days in space, Crew-4 – the first to fly on a fourth-flight booster – undocked from the space station and splashed down off the coast of Jacksonville, Florida on Oct. 14.

Another first for CCP was the launch of an UAE (United Arab Emirates) astronaut on Crew-6, bringing the total number of international partners launched on a SpaceX crewed flight to four, among JAXA (Japan Aerospace Exploration Agency), ESA (European Space Agency), Roscosmos, and UAE.

Launched on March 2, 2023, Crew-6 was the fourth flight for SpaceX's Endeavour spacecraft – previously supporting the Demo-2, Crew-2, and Axiom Mission-1 flights to and from the space station. After a brief handover with the Crew-6 crew, Crew-5 undocked from the space station and splashed down in the Gulf of Mexico off the coast of Tampa, Florida on March 11, bringing an end to their 157 days in space.

The Crew-7 launch on Aug. 26, 2023, marked the first commercial crew flight with three international partners, and it was the first time a non-NASA astronaut piloted a flight for CCP. The crew launched to the space station in SpaceX's Dragon Endurance spacecraft, which previously supported the Crew-3 and Crew-5 missions. Crew-7 also was the first commercial crew flight to have a Falcon 9 booster return to Landing Zone 1 at Cape Canaveral Space Force Station (CCSFS) for recovery – a change in recovery procedures following the Axiom Mission-2 launch.

CREW-5

NASA's SpaceX Crew-5 is photographed inside the crew suit-up room in the Neil A. Armstrong Operations and Checkout Building at NASA's Kennedy Space Center in Florida ahead of the agency's SpaceX Crew-5 launch on Oct. 5, 2022. Photo Credit: NASA/ Kim Shiflett



CREW-6

SpaceX Crew-6 astronauts pause for a photograph after arriving at Kennedy Space Center's Launch and Landing Facility in Florida on Feb. 21, 2023. From left are Roscosmos cosmonaut Andrey Fedyayev, UAE (United Arab Emirates) astronaut Sultan Alneyadi, and NASA astronauts Warren "Woody" Hoburg and Stephen Bowen. Photo Credit: NASA/Kim Shiflett



CREW-7

NASA's SpaceX Crew-7 crew in training at SpaceX in Hawthorne, California, before their mission to the International Space Station. Photo Credit: SpaceX





SpaceX inaugurated operations from its firing room at Hangar X during Crew-7, a first for a commercial partner in this era of joint spaceflight operations. Located on Kennedy Space Center property and designed to control launches from both Launch Complex 39A and Space Launch Complex 40 on CCSFS, Hangar X is meant to see more activities with each mission.

NASA and Boeing teams continue preparations for Starliner's first crewed flight. The crew for Boeing's Crew Flight Test (CFT) completed various training milestones in fall 2022 and spring 2023, including a full start-to-finish integrated mission dress rehearsal in Boeing's avionics and software integration lab. Teams also completed a ground test of the parachute system and conducted successful software test runs that simulated the Starliner's manual back up mode in mission-like environments.

The Starliner team expects to have the CFT spacecraft ready in March 2024, pending resolution of technical issues identified during the agency's certification process to guarantee the system meets crew safety requirements. In parallel, joint NASA and Boeing teams continue working on the Starliner-1 vehicle to ensure the spacecraft is ready for a post-certification flight following the completion and review of data from CFT.

CCP's Suborbital Crew (SubC) office continues its work to enable NASA researchers and hardware developers to fly aboard commercial suborbital spaceflights. Team members from across the agency are participating in the safety case assessment of potential partners Blue Origin and Virgin Galactic. In parallel, SubC is working with NASA's Science Mission Directorate to select potential human-tended suborbital payloads. This work, expected to be completed next fiscal year, will provide researchers and hardware developers a steppingstone to one day conduct research on the space station. 🚀

Top: Inside the SpaceX horizontal processing facility at NASA's Kennedy Space Center in Florida, the SpaceX Falcon 9 rocket with Dragon spacecraft Endeavour attached are ready for rollout to Launch Complex 39A on Feb. 22, 2023, for NASA's SpaceX Crew-6 mission. Photo Credit: SpaceX

Middle: From left, NASA astronauts Mike Fincke, Suni Williams, and Barry "Butch" Wilmore, Boeing Crew Flight Test (CFT) backup spacecraft test pilot, pilot, and commander, respectively, exit the Astronaut Crew Quarters at NASA's Kennedy Space Center in Florida during a crew validation test on Oct. 18, 2022. Photo Credit: NASA/Kim Shiflett

Bottom: Boeing's CST-100 Starliner crew ship approaches the International Space Station on the company's Orbital Flight Test-2 mission before automatically docking to the Harmony module's forward port. Photo Credit: NASA

A SpaceX Falcon 9 rocket with the company's Dragon spacecraft on top is seen at sunset on the launch pad at Launch Complex 39A as preparations continue for the Crew-6 mission at NASA's Kennedy Space Center in Florida. Photo Credit: NASA/Joel Kowsky



LAUNCH SERVICES PROGRAM

NASA's Launch Services Program (LSP), based at Kennedy Space Center in Florida, unites scientific and robotic spacecraft customers' needs with the appropriate rocket, managing the process to ensure the spacecraft is placed in orbit around the Earth or powered to destinations throughout the solar system.

LSP works closely with established launch providers and fosters emerging providers to ensure NASA has the appropriate mix of launch capabilities that can support any agency payload.

LSP serves in a consulting role for many other important programs, providing advisory expertise to NASA's Artemis program, the Human Landing



Technicians move the National Oceanic and Atmospheric Administration's Joint Polar Satellite System-2, stacked atop NASA's Low-Earth Orbit Flight Test of an Inflatable Decelerator secondary payload, into the first half of the United Launch Alliance Atlas V payload fairing inside the Astrotech Space Operations facility at Vandenberg Space Force Base in California on Oct. 12, 2022. Photo credit: USSF 30th Space Wing/Steve L. Ge

System, HALO (habitation and logistics outpost) and the Power and Propulsion Element, Commercial Crew Program missions and Commercial Resupply Services (CRS) missions in support of the International Space Station.

In fiscal year 2023, LSP supported two primary missions, coordinated the launch of 12 CubeSats, and certified another rocket for NASA launches.

On Nov. 10, the National Oceanic and Atmospheric Administration's Joint Polar Satellite System-2 and NASA's Low-Earth Orbit Flight Test of an Inflatable Decelerator lifted off from Space Launch Complex-3 at Vandenberg Space Force Base on a United Launch Alliance Atlas V 401 rocket. This launch marked the 100th primary mission for the Launch Services Program.

On Nov. 26, four CubeSats selected by the agency's CSLI (CubeSat Launch Initiative) launched on NASA SpaceX's 26th Commercial Resupply Services mission to the International Space Station as ELaNa (Educational Launch of Nanosatellites) 49. The CubeSats were petitSat, developed by NASA's Goddard Space Flight Center in Greenbelt, Maryland; SPORT (Scintillation Prediction Observations Research Task), developed by the agency's Marshall Space Flight Center in Huntsville, Alabama; MARIO (Measurement of Actuator Response In Orbit), from the University of Michigan; and Thomas Jefferson High School for Science and Technology's TJREVERB (Thomas Jefferson Research and Education Vehicle for Evaluating Radio Broadcasts).

A United Launch Alliance Atlas V rocket carrying the Joint Polar Satellite System-2 civilian polar-orbiting weather satellite for the National Oceanic and Atmospheric Administration and NASA's Low-Earth Orbit Flight Test of an Inflatable Decelerator lifts off from Space Launch Complex-3 on Nov. 10, 2022. Photo credit: United Launch Alliance



Inside the SpaceX facility at Vandenberg Space Force Base in California, a crane lifts the Surface Water and Ocean Topography (SWOT) satellite onto the payload adapter on Dec. 5, 2022. Photo credit: USSF 30th Space Wing/Steven Gerl

After two and a half years of assessments and analysis, LSP completed certification of SpaceX's Falcon Heavy as a Category 3 rocket, determining it to be a low-risk vehicle for NASA missions. The Falcon Heavy will use three core boosters to produce over five million pounds of thrust at liftoff. Falcon Heavy is a heavy class launch vehicle that expands performance capabilities in the LSP fleet.

On Dec. 15, the agency's Surface Water and Ocean Topography satellite launched aboard a SpaceX Falcon 9 rocket from Vandenberg Space Force Base in California. This is the first satellite mission that will observe nearly all water on Earth's surface.

A SpaceX Falcon 9 rocket with the Surface Water and Ocean Topography spacecraft onboard is seen Dec. 14, 2022, as preparations for launch continue at Space Launch Complex 4E at Vandenberg Space Force Base in California. Photo credit: NASA/Keegan Barber



NASA selected SpaceX to provide launch services for the Sentinel-6B mission targeted to launch in 2025. Sentinel-6B will continue the long-term global sea level data record begun in 1992 by Topex/Poseidon followed by Jason 1, 2, 3, and Sentinel-6 Michael Freilich. The mission is a partnership between NASA, the National Oceanic and Atmospheric Administration, ESA (European Space Agency), and the European Organization for the Exploitation of Meteorological Satellites.

In February 2023, NASA selected Blue Origin LLC to provide launch services for the agency's EscaPADE (Escape and Plasma Acceleration and Dynamics Explorers) mission under the VADR (Venture-Class Acquisition of Dedicated and

Rideshare) contract. EscaPADE will launch on Blue Origin's New Glenn rocket from Cape Canaveral Space Force Station in late 2024.

On March 15, NASA's CubeSat Launch Initiative (CSLI) sent two CubeSats to the International Space Station on NASA's SpaceX CRS-27 mission. Included in ELaNa 50 was ARKSAT-1 from the University of Arkansas, and LightCube from Arizona State University, Tempe, with cooperation from Vega Space Systems and Mexico's CETYS Universidad.

Transporter 7, a commercial dedicated rideshare flight, launched to space on a SpaceX Falcon 9 rocket from Vandenberg Space Force Base on April 15. Aboard were CSLI's ELaNa 40 and ELaNa 47 missions: Colorado Inner Radiation Belt Experiment, a CubeSat from the University of Colorado Boulder; and Low-Latitude Ionosphere/Thermosphere Enhancements in Density, which consisted of two CubeSats developed by The Aerospace Corporation, Embry-Riddle Aeronautical University in Florida, and the University of New Hampshire.

NASA's TROPICS (Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats) mission is a constellation of four identical CubeSats designed to study tropical cyclones, some of the most powerful and destructive weather events on Earth. On May 8, the first pair of the CubeSats launched from Māhia, New Zealand, on Rocket Lab's "Rocket Like a Hurricane" Electron rocket. The final two CubeSats lifted off May 25 on Rocket Lab's "Coming to A Storm Near You." The mission will help scientists understand the factors driving tropical cyclone intensification and improve forecasting models. TROPICS marked the first VADR mission to launch.

In June, the Psyche spacecraft team returned to Florida to begin final preparations for launch. Scheduled to launch in October 2023 on a SpaceX Falcon Heavy rocket, Psyche will study a unique metal asteroid orbiting the Sun between Mars and Jupiter. After escaping Earth's gravity, the Psyche spacecraft will use solar electric propulsion to complete its six-year journey to asteroid Psyche.

Technicians connected NASA's Psyche spacecraft to the payload attach fitting inside the clean room at Astrotech Space Operations facility in Titusville, Florida on Sept. 20, 2023. Photo credit: NASA/Kim Shiflett



A scene from the wet dress rehearsal for Rocket Lab's Electron rocket at Launch Complex 1 in Māhia, New Zealand on April 28, 2023. NASA's TROPICS (Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats) CubeSats are secured in the payload fairing. Photo credit: Rocket Lab, USA



Above: The Falcon Heavy rocket that will launch NASA's Psyche mission in the hangar at Launch Complex 39A at Kennedy Space Center in Florida before it rolled out to the pad for a static fire test as part of preparations for the journey to a metal-rich asteroid. Photo credit: SpaceX



NASA Associate Administrator Bob Cabana gives remarks during the Day of Remembrance on Jan. 26, 2023, at the Kennedy Space Center Visitor Complex in Florida. The event honored the crews of Apollo 1 and space shuttles Challenger and Columbia, as well as other astronauts who lost their lives in the pursuit of spaceflight. 2023 marks the 20th anniversary of the Columbia tragedy. Photo credit: NASA/Kim Shiflett



ARTEMIS

Fiscal year 2023 brought the world together as audiences witnessed the uncrewed Artemis I launch of NASA's SLS (Space Launch System) rocket and Orion spacecraft from Kennedy Space Center. After a 25.5-day-long journey around the Moon, the spacecraft returned to Earth, where recovery teams from Exploration Ground Systems, alongside members of the Defense Department, retrieved Orion from the Pacific Ocean and safely returned it to Kennedy.

In the spring, Guinness World Records named the crawler-transporter 2, the vehicle that carries the Artemis Moon rockets to the launch pad, as the record-holder for the heaviest self-powered vehicle. This summer, the crawler carried mobile launcher 1, the structure used to assemble and launch SLS, to Launch Pad 39B for a series of tests ahead of the Artemis II mission.

Following the Artemis I launch, mobile launcher 1 returned to its park site location, where it underwent repairs, upgrades, and modifications to prepare for crewed Artemis missions. Teams also tested the crew access arm, the entry and exit point on the mobile launcher astronauts use to access the spacecraft.

In late summer, the mobile launcher returned to the launch pad to ensure its systems were certified to support crewed missions. This included the addition of the emergency egress life safety system. The system provides astronauts and closeout crews the ability to safely exit the mobile launcher or Orion in the unlikely event of an emergency during launch countdown. If astronauts and pad personnel need to evacuate, they will proceed to the emergency egress baskets, which are suspended from a catenary system, and travel down to emergency vehicles located at the base of the launch pad. The baskets, similar to gondola cars at ski lifts, will be installed on the mobile launcher and tested by the end of 2023.

Teams also continue making modifications to the existing pad infrastructure to ensure it's ready to support crewed missions. Over the summer, the pad portion of the crew emergency escape system was completed ahead of testing with the mobile launcher in the fall. Additional work at the pad includes completion of the new liquid hydrogen tank, which will allow less time between launch attempts. Teams plan to test the new tank near the end of 2023. Teams also are upgrading the environmental control system, which provides air supply, thermal control, and pressurization to SLS and Orion, and will test the upgraded system during the ground system's testing.

NASA received a new fleet of environmentally friendly crew transportation vehicles for the Artemis

NASA's Space Launch System rocket carrying the Orion spacecraft launches on the Artemis I flight test, Wednesday, Nov. 16, 2022, from Launch Complex 39B at NASA's Kennedy Space Center in Florida. Photo Credit: NASA/Bill Ingalls



Teams with Exploration Ground Systems at NASA's Kennedy Space Center in Florida continue to work the upgrades and repairs on mobile launcher 1 and Launch Pad 39B on June 13, 2023, ahead of the first critical ground testing for Artemis II. Construction is nearly complete on the additional 1.4-million-gallon liquid hydrogen sphere used for propellant loading. Photo credit: NASA/Kim Shiflett

After splashing down at 12:40 p.m. EST on Dec. 11, 2022, U.S. Navy divers help recover the Orion Spacecraft for the Artemis I mission. Photo credit: NASA/Josh Valcarcel

Guinness World Records officially designated NASA's Crawler Transporter 2 as the heaviest self-powered vehicle, weighing approximately 6.65 million pounds, during a March 29, 2023, ceremony at the agency's Kennedy Space Center in Florida. Photo credit: NASA/Isaac Watson





astronauts, delivered this summer. The vehicles are customized to accommodate unique specifications, and a creative team that included the Artemis launch director and representatives from NASA's Astronaut Office chose many aspects of the design – from the interior and exterior markings to the color of the vehicles to the wheel wells.

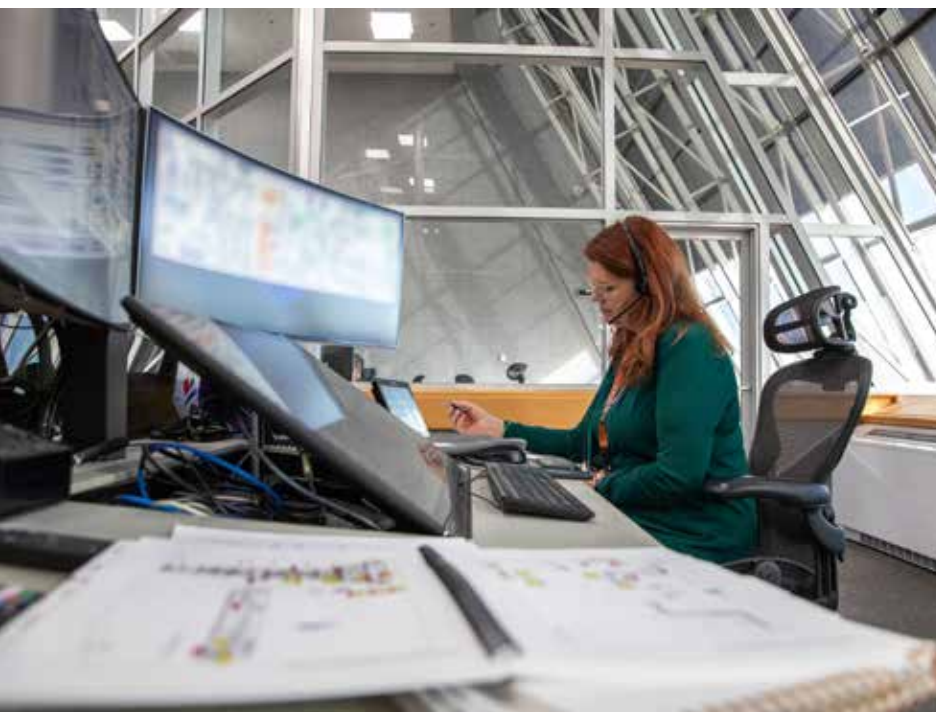
The launch team also is preparing for liftoff of Artemis II and have started conducting launch countdown simulations. The addition of astronauts adds extra steps to the nearly two-day countdown, including the addition of the “AstroComm” loop, which is the line the launch team will use to communicate with the crew when they’re inside Orion.

In August, the Artemis II crew, NASA astronauts Commander Reid Wiseman, Pilot Victor Glover, and Mission Specialist Christina Koch, and Canadian Space Agency astronaut Jeremy Hansen, visited the Orion spacecraft that will take them on a 10-day journey around the Moon. Artemis II isn't the only Orion spacecraft in assembly; processing the spacecraft for Artemis III and IV is also well underway.

Also in August, teams started constructing Mobile Launcher 2, which will be used for missions starting with Artemis IV that will use a more powerful version of SLS – Block 1B – that includes the exploration upper stage.

Once Orion is on its return from the Moon, NASA's Landing and Recovery team will be ready to retrieve the crew and the spacecraft after a safe splashdown in the Pacific Ocean, as practiced during the successful completion of the first recovery test for the crewed Artemis II mission.

Throughout the rest of FY23, the team will continue receiving the rocket hardware needed for Artemis II and beyond. Once all the components of the Artemis Moon rocket are at Kennedy, engineers and technicians will begin integrating the rocket and spacecraft for the Artemis II mission. 🚀



Top: With the Vehicle Assembly Building in the background, the three specially designed, fully electric, environmentally friendly crew transportation vehicles for Artemis missions arrived at NASA's Kennedy Space Center in Florida on July 11, 2023. Photo credit: NASA/Isaac Watson

Middle: Charlie Blackwell-Thompson, NASA Artemis launch director, leads the first launch simulation for the Artemis II mission inside Firing Room at the Launch Control Center at NASA's Kennedy Space Center in Florida on July 20, 2023. Photo credit: Kim Shiflett

Bottom: Artemis II crew members, shown inside the Neil Armstrong Operations and Checkout Building at NASA's Kennedy Space Center in Florida, check out their Orion crew module on Aug. 8, 2023. Photo credit: NASA/Kim Shiflett



Above: The Orion spacecraft for NASA's crewed Artemis II (right), Artemis III (left), and Artemis IV (center) missions are stationed next to each other inside the high bay of the Neil Armstrong Operations and Checkout Building at NASA's Kennedy Space Center in Florida on June 22, 2023. Each capsule is in a different stage of production as technicians and engineers prepare the spacecraft to carry astronauts to and around the Moon on their upcoming flights. Photo credit: NASA/Marie Reed



Teams with Bechtel National, Inc. begin constructing Mobile Launcher 2 for NASA's future Artemis missions starting with Artemis IV in August 2023 at the agency's Kennedy Space Center in Florida. Mobile Launcher 2 will serve as the launch and integration platform for the more powerful SLS Block 1B version, which introduces the exploration upper stage. Photo credit: Bechtel



Naval helicopter pilots from Helicopter Sea Combat Squadron (HSC) 23 "Wildcards" fly over the Orion Crew Module Test Article (CMTA) with American flags after completing flight operations during an Artemis II mission simulation during NASA's Underway Recovery Test 10 (URT-10) off the coast of San Diego. Photo credit: NASA/Kenny Allen

DEEP SPACE LOGISTICS

The Gateway Program based at NASA's Johnson Space Center in Houston, Texas, is building a small, human-tended space station orbiting the Moon that will provide extensive capabilities to support NASA's Artemis campaign. Built with international and commercial partnerships, Gateway's capabilities for supporting sustained exploration and research in deep space include docking ports for a variety of visiting spacecraft, space for crew to live and work, and onboard science investigations to study heliophysics, human health, and life sciences, among other areas. Gateway will be a critical platform for developing technology and capabilities to support Moon and Mars exploration in the coming years.

Deep Space Logistics (DSL) is the Kennedy Space Center's focal point for all Gateway activities that include leading the commercial supply chain in deep space by procuring services for transporting cargo, equipment, and consumables to enable exploration and scientific discoveries of the Moon and Mars.

The project oversees requirements definition and decomposition in preparation for DSL's first mission; modeling and analysis to successfully enable Gateway and DSL spacecraft integration; concept development to prepare for the expansion of our science and technology customer base; and fostering new technologies that drive efficiencies and improve operational optimization for deep space cargo shipments.

DSL's work also encompasses collaborating with NASA's international partners — the Canadian Space Agency on the delivery of the Gateway External Robotic System, as well as with the Japan Aerospace Exploration Agency on investigating enhancements to its HTV-X cargo resupply spacecraft for use in the Gateway architecture.

The team also engages extensively with academia, private industry, and small business via NASA's innovation research grant program, in conjunction with STEM outreach, to help solve next-generation deep space logistics challenges, support lunar research, and inspire the next generation of space scientists, engineers, and explorers. 🚀

Right: DSL's women engineers during social media filing in support of International Women in Engineering Day Photo credit: NASA



Jenny Lyons, DSL's deputy manager, giving the keynote at the Society of Women Engineers Space Coast annual awards dinner. Photo credit: Society of Women Engineers



Artist illustration of Gateway, including the logistics module at lower left.



Left: DSL reaches across the Agency to support other Artemis programs in a variety of roles, such as analysis and testing. Photo credit: NASA



Right: DSL in discussions with a Small Business Innovation Research grant awardee regarding 3D printing to develop future technologies to improve supplies fabrication and sustainability in deep space. Photo credit: NASA

EXPLORATION RESEARCH & TECHNOLOGY

Throughout fiscal year 2023, Kennedy's Exploration Research and Technology (ER&T) Programs provided the International Space Station with ground operations, logistics, and maintenance support. The team also continued pushing the boundaries of research and technology development, working with a wide array of customers and stakeholders across NASA and industry to help meet the agency's needs. In addition, the team supported various Moon to Mars activities.

Several activities took place in the Space Station Processing Facility (SSPF). Ground processing crews prepared payloads bound for the orbiting laboratory for three commercial resupply missions, ranging from air in the Nitrogen Oxygen Recharge System and spare parts for the space station with orbital replacement units, to various experiments. The team assisted with the quick return of science from the orbital outpost, allowing researchers using the SSPF labs to analyze data quickly with minimal loss of microgravity effects. Additionally, ER&T worked closely with the Space Launch System team, using the SSPF to simultaneously manufacture multiple elements in preparation for future Artemis missions.

ER&T teams also led the task to deliver a Multipurpose Logistics Module (MPLM) to Axiom Space to be utilized for further commercialization of space. This activity cleared the way for Northrop Grumman to enter into an agreement with the International Space Station program to process the company's 20th, 21st, and 22nd commercial resupply missions in the SSPF, targeted to launch starting in late 2023.

Additionally, the team worked on multiple biological research projects during ground operations and aboard the space station. In the spring, the Veg-05 experiment – a project to grow Red Robin tomatoes in the Vegetable Production System (Veggie) – concluded. The goal was to study crop growth, nutrient composition, microbial food safety, flavor, and psychological benefits for the crew aboard station while examining how light quality affects these key factors. This experiment marked the first time NASA hardware was used to grow multiple tomato plants in space.

The ER&T team prepared and delivered the Biological Experiment-01 (BioExpt-01) payload for the Artemis I mission. The BioExpt-01 payload included four science experiments designed to assess radiation effects on a variety of organisms (plant seeds, algae, fungi, and yeast). Researchers then conducted ground controls to compare the Earth-based studies to those performed in space to learn how NASA can help protect crew health and develop nutritious, sustainable crops for deep-space missions.

Teams also were busy preparing for upcoming lunar missions. Researchers finished testing two Mass Spectrometer Observing Lunar Operations units destined to launch on NASA's Volatile Investigating Polar Exploration Rover and Polar Resources Ice Mining Experiment-1 missions. Another team prepared two Electrodynamic Dust Shield (EDS) instruments.

The EDS technology will play a key role in mitigating dust by removing it from spacecraft and equipment used in space exploration.

2023 marked the 10th anniversary of Swamp Works – a space devoted to innovation and collaboration across Kennedy's research facilities. Swamp Works includes areas such as granular mechanics and regolith operations; electrostatics and surface physics; robotics integration, checkout, and assembly; and advanced manufacturing. The technologies being developed at Swamp Works, as well as other labs across ER&T, are a major part of NASA's exploration objectives.

As part of NASA's mission to engage, educate, and inspire the public, ER&T provided 40 interns from 26 colleges, universities, and institutes with meaningful, hands-on experiences spanning multiple areas of research, such as in-situ resource utilization and space crop growth.

As a result of the innovative research conducted under ER&T, 56 new technology reports were submitted, three provisional and two nonprovisional patent applications were filed, and one nonprovisional patent was issued this fiscal year. Overall, Kennedy's research and technology efforts span 10 states through a variety of mechanisms, including licenses, Space Act Agreements, grants, and Small Business Innovative Research/Small Business Technology Transfer contracts.

The technological advancements enabled by the ER&T team at Kennedy will help provide the capabilities needed for living on and exploring the surfaces of the Moon, and one day, Mars. 🚀



Above: Technicians prepare the Mass Spectrometer Observing Lunar Operations (MSOLO) for NASA's Volatile Investigating Polar Exploration Rover (VIPER) mission for packing inside a laboratory in the Space Station Processing Facility on Feb. 21, 2023. Photo credit: NASA/Kim Shiflett



To celebrate its 10-year anniversary, the Swamp Works team poses for a group photograph inside the Granular Mechanics and Regolith Operations Laboratory at NASA's Kennedy Space Center in Florida on April 21, 2023. Photo credit: NASA/Kim Shiflett



Left: Scientists package up part of NASA's Biological Experiment-1 (BioExpt-1) for official handover to the Orion team for Artemis I inside the Space Station Processing Facility at the agency's Kennedy Space Center in Florida. BioExpt-1 is a space biology pathfinder, which will carry plant seeds, algae, yeast, and fungi science payloads for biology research beyond low-Earth orbit aboard the Orion capsule on the Artemis I mission. Photo credit: NASA/Frank Michaux



Inside of the Electrostatics and Surface Physics Laboratory, an electrodynamic dust shield (EDS) is in view on Jan. 18, 2023. The dust shield is one of the payloads that will fly aboard Firefly Aerospace's Blue Ghost lunar lander as part of NASA's Commercial Lunar Payload Services (CLPS) initiative. Photo credit: NASA/Cory Huston



The Nitrogen Oxygen Recharge System team from Kennedy Space Center perform final inspections on the flight tanks at NASA's Wallops Flight Facility in Virginia in preparation to turn over to Northrop Grumman. Photo credit: NASA/Jessica Langley



Pictured are Red Robin tomato plants growing in the International Space Station's Vegetable Production System, known as Veggie, as part of the VEG-05 investigation on Feb. 5, 2023. The experiment returned to Earth aboard a SpaceX Dragon cargo resupply spacecraft on April 15. Photo credit: NASA



Plaques bearing the names of this year's Chroniclers honorees, Robert E. Granath, Red Huber, and Mark Kramer, are in view in the far right panel, during a ceremony on May 1, 2023 at the NASA News Center at the agency's Kennedy Space Center in Florida.

ENGINEERING

NASA Engineering at Kennedy Space Center provides engineering excellence in the design, development, and operations of launch vehicles, spacecraft, payloads, ground systems, and facilities. The team contributes to the Artemis missions through Exploration Ground Systems, Human Landing Systems, and Gateway Deep Space Logistics. Engineers are embedded in the Commercial Crew Program, Launch Services Program, and Exploration Research and Technology programs. Additionally, the team supports the International Space Station, as well as Center Engineering, Safety, and Operations. In the next five years, Kennedy Engineering will provide critical engineering leadership and support to more than 100 major milestones, 75 launches, and 15 different launch vehicle fleets, ensuring NASA's mission success.

Launch Services Program

Engineers successfully supported the launch of scientific and technological missions from Vandenberg Space Force Base, including NOAA's Joint Polar Satellite System-2 (JPSS-2) mission with the LOFTID (Low-Earth Orbit Flight Test of an Inflatable Decelerator) secondary payload on the final United Launch Alliance Atlas V to launch from Vandenberg and NASA's SWOT (Surface Water and Ocean Topography) mission on a SpaceX Falcon 9. Engineering played a critical role in troubleshooting and resolving time-critical issues leading to the successful launch of both missions.

Commercial Crew Program

Kennedy engineers supported operations for NASA's SpaceX Crew-4 landing, Crew-5 launch and landing, Crew-6 launch and landing, and Crew-7 launch. Additionally, engineering teams are supporting Boeing's upcoming Crewed Flight Test mission. Engineering also had the opportunity to observe and participate in the SpaceX Axiom-2 private astronaut mission. Multi-center working opportunities enable Kennedy engineers to successfully evaluate the flight worthiness of future suborbital launch vehicle prospects to determine how these vehicles will best support the Commercial Crew Program and potentially take NASA to future commercial low Earth orbit destinations.

Artemis

The Engineering team certified all ground systems of the Artemis I mission required to process, operate, and launch NASA's Space Launch System rocket and Orion spacecraft, as well as flight processing operations on both vehicles through launch countdown in the firing rooms and remotely. The Engineering launch team achieved 85 subsystem certifications and provided 12 launch system specialists on console to ensure the success of the final



A crane lifts NASA and the National Oceanic and Atmospheric Administration's (NOAA) Joint Polar Satellite System-2 (JPSS-2) satellite for transfer to an Aronson Table for processing inside the Astrotech Space Operations facility at Vandenberg Space Force Base in California on Aug. 22, 2022. Photo credit: USSF 30th Space Wing/Steven Gerl



Support teams work around the SpaceX Crew Dragon Freedom spacecraft shortly after it landed with NASA astronauts Kjell Lindgren, Robert Hines, Jessica Watkins, and ESA (European Space Agency) astronaut Samantha Cristoforetti aboard in the Atlantic Ocean off the coast of Jacksonville, Florida, Friday, Oct. 14, 2022. Photo credit: NASA/Bill Ingalls

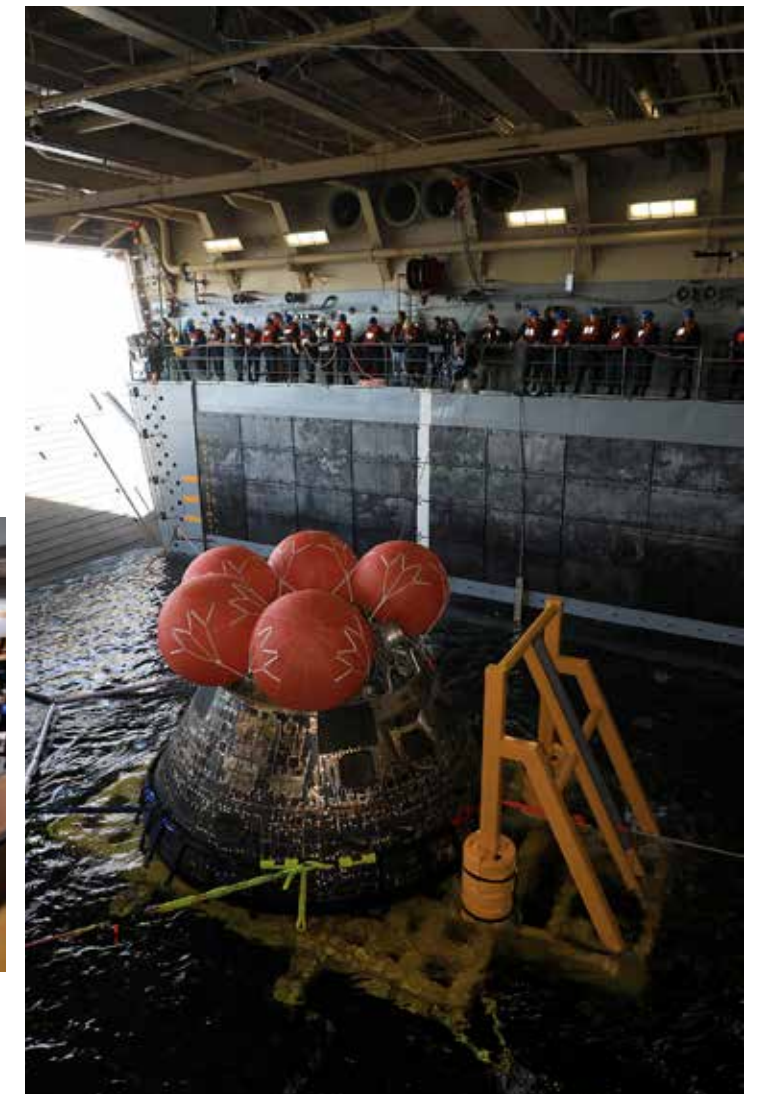


The Starliner team works to finalize the mate of the crew module and new service module for NASA's Boeing Crew Flight Test. Photo credit: Boeing/John Grant



Artemis I launch team members are at their consoles in Launch Control Center Firing Room 1 at NASA's Kennedy Space Center in Florida during countdown and liftoff of the agency's Space Launch System and Orion spacecraft from Launch Complex 39B on Nov. 16, 2022. Photo credit: NASA/Kim Shiflett

Below: NASA's Orion spacecraft for the Artemis I mission was successfully recovered inside the well deck of the USS Portland on Dec. 11, 2022, off the coast of Baja California. Photo credit: NASA/Kim Shiflett





Inside the Space Station Processing Facility high bay at NASA's Kennedy Space Center in Florida, technicians assist as a crane lowers a set of International Space Station Roll Out Solar Arrays (iROSA) onto a platform on March 23, 2023. Photo credit: NASA/Isaac Watson

Spaceport Support

The Construction of Facilities (COF) continues modernizing and enhancing the nation's premier spaceport. In coordination with the Florida Department of Transportation and Space Florida, it completed the first of two bridge spans replacing the 60-year-old NASA Causeway drawbridge over the Indian River. Additionally, the team completed projects to construct the emergency egress life safety system at Launch Complex 39B, modernize and upgrade the Converter Compressor Facility, and upgrade the Rotation, Processing, and Surge Facility's fire protection systems. Kennedy continues repairing hurricane-damaged facilities, utilities, and shorelines caused by hurricanes

Matthew, Ian, and Nicole. The team completed a centerwide water and wastewater upgrade project and began the replacement of the 1964 power system in the south wing of the Neil A. Armstrong Operations and Checkout Building.

Human Landing System Program

Engineering provided insight into Human Landing System activities for SpaceX and Blue Origin/Lockheed Martin on behalf of the Lander Ground Operations Office. For SpaceX, the focus was on design, fabrication, and operations leading up to the first Orbital Flight Test (OFT-1) of Starship at Boca Chica, Texas in April 2023. The design modifications and re-construction of the Starbase pad following the flight test will directly apply to Kennedy's Launch Complex 39A and surrounding infrastructure. For Blue Origin/Lockheed Martin, support ensured all contract deliverables technically met the contract. 🚀

launch countdown for Artemis I. Engineering also supported the landing, recovery, and subsequent de-servicing of the crew module at Kennedy. Engineers continue to support the post-Artemis I launch debris and damage assessment and design action teams to prioritize repairs and launch-harden ground systems to alleviate turnaround time among Artemis II, Artemis III, and future missions while planning for forthcoming Artemis II mission stacking and integrated test efforts. Engineers are instrumental in the success of subsequent Artemis missions, mobile launcher 2, and the Block 1B mission configuration in support of the new crew configurations with NASA's Moon to Mars architecture.

Laboratories, Development, and Testing

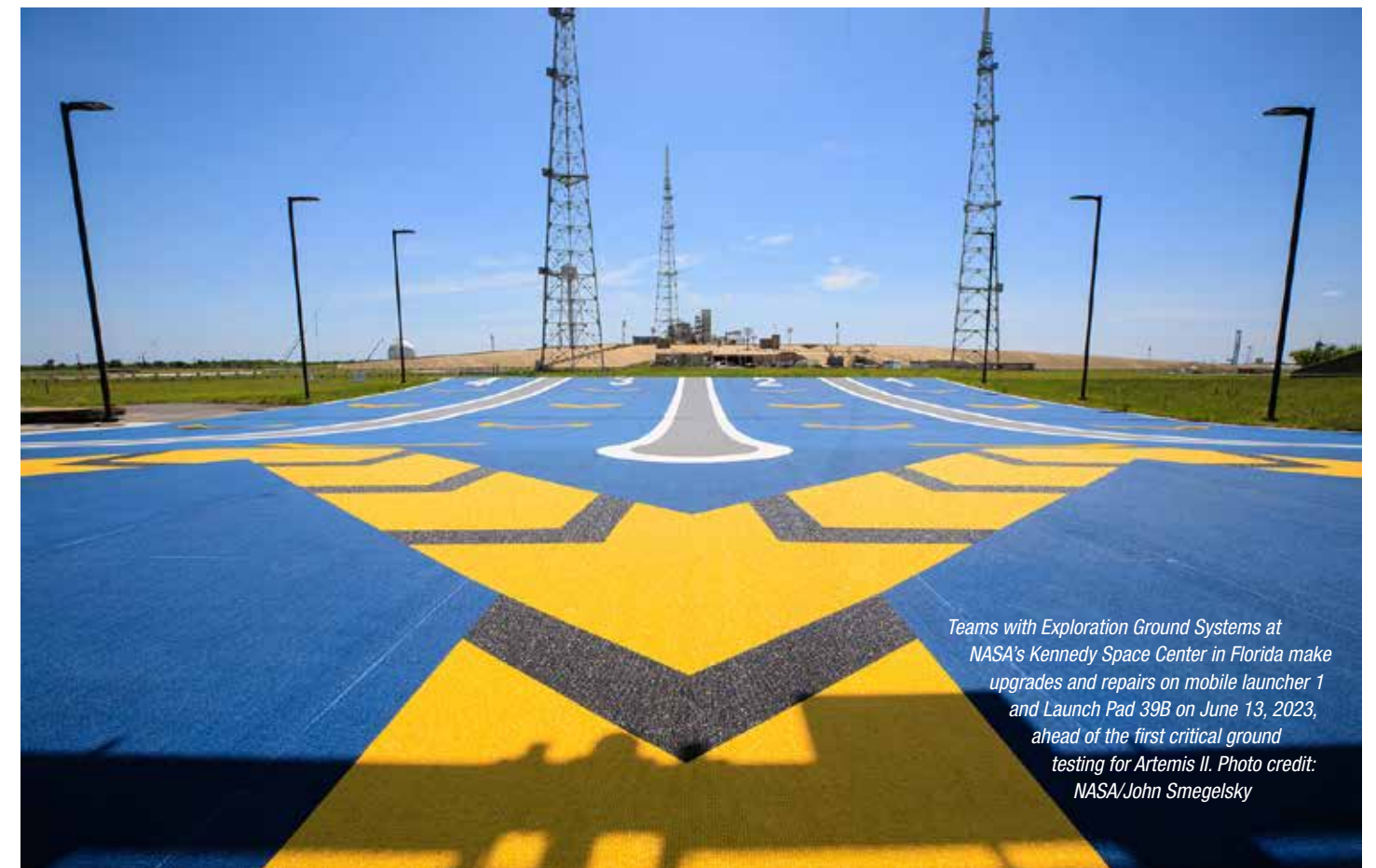
The Engineering team contributed to the success of missions and projects spanning several agency programs and customers, as well as numerous external aerospace business partners. Engineers continued to certify Commercial Crew spacecraft and launch vehicles with a focus on reuse and provided critical production engineering and laboratory support. Additionally, engineers offered large-scale article testing, quick response failure analysis and troubleshooting, component qualification, and hardware/software fabrication and development. Multi-disciplinary engineering expertise was provided during the Artemis I launch campaign and continued through post-flight image analysis and post-landing hardware inspections. Engineers continue to play a critical role in providing support to the International Space Station for the ground processing of cargo, payloads, and orbital replacement units.

A view from inside the Vehicle Assembly Building at NASA's Kennedy Space Center in Florida on Dec. 9, 2022, as the mobile launcher, carried atop the crawler-transporter 2, arrives at the entrance to the transfer aisle, following the successful launch of the agency's Space Launch System (SLS) rocket and Orion spacecraft on the Artemis I flight test on Nov. 16, 2022. Photo credit: NASA/Ben Smegelsky



Inset image: A ribbon-cutting ceremony on the upgraded eastbound span of the Indian River Bridge is held on June 9, 2023, near NASA's Kennedy Space Center in Florida. Photo credit: NASA/John Smegelsky

Background image: In view is the upgraded eastbound span of the Indian River Bridge leading to NASA's Kennedy Space Center in Florida. Photo credit: NASA/John Smegelsky



Teams with Exploration Ground Systems at NASA's Kennedy Space Center in Florida make upgrades and repairs on mobile launcher 1 and Launch Pad 39B on June 13, 2023, ahead of the first critical ground testing for Artemis II. Photo credit: NASA/John Smegelsky

SPACEPORT INTEGRATION & SERVICES

The Heartbeat of Kennedy Space Center

Spaceport Integration and Services (SI) supports all government and Federal Aviation Administration-licensed launches from Kennedy Space Center and Cape Canaveral Space Force Station.

67 launches and 51 other major events, including static fire tests and wet dress rehearsals, occurred during fiscal year 2023. The Emergency Operations Center activated 90 times to support launch operations in FY 2023.

SI also manages multiple large contracts to support the spaceport's various missions, including a facilities operations and maintenance contract, and a medical, occupational health, industrial hygiene, and environmental services contract. In addition, SI oversees contracts for Kennedy's propellants, gas distribution systems, and life support systems, as well as contracts to supply commodities vital to the success of Kennedy's missions.

Other contracts run by SI at Kennedy include construction and design, custodial services, mail, recycling, roads and grounds, trash collection, and utilities. These contracts are key to ensuring the spaceport has the capacity and reliability to support all the needs of Kennedy's mission partners, programs, and workforce.

In coordination with federal, state, and local government agencies, SI's Medical and Environmental Services Division is responsible for environmental planning, permitting and compliance, remediation, and sustainability efforts within Kennedy, ensuring the health and safety of employees and visitors while protecting the wildlife and environment in and around the center.

The following are some of SI's most notable accomplishments during FY 2023.



Rainbirds Dampen Artemis' Sound and Fury

Future Artemis missions will lift off on a mobile launcher outfitted with new safety features to protect the Space Launch System (SLS) rocket from the intense sound and heat energy generated during launch. The Ignition Overpressure Protection and Sound Suppression systems on mobile launchers 1 and 2 now have next generation "rainbird" deck spray nozzles to optimize system performance.

The water flow from these "Rainbirds" protect our mobile launchers from the sound and heat generated during Artemis launches. Photo credit: NASA/Bill Chardavoyne



Expansion of Launch Complex 39A and Roberts Road

SpaceX looks to streamline its launch schedule by consolidating its operations at Kennedy, including a new launch site within the perimeter of Launch Complex 39A and an expansion of its Roberts Road manufacturing site. NASA has completed a Supplemental Environmental Assessment for the proposed Roberts Road Campus Expansion proposal, with the results released for public review and comment as required by the National Environmental Policy Act. The process enables interested persons and organizations to provide input on potentially affected resources, environmental issues, and the agency's planned approach to the environmental analysis process.

This sign marks the entrance to SpaceX's Roberts Road location off State Road 3 at Kennedy Space Center. The company is undergoing a required federal environmental review for its request to extend the road and increase its facility size. Photo credit: NASA/Ben Smegelsky

Agreement Provides Faster Scrub Turnarounds for Artemis

The liquid hydrogen storage sphere at Launch Complex 39B contains only enough liquid hydrogen for a single Artemis launch attempt. If an Artemis launch is postponed or scrubbed for any reason, about 20% of the hydrogen will evaporate by the time it's transferred back to the storage sphere from the SLS rocket. Logistical challenges prevent replenishing that much liquid hydrogen in a 24-hour period, so to ensure another launch attempt within 48 hours of the initial scrub, NASA entered into an agreement with United Launch Alliance (ULA) to transfer liquid hydrogen from its storage tank at Cape Canaveral Space Force Station to help make up for the 20% lost in the previous launch attempt. Future Artemis missions will not require this support from ULA once construction is complete for a second liquid hydrogen storage sphere (pictured) which can hold an additional 1.4 million gallons.



This storage sphere near Launch Complex 39B can hold up to 1.4 million gallons of liquid hydrogen, a chemical used during Artemis launches to propel the Space Launch System rocket from Kennedy Space Center into space. Photo credit: NASA/Kim Shiflett



First responders and members of Kennedy's Aerospace Medicine and Biomedical team train for emergency scenarios ahead of Artemis I's successful launch in November 2022. Photo credit: NASA/Phillip Scarpa

Aerospace Medicine and Biomedical Team Awarded for Artemis Support

The Aerospace Medicine and Biomedical team received a Kennedy Space Center Silver Group Achievement Award in 2023 for its preparation and support of the Artemis program as it took the first step in NASA's plan to establish a permanent base on the Moon and send humans to Mars. Personnel were trained to handle various emergency scenarios that could have occurred during Artemis I's successful launch in November 2022 and provided medical screening for Emergency Ground Systems personnel as well as support for all readiness reviews and wet dress rehearsals leading up to the launch.

Kennedy Patrol Helicopters Show Their Worth

In March 2020, the spaceport's Flight Operations Group began training with Airbus EC-135 helicopters that replaced its aging fleet of UH-1 Huey helicopters. Besides improvements in speed, flight range, and image/video capture, these helicopters provide greater flexibility and enhanced capabilities for patrolling the spaceport and its more than 140,000 acres. The EC-135's are more than a security tool, though. With appropriate approvals, they were utilized for cargo and crew mission recovery efforts, as demonstrated during Crew-5's splashdown in the Gulf of Mexico last March, and the asteroid Bennu samples gathered in Utah last September at the conclusion of the OSIRIS-REx mission.



Three Airbus EC-135 helicopters touch down at the Launch and Landing Facility at NASA's Kennedy Space Center. These new helicopters provide technological and safety advantages over the Hueys they replaced, including more lifting power, greater aerial stability and expanded medical capabilities. Photo credit: NASA/Kim Shiflett

More Electric Vehicle Charging Stations Go Live

Fifty-six additional electric vehicle charging stations have been installed by Florida Power & Light (FPL) at various parking lots near six Kennedy facilities, including the Central Campus Headquarters, the Neil A. Armstrong Operations and Checkout Building, and the Space Shuttle Processing Facility. Through an agreement made under the Fixing America's Surface Transportation Act, FPL will operate and maintain the charging stations for government vehicles, as well as privately-owned vehicles, with payments processed through the ChargePoint app. This partnership enhances Kennedy's electric vehicle charging capability, allowing the spaceport to replace 19 gas-powered vehicles with electric models.



These electric vehicle charging stations at Kennedy's Central Campus Headquarters enhance the spaceport's electric vehicle charging capability while providing employees opportunity to pay for charge-ups of their personal vehicles while they work. Photo credit: NASA/Kim Shiflett



A section of Kennedy's Central Campus Headquarters cafeteria transformed into an employee collaboration area as part of the center's new work strategy approach developed during COVID-19. Photo credit: NASA/Melissa Duffy

Office Spaces Reimagined for Better Workplace Collaboration

Kennedy Space Center is experimenting with new ways of using office space to take advantage of work strategies developed during the COVID-19 pandemic, including reworking an entire office area into a collaborative environment instead of using traditional cubicle and office concepts. Modified spaces include a project office area in the Space Station Processing Facility as well as a section of the Central Campus Headquarters cafeteria. Concepts such as hoteling and stand-alone collaboration furniture in open areas can make employee interactions more effective while using space more efficiently.

Kennedy Saves Green While Going Green

To create greater energy efficiency and reduce energy costs across Kennedy, over 30,000 lights across the spaceport are being replaced under the Phase 1 Utility Energy Services Contract. The \$21.9 million project bundles a diverse mix of conservation measures designed to provide energy savings, resilience, efficiency, and security to critical NASA missions. Street and parking lights are included in the lighting upgrades, as are fixtures inside Kennedy facilities, including the Neil A. Armstrong Operations and Checkout Building. A 2-megawatt solar power plant, over 70 new transformers, and new boilers, chillers, mechanical controls, and water fixtures will also be installed, all of which are projected to save approximately \$1.4 million annually in energy and maintenance costs. Separate from the Phase I project, an electric utility rate analysis was performed by the Lawrence Berkeley National Laboratory through an intermediary agreement with the United States Department of Energy's Office of Science. NASA assessed the benefits and risks of that analysis, leading to an estimated annual savings of \$940,000.



Construction workers off-load new equipment for installation as part of Kennedy's efforts to save money and create a more efficient, resilient and secure energy grid. Photo credit: NASA/Manuel Docurru

Indian River Lagoon Seagrass Restoration Project

Once home to the densest region of seagrass in the Indian River Lagoon system, Kennedy has recently become the focus of a pilot project for seagrass restoration efforts. Due to a series of algae blooms, the grass has been greatly reduced. This pilot is expected to aid in the recovery of seagrass, which provides a food source for manatees, turtles, and other herbivores. Seagrass also improves water quality and gives small fish a hiding place from predators.



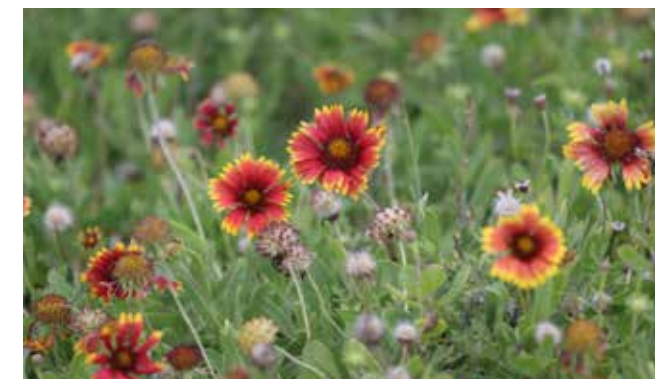
Members of the Florida Oceanographic Society prepare to plant seagrass in the Banana River at NASA's Kennedy Space Center. Kennedy's Environmental Management Branch is working to plant a minimum of 28,000 shoots of seagrass divided into 18 sites across three areas at the Florida spaceport as part of a pilot project for seagrass restoration efforts. Photo credit: NASA/Kim Shiflett



Additional helium tanker trucks like these will help Kennedy Space Center keep pace with the expected increase in launches from NASA and its commercial partners. Photo credit: NASA/Bill Ingalls

New Helium Tankers Vital for Kennedy's Launch Pace

The Propellants and Life Support Branch has acquired two new liquid helium tankers, which are now incorporated into the transportation fleet of the NASA helium contractor. Helium is primarily used as a pressurant and to purge gas during launches for all major launch providers, including NASA and its commercial partners. With launch numbers projected to increase rapidly in the future, the additional tankers will ensure the spaceport's helium supply can keep up with the expected demand.



Wildflowers called Gaillardia pulchella (Firewheel) are in view in a field at NASA's Kennedy Space Center in Florida on June 13, 2023. The center shares a boundary with the Merritt Island National Wildlife Refuge. Along with wildflowers, Kennedy and the wildlife refuge are home to more than 300 native and migratory bird species, 65 amphibian and reptile species, and more than 1,000 different types of plants. Photo credit: NASA/Frank Michaux

Kennedy's Sustainability Roadmap

Executive Order 14057 – released in December 2021 by President Joe Biden – aims to create a sustainable climate and environmental culture throughout the federal workforce. Among its goals are to reduce the federal government's greenhouse gas emissions, incorporate environmental stewardship value, and build employees' skills and knowledge through engagement, education, and training. At Kennedy, those goals are being met through a multi-faceted approach, which includes a sustainability speaker series, hands-on team building activities designed to protect our local environment, and various outreach campaigns that connect NASA's mission to ways employees can reduce their carbon footprint.



New Waste Tanker Truck Keeps Kennedy Clean

The NASA Environmental and Medical Contract (NEMCON) has a new vacuum tanker truck designed to enhance its waste management capabilities. The third addition to NEMCON's tanker truck fleet is designed for light duty, efficiently picking up smaller volumes of waste while going into areas that the larger tankers cannot access. During a typical year at Kennedy, NEMCON gathers over 250,000 gallons of industrial waste liquids for disposal, including over 6,000 gallons of used oil that is recycled or reused.

Tanker trucks like these help gather the over 250,000 gallons of industrial waste liquids generated during a typical year at Kennedy Space Center. Photo credit: NASA/Edward L. Coyle



KARS Park Mangrove Restoration Project

Shoreline resiliency and living shoreline projects are a key focus area for the spaceport. Due to damage caused by hurricanes and other storms, repairs were needed to approximately 3,500 feet of shoreline at the Kennedy Athletic, Recreation & Social (KARS) Park. Employees removed seedling mangroves from the damaged shoreline, placed them in pots, and put the pots in a watery area protected from wind, waves, and maintenance activities. Once the repairs are complete, those plants will be replanted on the same shoreline. This approach protects infrastructure, prevents erosion, and protects water quality in the Indian River Lagoon.

Employees from Kennedy's Environmental Management Branch removed over 100 mangrove seedlings from the shoreline and repotted them for protection during the final stages of a shoreline restoration project inside Kennedy Athletic, Recreation, and Social (KARS) Park. Photo credit: NASA/Glenn Benson

Launch Complex 34 Groundwater Treatment System Expansion

The hydraulic containment and air sparge system at historic Launch Complex 34 is now treating groundwater for volatile organic compounds over a larger area, thanks to infrastructure improvements completed in July 2023. Nearly 200 air sparge wells, well-head connections, conveyance piping, and manifold distribution trailers were installed over an eight-month stretch that began in October 2022, increasing the acreage treated from 26.8 to 38. As of September 29, 2023, the hydraulic containment system has effectively treated over 327 million gallons of groundwater and removed over 92,000 pounds of volatile organic compounds.



This building houses the hydraulic containment and air sparge system used for treating volatile organic compounds at historic Launch Complex 34. Photo credit: Tetra Tech/Dan Forester



Cleanup crews use all kinds of equipment, including large construction machinery, to remove contaminated soils at Kennedy Space Center. Photo credit: HydroGeoLogic/Dustin Lupis

Over 2,000 Tons of Contaminated Soil Removed

Kennedy Space Center continues its robust environmental remediation program, identifying and cleaning up environmental contamination from actions that occurred before their environmental harm was known. More than 2,441 tons of soil affected with metals, polychlorinated biphenyls, or polycyclic aromatic hydrocarbons were removed in FY 2023. The program also is actively treating 65 acres of affected groundwater.

Wilson Corners Groundwater Treatment System Installed

Volatile organic compounds in the groundwater at Wilson Corners, near Kennedy Parkway North and Beach Road, are being treated with a new air sparge system that went fully operational in April 2023. The Remediation Group oversaw the system installation, which includes over 300 air sparge wells, along with well-head connections, conveyance piping, manifold distribution trailers, and an air compressor trailer. The system was installed to remediate a seven-acre area with affected groundwater.



This air sparge system treats volatile organic compounds at Wilson Corners near Kennedy Parkway North and Beach Road. Photo credit: AECOM/Linnea King

Record Number of Sea Turtle Nests at Kennedy

Merritt Island National Wildlife Refuge and Canaveral National Seashore biologists found over 13,000 sea turtle nests along Kennedy Space Center's shoreline during the 2023 nesting season, the most ever in a single year. That number includes over 8,500 green turtle nests (*Chelonia mydas*) and over 5,000 loggerhead nests (*Caretta caretta*) as well as 26 leatherback nests (*Dermochelys coriacea*) and 1 Kemp's ridley nest (*Lepidochelys kempii*), the latter of which are one of the world's most endangered sea turtle species. Kennedy's nests usually make up 10% of all Florida sea turtle nests in any given year.



Baby sea turtles like these began their lives inside nests created by their mothers on Kennedy Space Center's beaches. Since 1983, more than 160,000 nests have been deposited along the Canaveral National Seashore, representing more than 16 million eggs. Only 1 in 1,000 baby sea turtles makes it to adulthood on average.

SAFETY AND MISSION ASSURANCE

Safety is the cornerstone upon which NASA builds mission success. The Safety and Mission Assurance (SMA) Directorate provides system safety and mission assurance, operations safety, institutional safety, and quality engineering and assurance leadership to Kennedy programs, projects, and the institution. The SMA team ensures Kennedy operations are performed in a safe manner and minimizes risk to the public, Kennedy personnel, hardware, and our facilities through the application of technical expertise and performance of risk assessments and fostering a strong safety and health culture.

SMA principles are interwoven into every facet of operations at our nation's premier multi-user spaceport.

This year stood out as a momentous one for NASA, Kennedy, and our SMA Directorate, marked by the completion of processing, successful launch, and safe landing of Artemis I. SMA played a crucial role in ensuring the mission's success.

SMA conducted over 50 technical assessments during launch vehicle processing, addressing topics including foreign object debris, noncompliant equipment, and contingency operations. The team performed in-depth fault tree and root-cause analyses for several high-profile anomalies, from which they developed troubleshooting and repair procedures and identified ground equipment for redesign such as the ground and flight umbilical connections. The quality assurance team performed 27,000 government mandatory critical inspections for Artemis I.

During the Artemis I launch countdown, SMA provided expertise and risk assessment toward the repair of a ground valve during cryogenic loading, allowing repair operations by the "red crew" team. Without the successful "red crew" operation, Artemis I could not have launched that day.

SMA played a vital role in the landing and recovery operations. The team helped develop the recovery procedures to ensure the safety of the team and the crew module, actively involved in all prelaunch training and testing of recovery operations with the U.S. Navy during the Underway Recovery Tests.

Following the mission, SMA compiled and submitted lessons learned and continued to provide insight into design upgrades and construction activities of the spaceport's launch systems and facilities, as Kennedy prepares for Artemis II.

SMA contributed to mission processing and launches of the Surface Water and Ocean Topography and Joint Polar Satellite System-2 missions. The team provided independent assessments of risks to mission success and ensured launch vehicle systems and integrated vehicles met NASA requirements. SMA also partnered with the U.S. Space Force to address ground safety compliance concerns shared among launch service providers to prevent

redundant efforts and ensure a unified approach to resolving these issues. This joint initiative not only enhances the protection of personnel at Kennedy, but also reinforces mission assurance for NASA payloads before their launch with commercial providers.

SMA collaborated with the Commercial Crew Program to ensure the continued certification and operation of spacecraft and launch systems for crewed missions to the International Space Station. SMA's involvement encompassed SpaceX's Crew-4 landing, Crew-5 launch and landing, Crew-6 launch and landing, and preparations for Boeing's Crew Flight Test mission. The activities ranged from monitoring spacecraft and launch vehicle production and refurbishment to evaluating hardware changes for potential effects on crew safety. The team identified measures to mitigate risks, conducted audits and assessments of commercial partners' adherence to standards, and enhanced surveillance strategies for flight hardware reuse. Additionally, the team assessed



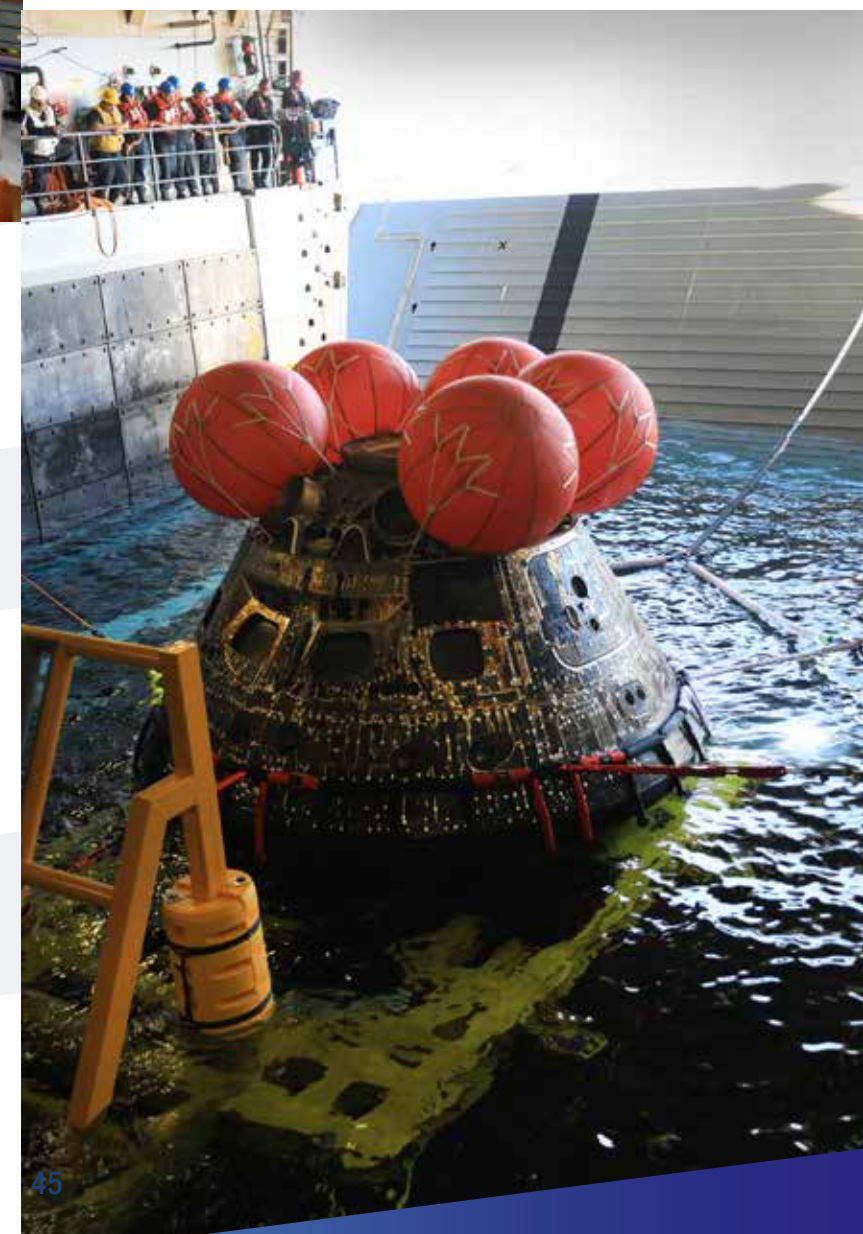
Members of the Artemis I launch team monitor data at the safety console inside Firing Room 1 of the Rocco A. Petrone Launch Control Center at NASA's Kennedy Space Center in Florida during a cryogenic propellant tanking demonstration on Sept. 21, 2022. Photo credit: NASA/Kim Shiflett



The persistent dedication and unwavering efforts of the Safety and Mission Assurance team have played a pivotal role in upholding the multifaceted nature of the spaceport. The core objective of SMA's team remains steadfast: to enable safe and successful access to space, while pushing the boundaries and ensuring the safety of our workforce. 🇺🇸

Left: Technicians check the United Launch Alliance Atlas V payload fairing containing the National Oceanic and Atmospheric Administration's (NOAA) Joint Polar Satellite System-2 (JPSS-2) inside the Astrotech Space Operations facility at Vandenberg Space Force Base (VSFB) in California on Oct. 12, 2022. Photo credit: USSF 30th Space Wing/Steve Gerlich

Below: NASA's Orion spacecraft for the Artemis I mission was successfully recovered inside the well deck of the USS Portland on Dec. 11, 2022 off the coast of Baja California. Photo credit: NASA/Kim Shiflett



safety, quality, and risk management for NASA's suborbital crew endeavors, defining pertinent approaches.

SMA conducted vital safety assessments and reviews for multiple partners seeking occupancy and operational activities within the Space Station Processing Facility. These partners included SLS for the core stage engine section, Northrop Grumman in support of Commercial Resupply missions, and Sierra Space for Dream Chaser processing. These reviews play a crucial role in establishing a safe environment for both personnel and the various programs and projects sharing the high bay space. In addition, the team supported the Human Landing System's Safety Assessment Report to address integrated hazards between Orion and Starship for Artemis III.

SMA focused their efforts on improving Multi-user Safety and Partnership Agreements. The team is clarifying which requirements and standards apply to contractors, partners, and civil servants. Improvements to partnership agreements include standardized hazard checklist and templated documents, mishap language, and guides for surveillance. The team collaborated with various stakeholders to clarify Kennedy's responsibilities for FAA-licensed launches and landings. New explosives safety initiatives resulted in the creation of site plans for the Launch Abort System Hangar, Solid Rocket Booster Rail Staging, and the propellant farm relocation. SMA worked to expand Kennedy's range safety capabilities, which includes enhancing the types and precision of analyses performed.

CENTER ENGAGEMENT & BUSINESS INTEGRATION SERVICES

Office of Communication

Kennedy Space Center is sharing NASA's story in many exciting, immersive ways. In fiscal year 2023, the team produced 10 live launch broadcasts, in addition to numerous press briefings and being part of the Artemis recovery broadcast. The most watched broadcast was the historic launch of Artemis I, which had a peak live viewership of about 1 million people around the world.

In addition to broadcasts, Kennedy interacts with the public by sharing feature stories, blog updates, and original content with more than 6.6 million followers across Facebook, X, Instagram, and YouTube. Kennedy also hosted eight NASA Social events, six in person and two virtually. The in-person NASA Socials received more than 3,000 applicants, with 350 influencers selected. The chosen digital content creators were treated to behind-the-scenes tours of Kennedy Space Center and spoke with many interesting space program employees. Overall, these influencers were able to generate content to both traditional and non-traditional NASA audiences, including a prime-time slot in NBC's "Harlem Globetrotters: Play it Forward" TV series.



Artemis II crew members, shown inside the Neil A. Armstrong Operations and Checkout Building, stand in front of their Orion crew module on Aug. 8, 2023. This photo received 1 million views on the social media platform X. Photo Credit: @NASAKennedy on X

Media Attendance at Milestone Events

LAUNCHES		
Date	Mission	Attending
Oct. 2022	NASA's SpaceX Crew-5	130
Nov. 2022	NASA's Artemis I	337
Nov. 2022	SpaceX Commercial Resupply Services 26	32
Nov. 2022	NOAA JPSS-2 – Vandenberg Space Force Base	25
Dec. 2022	NASA's Surface Water and Ocean Topography (SWOT)	25
March 2023	NASA's SpaceX Crew-6	61
March 2023	SpaceX Commercial Resupply Services 27	37
June 2023	SpaceX Commercial Resupply Services 28	38
Aug. 2023	NASA's SpaceX Crew-7	111
MEDIA EVENTS		
Date	Event	Attending
Aug. 2023	Orion Media Day	51
Aug. 2023	Psyche Media Day	24



NASA provided nearly five and a half hours of live coverage for the Artemis I launch, the agency's uncrewed flight test of the Space Launch System rocket and Orion spacecraft for humanity's return to the Moon.



NASA Social attendees pose for a picture with Snoopy at the Press Site countdown clock on Aug. 27, 2022. Photo Credit: NASA/Keegan Barber

Engagement Office

Guest Operations

Kennedy Space Center Guest Operations hosted more than 16,000 guests, including 2,452 employee viewing guests, for the 10 launches that took place in Florida – including the Nov. 14 Artemis I launch attempt – and at Vandenberg Space Force Base in California.



Guests at the Banana Creek viewing site watch the launch of NASA's Space Launch System rocket carrying the Orion spacecraft on the Artemis I flight test, Nov. 16, 2022, at NASA's Kennedy Space Center in Florida. Photo credit: (NASA/Keegan Barber)

Virtual Guest Operations

The 12 Virtual Guest Program opportunities offered in FY 2023 allowed members of the public to share virtually the excitement of NASA missions. Together these opportunities drew a total of 522,607 participants from around the world and granted access to curated mission-specific



resources. Since its inception in May 2020, 1,061,591 people, representing all 50 U.S. states and 173 countries, have registered for the program. More than 340,000 people registered for the Artemis I virtual guest experience and enjoyed a custom virtual passport to commemorate the mission. In addition, the program's invitation list grew 19%, furthering program exposure.

NASA's virtual passport program started in 2020 as a way for the public to commemorate its virtual engagement in NASA launches and milestones with the NASA Virtual Guest Program. Image credit: NASA

Outreach

Kennedy's Outreach programs directly engage the local community as well as NASA fans at conferences, sporting events, and other large gatherings. With an exposure of 617,037 and an impact of 87,006 in FY 2023, the Center Exhibits Program has once again proven its ability to captivate and engage NASA's audiences. In FY 2022, our exposure stood at 346,000 and an impact of 34,885. The increase in both areas demonstrates the continuous evolution and expansion of the program's reach and influence and sets the stage for a successful FY 2024.

To share the NASA story through digital media, the team manages Learn & Engage with NASA Studio (LENS), a studio offering services such as streaming, filming, editing, and creative development. LENS livestreamed 17 live and 12 hybrid events during the fiscal year, attracting 5,326 participants. Through its technical and on-air hosting support, the studio also played a key role in the success of the Artemis I Spanish broadcast, which drew over 370,000 viewers.

NASA Kennedy's Exploration Station Classroom is another effective outreach pathway. The classroom welcomed 5,076 youths representing 13 Florida counties, the United Kingdom, and Japan. The participants came from formal K-12 schools, homeschool groups, and informal groups. The classroom continues to be an access point for our local communities, and the team intends to continue services in FY24.



Employees attend "The Legacy of Sally Ride: The First American Woman in Space" event at KSC on June 15, 2023. Forty years ago, Ride made her trailblazing flight into space. A hero to millions, Ride was a steadfast advocate for inclusion in STEM (science, technology, engineering, mathematics) – especially for girls and young women. Photo credit: NASA

Center Events

Completed 17 center events, including 12 in person, 8 hybrid, and one virtual, attended by 5,856 employees. An additional four online events generated 127,935 virtual participants.

Astronauts often visit the center to thank the workforce for supporting their respective missions. Crew members from NASA's SpaceX Crew-4 and Crew-5 missions were amongst the visitors this fiscal year.

Left: Children learn about the missions NASA has launched at Megacon Orlando. Photo credit: NASA

VIP Tours and Visits

Through the 369 VIP tours completed this fiscal year, over 7,882 guests were hosted at the center, including foreign delegations from Mexico, Canada, Israel, Poland, Japan, Denmark, Brazil, UAE, New Zealand, Ireland and Russia

Kennedy hosted influential personalities representing various space agencies and governmental bodies, including members of the White House, FAA, FCC, DoD and DoE underlining the center's significance in shaping the future of human spaceflight and international cooperation.

Lt. Gen. Steven Nordhaus' visit to Kennedy, on July 19, 2023, centered around the critical theme of human spaceflight recovery missions. This visit underscored the importance of the center's expertise in managing complex missions and ensuring the safety of astronauts. Lt. Gen. Nordhaus' engagement highlights the center's vital role in advancing space travel capabilities and emergency response strategies.



Chirag Parikh, at left, executive secretary of the National Space Council, and Johnathan Pellish, director of civil space policy for the National Space Council, attend discussions at the Spaceport Industry Summit on June 14, 2023, at NASA's Kennedy Space Center in Florida.



Federal Communications Commission (FCC) Chairwoman Jessica Rosenworcel stands with NASA's Artemis II crew in front of a model of the Orion Spacecraft. Rosenworcel and Julie Kearney, FCC appointed Chief of the Space Bureau (not pictured) visited Kennedy Space Center on August 8, 2023 to discuss policy matters.

In addition, Kennedy hosted Chairwoman Jessica Rosenworcel of the Federal Communications Commission (FCC) and Julie Kearney, the appointed Chief of the Space Bureau. They discussed providing support for the Crew-7 launch and deliberations on policy matters. This meeting demonstrated the collaborative nature of space missions, with regulatory bodies like the FCC playing an integral role in ensuring successful communications and coordination during missions.

The global aspect of space exploration and cooperation was further accentuated by visits from the Minister for Higher Education and Science of Denmark and Deputy Chief of Mission, Ambassador Stig P. Piras from the Embassy of Denmark in the United States. These connections promote knowledge sharing, collaborative projects, and the pooling of resources, enhancing the capabilities and reach of all parties.

Office of STEM Engagement

- In fiscal year 2023, Kennedy hosted more than 108 OSTEM interns on-site, hybrid, and virtually.
- NASA Days events reached 500-plus students at minority-serving institutions (MSIs) and resulted in 14 student internships. Participating institutions and events included: Bethune-Cookman University, University of Central Florida, National Historically Black Colleges and Universities (HBCUs) Week Conference, National Society of Black Engineers (NSBE) Annual Convention, NSBE Regional Conference Virtual Career Fair, The Astronauts Memorial Foundation Career and Networking Event, and Women of Color Virtual Career Fair.
- LUNABOTICS robotic mining competition engaged 601 students and faculty representing 49 teams from 26 states and Puerto Rico, with 24% of participating institutions being MSIs.
- LUNABOTICS JUNIOR piloted four robotics-themed workshops with 87 underserved middle schoolers. Students completed a three-part mission using block coding to traverse robots across giant maps of the Moon's south pole and push "blocks of ice" back to the Lunar outpost. This mission simulates future robotic Artemis missions like NASA's VIPER (Volatiles Investigating Polar Exploration Rover), which will explore the Moon in search of ice and other potential resources.
- NASA MINDS challenged 40 collegiate teams representing 14 states/territories to aid NASA in bridging technology gaps in support of future Artemis missions.
- Next Gen STEM reached over 1,000 students through 10 Virtual Classroom Connections hosted across the country. One hundred twenty-three students came to Kennedy for two special events where they interviewed NASA experts, toured the Space Center, and wrote an article about their experience for the agency's website.
- Students to Launch hosted 48 underserved students from Texas for the launch of Artemis I, and another 48 students from a reservation in Montana for the launch of Crew-5.
- Established Program to Stimulate Competitive Research (ESPCoR) awarded \$22.3 million in direct funding, including:
 - ★ 16 research awards totaling \$11.6M
 - ★ 28 Rapid Infrastructure Development awards totaling \$5.6M
 - ★ 40 Rapid Response Research awards totaling \$4M
 - ★ 5 International Space Station Flight Opportunity awards totaling \$500K
 - ★ ESPCoR Research Infrastructure Improvement totaling \$600K



From left, University of Wisconsin, Madison team members Paul Lema, Elias Fox Baker, and team advisor and American Indian Science and Engineering Society Tribal Elder Bret Bennally Thompson are all smiles on their way to launch in April 2023 during the 14th First Nations Launch High-Power Rocket Competition at the Richard Bong State Recreational Area in Wisconsin. Photo credit: Steve Janiak/Wisconsin Space Grant Consortium

WORKPLACE OVERVIEW

Kennedy Space Center is the nation's premier, multiuser spaceport. It is an integral part of the local economy, providing more than 13,000 jobs for civil servants, contractors, tenants, and construction crews. In Fiscal Year 2023, the total KSC population increased by close to 400 people.

The workforce includes people with diverse skills dedicated to supporting the nation's space program and NASA's exploration to destinations including the Moon, Mars, and beyond. To accomplish the agency's various missions, these individuals fulfill a multitude of tasks.

Each year, the center takes a snapshot of its workforce. This picture includes all federal and contractor employees chartered to work for Kennedy. Personnel serving other organizations, such as Cape Canaveral Space Force Station, support the spaceport's operations but are not reflected in these numbers.

The civil servant skill mix includes those in science, technology, engineering, and mathematics positions, as well as those in professional administrative and clerical positions. All employees work together to explore the universe for the benefit of all mankind.

See picture below. Please note that everything below "TOTAL KSC POPULATION" can be formatted as footnotes, as seen in last year's report on page 25: https://www.nasa.gov/wp-content/uploads/2015/03/ar_fy22_layout_508.pdf

Kennedy Space Center Workforce Profile	
Civil Servants	1,982
NASA Pathways Interns	63
Total Civil Servants	2,045
Civil Servants Skill Mix	
Scientific, Technology, Engineering and Mathematics	68%
Clerical and Professional Administrative	32%
On-site Contractor Employees	4,755
Off-site/Near-site Contractor Employees (Excludes construction workers)	92
Total Contractor Employees	4,847
Total Construction Workers	687
Total Tenants	5,674
TOTAL KSC POPULATION	13,253

Civil Servants as of September 23, 2023
Contractors, Construction Workers and Tenants as of June, 30 2023*
*For those Contractors, Construction Workers and Tenants that are reportable.

DIVERSITY AND EQUAL OPPORTUNITY

NASA is fully committed to Diversity, Equity, Inclusion, and Accessibility (DEIA) within our workforce and throughout our workplaces. We are dedicated as a federal agency to promoting an environment where employees receive fair and just treatment, fostering a respectful and inclusive culture for all, and ensuring employees can fully and independently access facilities, information and communication technology, programs, and services.

DID YOU KNOW?

NASA (KSC) Employees Believe*:

- Kennedy teams are committed to helping achieve their organizations' goals (97%)
- Kennedy employees feel they are treated as a valued member of the team (93%)
- Managers and supervisors are committed to a workplace representative of all segments of society (92%)
- Kennedy has an effective process for meeting accessibility needs (91%)
- Supervisors demonstrate a commitment to workforce diversity (90%)

*Source: 2023 Federal Employee Viewpoint Survey



Kennedy Space Center Employee Resource Groups (ERGs) with NASA Administrator Bill Nelson and Associate Administrator Bob Cabana. Photo Credit: NASA/Jessica Conner

NASA's prioritization of DEIA contributes to NASA's ranking as the "Best Place to Work in the Federal Government" among large federal agencies for 11 consecutive years. Based on data from the Federal Employee Viewpoint Survey (FEVS), Kennedy is ranked **FIRST** among the agency's centers.

AGE DEMOGRAPHICS at KSC

- Boomers** (born 1946 – 1964) 20%
- Gen X** (born 1965 – 1979) 38%
- Millennials** (born 1980 – 1996) 38%
- Gen Z** (born 1997 – 2012) 4%

- Average age: 46 years
- Most junior employee: 20 years
- Most senior employee: 77 years

Generational Measures at KSC

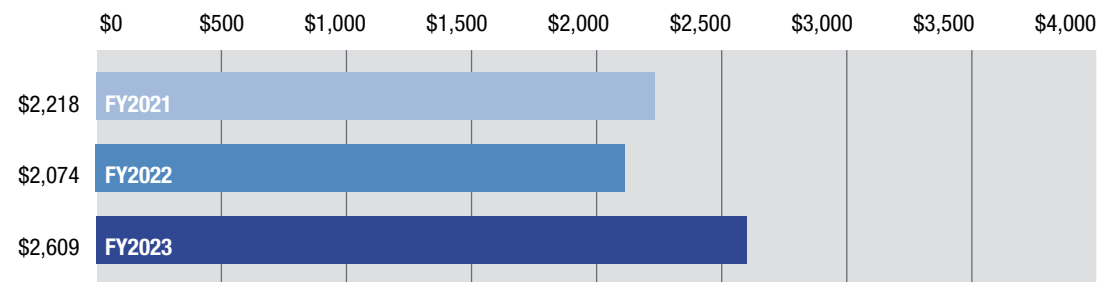


BUDGET AUTHORITY

Kennedy Space Center FY 2023 Budget Authority (\$ in Millions)

Commercial Crew Program	704
Exploration Ground Systems	820
Launch Services/Science	323
Mission Services and Capabilities (MSaC)	232
Engineering, Safety and Operations (ESO)	119
Space Station	33
Other	379
Total KSC	\$2,609

NASA/KSC Budget Authority Summary FY 2021 through FY 2023 (\$ in Millions)



FY 2023 KSC Budget by Element (\$ in Millions)



INDUSTRY PARTNERS AT A GLANCE

Space Exploration Technologies Corporation (SpaceX) participated in NASA's goal of developing and operating orbital commercial Crew Transportation Systems. Under the Commercial Crew Transportation Capability (CCTCap) contract for NASA's Launch America initiative, SpaceX continued providing safe, reliable, and cost-effective crew transportation to and from the International Space Station on American spacecraft launched from the United States. Under the NASA Launch Services II (NLS II) contract, SpaceX provides complete launch services to the Launch Services Program (LSP). In addition, SpaceX is the contractor for the Deep Space Logistics Gateway Logistics Services (GLS) contract. In this role they will provide delivery of cargo, experiments, and other supplies to the Gateway.

Bechtel National Inc. is the prime contractor for the design and construction services for Exploration Ground Systems' Mobile Launcher 2 (ML2). Bechtel is responsible for the design, construction, testing, and commissioning of the ML2. The ML2 is necessary to meet NASA's goal of returning men and landing the first female astronaut on the Moon.

Jacobs Technology Inc., prime contractor for the Test and Operations Support Contract (TOSC), was responsible for the overall management and implementation of ground systems capabilities, flight hardware processing, and launch operations at Kennedy. Specific services provided by Jacobs Technology under TOSC include launch vehicle, spacecraft, and payload integration and processing; operations and development of associated processes for ground systems to support integration, processing and launch; servicing and testing of flight hardware; and launch of development and operational flights at Kennedy.

Air Products and Chemicals, Inc. (APCI) provides bulk liquid helium (LHe) to Kennedy Space Center (KSC). The Government requires the delivery of bulk LHe and the lease of six helium pumps at KSC to support a range of activities at KSC and Cape Canaveral Space Force Station (CCSFS). LHe is converted to gaseous helium (GHe) through a pressurization process using an APCI proprietary LHe pump. The high pressure GHe is in turn pumped into the KSC GHe pipeline and is distributed and utilized by nearly every customer at KSC and CCSFS. GHe is used as an inert purge gas for hydrogen systems and as a pressurizing agent for ground and flight fluid systems. Helium is also used for spacecraft and launch vehicle processing, launch operations, and as a cryogenic cooling agent.

PAE-SGT Partners LLC (PSP) performed institutional support services at Kennedy and NASA facilities at its neighboring Cape Canaveral Air Force Station under the Base Operations, Spaceport Services (BOSS) Contract. PSP provided mission-focused institutional facilities, systems, equipment and utilities; work management and spaceport integration functions; mission support and launch readiness management; project management and design engineering services; construction support services; and institutional logistics.

AI Solutions, Inc. provides integrated support services primarily to the Launch Services Program for NASA and NASA sponsored payloads in the areas of launch vehicle system engineering and mission analysis; launch site support engineering; safety and mission assurance, technical integration services; institutional services at Vandenberg Space Force Base; information technology; and engineering, operations, and maintenance of communications and telemetry system.

Engineering Research and Consulting, Inc. (ERC) provides laboratory services in support of multiple customers and projects at the agency's Kennedy Space Center (KSC). Under the Laboratory Support Services and Operations (LASSO) II contract, support includes program management; laboratory maintenance and support; operational laboratory services; and professional and technical support for scientific research, engineering, test and evaluation in laboratory environments. ERC operates and maintains a diverse set of laboratories, developmental shops and test facilities that support programs and projects at the Florida spaceport, including Center Engineering, Safety, and Operations; Exploration Ground Systems; International Space Station; Launch Services Program; the Space Technology Mission Directorate; Science Mission Directorate; and the U.S. Space Force Space Launch Delta 45 at Cape Canaveral Space Force Station.

Your Procurement Dollars at Work

Geographical Distribution by State (Fiscal Year 2023 Obligations)

STATE	TOTAL DOLLARS
ALABAMA	2,684,921
ARIZONA	10,000
CALIFORNIA	80,780,880
COLORADO	5,000
DISTRICT OF COLUMBIA	49,582
FLORIDA	1,234,806,071
GEORGIA	1,013,788
MARYLAND	9,304,071
MISSISSIPPI	95,971
NEW HAMPSHIRE	7,500
NEW MEXICO	209,696
NORTH CAROLINA	514,844
OHIO	12,499
TEXAS	1,282,068
VIRGINIA	339,824,899
TOTAL STATE OBLIGATIONS	1,670,601,792

Top 25 KSC Business Contractors for FY 2023

Contractor	Dollars
SPACE EXPLORATION TECHNOLOGIES CORP.	860,583,692
BECHTEL NATIONAL, INC.	308,679,000
JACOBS TECHNOLOGY INC.	273,541,373
AIR PRODUCTS AND CHEMICALS, INC.	148,448,132
PAE-SGT PARTNERS LLC	97,027,309
AI SOLUTIONS, INC.	48,641,347
ENGINEERING RESEARCH AND CONSULTING, INC.	36,420,005
CHENEGA GLOBAL PROTECTION, LLC	30,269,436
AMENTUM SERVICES, INC.	27,786,166
J.P. DONOVAN CONSTRUCTION, INC.	25,005,833
ROCKET LAB USA, INC.	22,855,500
HSG, LLC	22,492,690
ALEUT BUILDING COMPANY, LLC	21,572,354
BLUE ORIGIN FLORIDA, LLC	19,777,787
ASTROTECH SPACE OPERATIONS LLC	15,991,037
THE BOEING COMPANY	15,924,000
FLORIDA POWER & LIGHT COMPANY INC.	15,426,070
A. WEST ENTERPRISES, LLC	13,948,360
AIR LIQUIDE LARGE INDUSTRIES U.S. LP	13,463,810
ASRC FEDERAL DATA SOLUTIONS, LLC	12,174,907
UNITED LAUNCH SERVICES, LLC	10,903,485
ARES TECHNICAL SERVICES CORPORATION	10,151,260
WRIGHT BROS., LLC	9,282,803
SES CIVIL AND ENVIRONMENTAL LLC	9,209,257
A-P-T RESEARCH, INC.	8,877,951
TOTAL	2,078,453,564



Two ospreys are perched in their nest atop a marshaling area sign in front of the Vehicle Assembly Building at NASA's Kennedy Space Center in Florida on June 7, 2023. Photo credit: NASA/Ben Smegelsky



National Aeronautics and Space Administration
John F. Kennedy Space Center
Kennedy Space Center, FL 32899
Public Affairs Directorate

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