

Kennedy Space Center's Annual Report FY2014

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01

Vision, Mission & Core Competencies

KSC Vision

KSC is the world's preeminent launch complex for government and commercial space access, enabling the world to explore and work in space.

KSC Mission

KSC safely manages, develops, integrates and sustains space systems through partnerships that enable innovative, diverse access to space and inspires the nation's future explorers.

KSC Core Competencies

- Acquisition and management of launch services and commercial crew development
- Launch vehicle and spacecraft processing, launching, landing and recovery, operations and sustaining
- Payload and flight science experiment processing, integration and testing
- Designing, developing, operating, and sustaining flight and ground systems, and supporting infrastructure
- Development, test and demonstration of advanced flight systems and transformational technologies to advance exploration and space systems



Robert D. Cabana
Center Director

The past fiscal year (FY) truly has been an amazing year at Kennedy Space Center. We are establishing Kennedy as the world's pre-eminent launch complex for both government and commercial launches to and from low-Earth orbit and beyond. FY 2014 was a year of tremendous growth and change as we transitioned from a historically government-only launch facility to an affordable and flexible multi-user spaceport with

operations supporting government and commercial customers.

We watched the historic rollout of the Orion spacecraft from the Neil Armstrong Operations and Checkout Building on its journey to Space Launch Complex 37 at Cape Canaveral Air Force Station. For the first time since the end of the Apollo Program some 30 years ago, we are taking giant steps to send astronauts beyond our home planet to destinations farther in space than any human spaceflight system has ever ventured.

Space exploration took a giant step forward shortly after the close of the FY when a United Launch Alliance Delta IV Heavy rocket launched Orion on its two-orbit, 4.5-hour flight test Dec. 5, 2014, at 7:05 a.m. EDT. The nearly flawless launch, splashdown and recovery of Orion during Exploration Flight Test-1 was a huge success for NASA, capturing the attention of the nation

and world, and reaffirming America's leadership in pioneering space.

Our Ground Systems Development and Operations Program and Center Operations workforce has done a remarkable job refurbishing and upgrading infrastructure and facilities to meet future demands. Also, our Center Planning and Development team has been instrumental in helping to redefine Kennedy as a multi-user spaceport with a new 20-year Master Plan.

The Launch Services Program continued its success, launching the Mars Atmosphere and Volatile EvolutionN, NASA's Tracking and Data Relay Satellite-L and Orbiting Carbon Observatory-2 missions. The International Space Station Ground Processing and Research Project Office processed hardware in support of various cargo resupply missions to the space station. We are conducting research and developing technology representative of our center's expertise to enable NASA's long-term goal of a mission to Mars.

NASA's Commercial Crew Program (CCP) made great strides in 2014, with the selection of commercial transportation partners, Boeing and SpaceX, to complete development of human space transportation systems capable of transporting our astronauts to the space station. Both partners are building the next generation of human-rated spacecraft, with flight tests planned in 2017. Operational missions won't be far behind. This is a unique partnership for the agency and one that has the potential to remake the way we think of spacecraft development. CCP's success is vital and they are showing they are well on the way to achieving it.

I invite you to read more about Kennedy's accomplishments and milestones in the pages of this annual report for FY 2014.

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Significant Events

1

Oct. 24, 2013: SpaceX Completes Review of Future Inflight Abort Test

Commercial Crew partner SpaceX laid out its plans to demonstrate the Crew Dragon spacecraft's ability to carry astronauts to safety in the event of an in-flight emergency. The test plan calls for a Crew Dragon spacecraft to use emergency thrusters to propel itself away from a Falcon 9 booster at the point of maximum dynamic pressure.

2

Oct. 28, 2013: NASA's Orion Spacecraft Comes to Life

Inside the Operations and Checkout Building (O&C) high bay, the Orion spacecraft was powered on for the first time, marking a major milestone in the final year of preparations for its first flight test.



3

Nov. 14, 2013: NASA Awards Ground Systems Development and Operations Support Contract

Millennium Engineering and Integration Company of Satellite Beach, Florida, was selected to provide support to the Ground Systems Development and Operations (GSDO) Program at Kennedy Space Center.

4

Nov. 14, 2013: Emergency Response Team Earns Award in SWAT Roundup International

Eight members of Kennedy's Emergency Response Team placed in the top five overall at the annual International SWAT Roundup in Orlando, Florida. The competition featured more than 50 teams from around the U.S. and other countries.



5

Nov. 15, 2013: Commercial Crew Partner SpaceX Achieves Safety Review Milestone

Engineers and safety specialists from NASA and SpaceX met in late October to review the safety of the Crew Dragon spacecraft and Falcon 9 rocket. The detailed overview of safety practices the company is implementing was a major milestone under its Commercial Crew Integrated Capability (CCiCap) Space Act Agreement with NASA.

6

Nov. 19, 2013: NASA Requests Proposals to Finalize Commercial Crew Development and Certification

NASA's Commercial Crew Program requested proposals from U.S. companies to complete final development of crew transportation systems that will meet agency certification requirements before conducting crew flights to the International Space Station. The certification phase, known as Commercial Crew Transportation Capability (CCtCap), will assess progress throughout the production and testing of one or more integrated space transportation systems, which include rockets, spacecraft, and ground and on-orbit operations.



7

Nov. 18, 2013: MAVEN Spacecraft Launches to Mars

The Mars Atmosphere and Volatile EvolutionN (MAVEN) spacecraft launched aboard a United Launch Alliance Atlas V rocket from Space Launch Complex 41 at Cape Canaveral Air Force Station (CCAFS) in Florida at 1:28 p.m. EST.



8	Dec. 3, 2013: Blue Origin Test-Fires New Rocket Engine Commercial Crew partner Blue Origin of Kent, Washington, announced it tested a new, hydrogen- and oxygen-powered engine designed to lift the company's Space Vehicle on future crew missions out of Earth's atmosphere.	
9	Dec. 3, 2013: Orion Heat Shield Arrives at Kennedy The heat shield that will protect NASA's Orion spacecraft during its first flight test arrived at Kennedy's Shuttle Landing Facility aboard the agency's Super Guppy aircraft. The heat shield, constructed by Textron Defense Systems in Wilmington, Massachusetts, was shipped from Manchester, New Hampshire.	
10	Dec. 13, 2013: Negotiations Begin for Use of Historic Launch Complex 39A NASA selected SpaceX of Hawthorne, California, to begin negotiations on a lease to use and operate Kennedy's historic Launch Complex 39A.	
11	Dec. 19, 2013: Launch Services Contract Awarded for InSight Mission NASA selected United Launch Services LLC of Centennial, Colorado, to launch the Interior Exploration Using Seismic Investigations, Geodesy and Heat Transport (InSight) mission to Mars.	
12	Jan. 17, 2014: SpaceX Announces Successful Test of Parachute System Commercial Crew partner SpaceX demonstrated how the Crew Dragon spacecraft's parachute system would function in the event of an emergency on the launch pad or during ascent.	
13	Jan. 23, 2014: TDRS-L Launches NASA's Tracking and Data Relay Satellite-L (TDRS-L) launched aboard a United Launch Alliance Atlas V rocket at 9:33 p.m. EST from Space Launch Complex 41 at CCAFS.	
14	Jan. 23, 2014: Sierra Nevada Corporation Announces Dream Chaser Expansion Sierra Nevada Corporation of Sparks, Nevada, announced expansion plans for its Dream Chaser Space System program. The company will prepare for a November 2016 orbital flight from Florida's Space Coast.	
15	Jan. 28, 2014: Roller Bearings Tested on Crawler-Transporter 2 The GSDO Program completed a five-day test of the new traction roller bearings on two of the truck sections on crawler-transporter 2. The crawler is being upgraded to support the mobile launcher with the SLS and Orion atop on its way to the launch pad.	
16	Jan. 31, 2014: NASA Day of Remembrance Kennedy Space Center paid tribute to the crews of Apollo 1 and space shuttles Challenger and Columbia, as well as other NASA colleagues, at the Space Mirror Memorial at the Kennedy Space Center Visitor Complex during the agency's Day of Remembrance.	
17	Feb. 28, 2014: Boeing, Sierra Nevada Corporation Complete Milestones Boeing completed milestones in emergency detection system development for its CST-100 system. Sierra Nevada Corporation completed an incremental critical design review for the Dream Chaser spacecraft.	

18	March 5, 2014: NASA Awards Contract to Modify Vehicle Assembly Building High Bay 3 NASA selected Hensel Phelps Construction Co. of Orlando, Florida, to modify High Bay 3 of Kennedy's Vehicle Assembly Building (VAB) for processing of the agency's Space Launch System rocket.	
19	March 13, 2014: Astronaut Candidates Visit Kennedy Space Center Eight NASA astronaut candidates visited Kennedy, learned about the upgrades in progress at the center and toured various facilities, including the VAB and the O&C.	
20	March 18, 2014: NASA Awards Launch Services Contract for Solar Orbiter Mission NASA's Launch Services Program selected United Launch Services LLC to launch the Solar Orbiter Collaboration mission to study the sun in July 2017.	
21	March 26, 2014: NASA Marks Major Milestone for Spaceport of the Future NASA achieved a major milestone in its effort to transform Kennedy into a multi-user spaceport by successfully completing the initial design and technology development phase for the GSDO Program.	
22	March 28, 2014: NASA Awards Launch Services Contract for CYGNSS Mission NASA's Launch Services Program selected Orbital Sciences Corp. of Dulles, Virginia, to launch the Cyclone Global Navigation Satellite System (CYGNSS) mission.	
23	March 31, 2014: Blue Origin, Boeing and SpaceX Report Milestone Achievements Blue Origin completed a review of the design, manufacture and assembly of its subscale propulsion tank. Boeing wrapped up a critical design review of the primary structures for its CST-100 spacecraft. SpaceX completed an early design review for the ground systems related to its Crew Dragon system.	
24	April 11, 2014: Orion Completes First Integrated System Testing The Orion spacecraft powered through its first integrated system testing to determine its readiness for the first flight test in December.	
25	April 15, 2014: Agreement with SpaceX Signed for Use of Launch Complex 39A NASA Kennedy Space Center signed an agreement with SpaceX for use of the historic Launch Complex 39A as a commercial launch site.	
26	April 18, 2014: SpaceX Mission Launches to Space Station SpaceX launched its Dragon spacecraft on its third cargo mission to the International Space Station under NASA's Commercial Resupply Services contract from Space Launch Complex 40 at CCAFS at 3:25 p.m. EDT.	
27	April 21, 2014: NASA Selects Kathy Lueders to Manage Commercial Crew Kathy Lueders was selected to lead NASA's Commercial Crew Program through final development and certification efforts. She previously served as the International Space Station Program's transportation integration manager, where she managed commercial cargo resupply services to the station.	

28	May 3, 2014: Astronaut Hall of Fame Induction Two former astronauts and veteran space explorers, Shannon Lucid and Jerry Ross, were inducted into the U.S. Astronaut Hall of Fame during a ceremony inside the Space Shuttle Atlantis exhibit at the Kennedy Space Center Visitor Complex.	
29	May 19, 2014: Kennedy Hosts NASA Moves! Fitness Challenge Kickoff Kennedy Space Center, in conjunction with the Florida Department of Health, kicked off National Employee Health and Fitness Month with the NASA Moves! Challenge at the center's Pathfinder Fitness Trail in the Launch Complex 39 area.	
30	May 19, 2014: Wind Tunnel Tests, Software Reviews Show Commercial Crew Progress Boeing completed its most in-depth evaluation yet of the software planned to operate the CST-100 spacecraft. Sierra Nevada Corporation put models of its Dream Chaser spacecraft through rigorous wind tunnel tests at facilities across America. SpaceX conducted an integrated critical design review to demonstrate major hardware and software elements of the company's Crew Dragon spacecraft and Falcon 9 rocket.	
31	May 19-23, 2014: NASA Robotic Mining Competition NASA Robotic Mining Competition was held at the Kennedy Space Center Visitor Complex and featured teams of undergraduate and graduate students from around the country demonstrating the mining capabilities of their excavator robots.	
32	May 29, 2014: SpaceX Unveils Crew Dragon The company raised the curtain on the version of its Crew Dragon spacecraft being designed to take people into space. The vehicle has been under development in partnership with NASA's Commercial Crew Program since April 2011.	
33	May 30, 2014: First Commercial Crew Certification Phase Complete NASA's Commercial Crew Program and its aerospace industry partners completed the first phase of certification agreements. Under the contracts, Boeing, Sierra Nevada Corporation and SpaceX completed reviews detailing how each plans to meet NASA's certification requirements to transport space station crew members to and from the orbiting laboratory.	
34	June 5, 2014: Heat Shield Installed on Orion Crew Module Inside the O&C high bay, NASA and Lockheed Martin engineers installed the largest heat shield ever constructed on the crew module of the agency's Orion spacecraft.	
35	June 10, 2014: Orion Crew Module Stacked Atop Service Module Engineers completed stacking the Orion crew module on top of the completed service module in the Final Assembly and System Testing Cell inside the O&C Building in preparation for its first flight test.	
36	June 16, 2014: Liquid Nitrogen and Oxygen Contract Awarded NASA awarded a contract to PRAXAIR Inc. of Danbury, Connecticut, to supply liquid nitrogen and liquid oxygen to NASA's Ames Research Center in California, and Kennedy Space Center and Cape Canaveral Air Force Station in Florida.	
37	June 30, 2014: Launch Complex 39B Refurbishment Contract Awarded NASA awarded a contract to Precision Mechanical Inc. of Cocoa, Florida, to refurbish the Environmental Control System at Kennedy's Launch Complex 39B.	

38	June 30, 2014: NASA and Partners Report Progress in Testing, Analysis Blue Origin made steady progress toward an interim design review of its spacecraft's subsystems. Boeing prepared for a critical design review of the CST-100 integrated design, systems, software and operations plans. Sierra Nevada Corporation tested the main propulsion and reaction control systems of its Dream Chaser spacecraft. SpaceX worked toward structural integrity tests of its Dragon spacecraft.	
39	July 2, 2014: Orbiting Carbon Observatory-2 Launches NASA successfully launched the Orbiting Carbon Observatory-2 aboard a United Launch Alliance Delta II rocket at 5:56 a.m. EDT from Space Launch Complex 2 at Vandenberg Air Force Base in California.	
40	July 21, 2014: Kennedy Facility Renamed in Honor of Neil Armstrong The iconic Operations and Checkout Building was renamed the Neil Armstrong Operations and Checkout Building during a ceremony in the high bay of the facility. Among the guests were Apollo 11 crew members Buzz Aldrin and Michael Collins.	
41	July 22, 2014: Sierra Nevada Corporation Completes Risk-Reduction Testing The Sierra Nevada Corporation team evaluated crew ingress and egress using a full-scale mock-up of the Dream Chaser pressurized cabin, as well as the visibility from inside the cockpit, controls and displays, and seat loading. The company also reviewed tests conducted on the thermal protection system, as well as the composite structure and life support system.	
42	July 27, 2014: Construction Contract Awarded for New Headquarters Building NASA awarded a two-year contract to Hensel Phelps Construction Co. of Orlando to build a new multi-story headquarters building at Kennedy.	
43	Aug. 6, 2014: Team Practices Orion Recovery Test Procedures A team of technicians, engineers, sailors and divers wrapped up a week of testing and preparing for various scenarios for recovery of the Orion spacecraft from the Pacific Ocean after splashdown following its first flight test.	
45	Aug. 21, 2014: NASA and Boeing Complete Critical Space System Reviews Development of the Boeing CST-100 continued with two milestone reviews conducted. The spacecraft phase two safety review demonstrated the CST-100 design follows the NASA safety analysis process, including documenting spacecraft hazard reports. The integrated critical design review demonstrated the design maturity of the integrated spacecraft, launch vehicle and ground systems are at their appropriate points.	
46	Sept. 11, 2014: Orion Spacecraft Moved to Payload Hazardous Servicing Facility NASA's Orion crew module atop its service module moved from the O&C Building to the Payload Hazardous Servicing Facility where it was fueled prior to its first flight test.	
47	Sept. 16, 2014: NASA Chooses American Companies to Carry Astronauts to Station NASA unveiled its selection of Boeing and SpaceX to transport crews to and from the International Space Station using their CST-100 and Crew Dragon spacecraft, respectively, with a goal of ending the nation's sole reliance on Russia in 2017.	

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Sept. 21, 2014: Fourth SpaceX Mission to the Space Station

SpaceX launches its fourth Commercial Resupply Services mission to the space station from Space Launch Complex 40 at CCAFS at 1:52 a.m. EDT.



49

Sept. 28, 2014 : Orion Moves to Launch Abort System Facility

The Orion spacecraft was moved to the Launch Abort System Facility for installation of the launch abort system and protective ogive panels in preparation for its first flight test.

50

Sept. 29, 2014: Delta IV Heavy Rocket Rolls to Pad for Orion Flight Test

The United Launch Alliance Delta IV Heavy rocket rolled from the Horizontal Integration Facility to the launch pad at Space Launch Complex 37 at CCAFS. The Orion spacecraft launched atop the rocket Dec. 5 at 7:05 a.m. EST. Orion was successfully retrieved from the Pacific Ocean after splashdown about 4.5 hours later.



A Delta IV Heavy rocket lifts off from Space Launch Complex 37 at Cape Canaveral Air Force Station in Florida carrying NASA's Orion spacecraft on an unpiloted flight test to Earth orbit. Liftoff was at 7:05 a.m. EST. During the two-orbit, four-and-a-half hour mission, engineers will evaluate the systems critical to crew safety, the launch abort system, the heat shield and the parachute system.

04

Center Planning & Development

NASA Kennedy Space Center's transformation from a government launch site to a multi-user spaceport continued to accelerate in 2014, and several milestones were crossed during the year that continue to point toward a successful transition. The Center Planning and Development directorate released a 20-year Master Plan for the space center that illustrates the center's look and operation as a spaceport offering multiple facilities for vertical and horizontal launch and recovery, including processing bays and laboratories.

Along with meeting the needs of NASA's future space exploration goals, including making the journey to Mars and continuing to operate the International Space Station, the Master Plan envisions a vibrant spaceport hosting different launch vehicles from an assortment of companies. Kennedy is the only place in the country that can offer facilities suited to the launch of everything from CubeSats on conventional rockets or high-speed aircraft, to medium-sized satellites, to Earth-orbiting spacecraft for astronauts, to the super-heavy Space Launch System (SLS) in development to send astronauts inside Orion spacecraft to deep space.

Concrete steps were taken toward that goal when SpaceX partnered with NASA at Launch Complex 39A for its needs, including the processing and launch of the Falcon 9 Crew Dragon spacecraft with people onboard and the Falcon 9 Heavy.

Launch Pad 39B continued its refurbishment through 2014 and remains on track to host the first SLS launch in 2018 when Exploration Mission-1 lifts off to send an uncrewed Orion on a shakedown mission around the moon.

Boeing and SpaceX are firming up their processing plans for their respective spacecraft using facilities at Kennedy. Boeing plans to assemble its CST-100 spacecraft and process it for launch inside the former Orbiter Processing Facility 3 near the Vehicle Assembly Building. The CST-100 spacecraft will be carried to Space Launch Complex 41 at adjacent Cape Canaveral Air Force Station to be mounted atop a United Launch Alliance Atlas V rocket for launch. SpaceX will operate a processing hangar at LC-39A for its Crew Dragon and Falcon 9 rocket launch processing.

The partnerships are the latest for a strategy that calls for increasingly close ties with aerospace companies, other government

Kennedy Space Center Director Bob Cabana announces that NASA signed a lease agreement with SpaceX of Hawthorne, California, for use and operation of Launch Complex 39A. NASA Administrator Charlie Bolden, left, and Gwynne Shotwell, president and chief operating officer of SpaceX, look on. SpaceX will use Launch Complex 39A for rockets such as the Falcon Heavy, currently under development.



agencies and companies in other industries that could use Kennedy's unique capabilities. Lockheed Martin used the high bay at the Neil Armstrong Operations & Checkout Building for Orion processing under a partnership that has shown a path for success. While high-level partnerships have taken shape and continue to develop, the center continues pursuing partnerships on many levels. The directorate conducted an Innovation Expo to engage potential future partners to take

advantage of facilities at Kennedy.

The Shuttle Landing Facility (SLF) continues as a focus for partnership potential and is finding a niche role as a technology testbed to perfect terrestrial technology, from hosting the world's fastest car to helping companies refine machinery, offering a glimpse of future exploration in the form of landers using experimental devices and flying over the SLF's expanse. 🚀



05

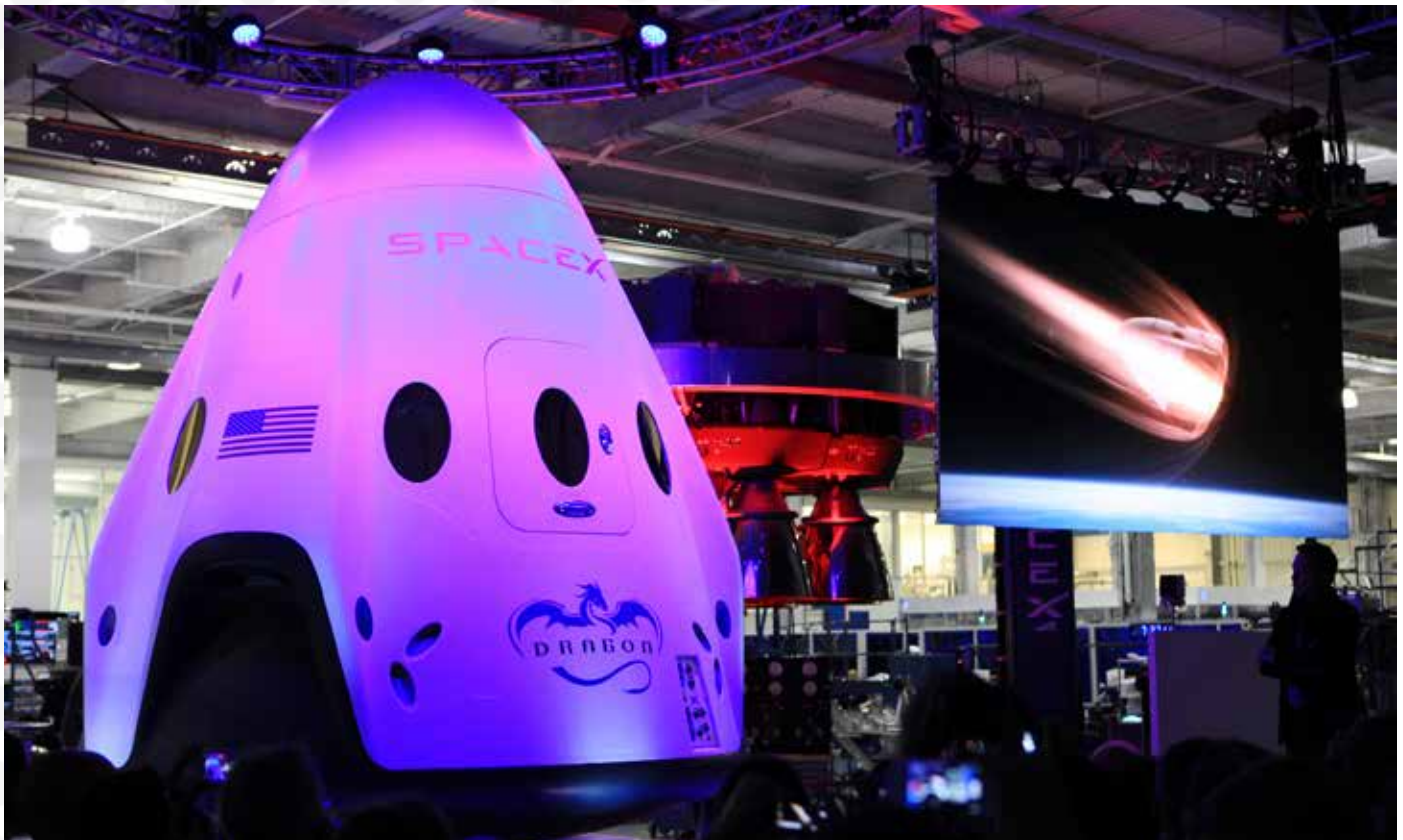
Commercial Crew Program

NASA's Commercial Crew Program continued to work with its industry partners throughout 2014 as they developed new American transportation capabilities. The year marked significant progress toward several of the program's cornerstone goals, including the completion of numerous development milestones with four companies, working through initial certification plans with three and awarding contracts to two for completing development and certification work along with executing missions.

Along with those advancements, a new program manager took the helm and began incorporating a reorganization

strategy to transition from performing insight using partner unique integration teams supporting several Space Act Agreements to performing insight and oversight using Systems Office integration teams for certification and accomplishing missions to transport astronauts to and from the International Space Station under contracts.

The year most likely will be remembered for Sept. 16, when NASA announced the new spacecraft that will carry our crews to the station: Boeing's CST-100 and SpaceX's Crew Dragon. The Commercial Crew Transportation Capability, or CCtCap, contracts call for the companies to demonstrate their systems'



Animation showing the crew Dragon spacecraft re-entering Earth's atmosphere plays during a May 29, 2014, unveiling ceremony inside SpaceX headquarters in Hawthorne, California. The spacecraft is designed to carry people into Earth's orbit and was developed in partnership with NASA's Commercial Crew Program.

An Erickson Air-Crane helicopter lifts Sierra Nevada Corporation's Dream Chaser flight vehicle during a captive-carry flight test. The test was a rehearsal for free flights at Edwards Air Force Base. The spacecraft is under development in partnership with NASA's Commercial Crew Program. Although the spacecraft is designed for crew members, the vehicle will not have anyone on board during the free flights.





capabilities by flying them on a crew flight test to the station before undertaking operational missions.

The Commercial Crew Program has learned from the many successes of NASA's commercial cargo transportation development program and commercial resupply missions launched to the space station. Kathy Lueders, one of the architects of those efforts, became the program manager in April 2014. She will lead the program during the critical phase when the systems are expected to make the

Bob Cabana, center, director of NASA's Kennedy Space Center in Florida, speaks at the start of the announcement ceremony to name the providers of the next generation of piloted American spacecraft. From left, NASA spokeswoman Stephanie Schierholz; Charles Bolden, NASA administrator; Kathy Lueders, manager of the agency's Commercial Crew Program; and former International Space Station Commander Mike Fincke also took part in the announcement.

U.S. Sen. Bill Nelson of Florida, left, and Chris Ferguson, Boeing's director of Crew and Mission Operations, survey a mock-up of the CST-100 spacecraft under development by Boeing during a June 9, 2014, ceremony detailing the company's plans to use Orbiter Processing Facility-3 as a manufacturing hub for the capsule-shaped spacecraft.





Blue Origin test fires a powerful new hydrogen- and oxygen-fueled American rocket engine at the company's West Texas facility. During the test, the BE-3 engine fired at full power for more than two minutes to simulate a launch, then paused for about four minutes, mimicking a coast through space before it re-ignited for a brief final burn. The last phase of the test covered the work the engine could perform in landing the booster back softly on Earth.

transition from design reviews and system testing to flight tests that will mirror operational conditions and ultimately missions with crews on board.

Success is vital for the orbiting laboratory because adding new American vehicles to transport station crews will allow the contingent of station residents to grow by one and double the research production time of the facility.

While Commercial Crew moved into the new contract phase, it maintained a steady pace of accomplishments along with its partners as they fulfilled milestones from ongoing development phases.

Blue Origin completed three primary objectives in 2014, including tests of the new BE-3 engine meant to power a reusable booster the company is developing.

Boeing completed 10 milestones that saw extensive spacecraft subsystem, system and integrated vehicle design work, along with component and wind-tunnel testing.

Sierra Nevada Corporation completed seven milestones, including the first free-flight of the Dream Chaser spacecraft. The company also accomplished main propulsion system and reaction control system risk-reduction work and several in-depth reviews.

SpaceX completed seven milestones in fiscal year 2014. An upgraded Falcon 9 v1.1 rocket was evaluated during a review, a series of critical design reviews was held, and the Dragon's parachute system underwent two drop tests, one from a crane and one from a helicopter, to simulate flight conditions.

Taken together, the accomplishments show progress for NASA as it pushes toward the return of human launch capabilities to U.S. shores using American spacecraft built with private industry's innovations and NASA's hard-earned know-how. ✨

06

Launch Services Program

During Fiscal Year 2014, NASA's Launch Services Program (LSP) at the Kennedy Space Center supported three missions that are a part of the agency's programs of exploration and efforts to make life better on Earth. The LSP team also aided in NASA's Orion Flight Test, the first step on the path to sending humans to Mars.

On Nov. 18, 2013, a United Launch Alliance (ULA) Atlas V rocket carrying NASA's Mars Atmosphere and Volatile Evolution (MAVEN) spacecraft lifted off from Cape Canaveral Air Force Station in Florida. The Lockheed Martin-built MAVEN now is studying the Red Planet's upper atmosphere in unprecedented detail. This robotic scientific explorer is helping pave the way for future human flights.

The agency's Tracking and Data Relay Satellite (TDRS-L) was launched from the Cape on Jan. 18, 2014. The Boeing-built spacecraft now provides tracking, telemetry, command and high-bandwidth data return services for numerous science and human exploration missions orbiting Earth. These include NASA's Hubble Space Telescope and the International Space Station.

A ULA Delta II rocket was launched from Vandenberg Air Force Base in California on July 2, 2014, carrying NASA's Orbiting Carbon Observatory-2 (OCO-2) to orbit. This is the agency's first mission dedicated to studying atmospheric carbon dioxide, the leading greenhouse gas driving changes in Earth's climate. Built by the Orbital Sciences Corp., OCO-2 will provide a new tool for studying the human and natural sources of carbon dioxide emissions.

CubeSats

In recent years NASA has launched small payloads called "CubeSats" to support external partnerships and education

focusing on STEM – science, technology, engineering and math. The CubeSat Launch Initiative supports projects designed, built and operated by students, teachers and faculty to obtain hands-on flight hardware development experience and a low-cost pathway to conduct research.

As part of the SpaceX CRS-3 mission delivering cargo to the International Space Station on April 18, 2014, NASA launched five CubeSats for three universities and the agency's



Crews guide NASA's MAVEN spacecraft, inside a payload fairing, into place atop a United Launch Alliance Atlas V rocket at the Vertical Integration Facility at Space Launch Complex 41. The Atlas V will lift MAVEN into space and on to Mars. MAVEN is short for Mars Atmosphere and Volatile Evolution.

Inside the Astrotech payload processing facility in Titusville, Florida, United Launch Alliance engineers and technicians ensure precision as the Tracking and Data Relay Satellite spacecraft is being encapsulated in its payload fairing for transport to Launch Complex 41 at Cape Canaveral Air Force Station.



Ames Research Center at Moffett Field, California. Over 120 students have been involved in the design, development and construction of the CubeSats that were flown as auxiliary payloads.

Orion Flight Test

During the year, engineers played an advisory role in preparations for the first flight test of NASA's new Orion spacecraft. The three primary core elements of the ULA Delta IV Heavy rocket were integrated, transported to Cape Canaveral Space Launch Complex 37 and mounted on the pad, forming the vehicle used to orbit the Lockheed Martin-built Orion to evaluate performance of the spacecraft's systems.

On Dec. 5, 2014, the Delta IV Heavy launched the Orion and sent it 3,600 miles in altitude beyond the Earth's surface. During the two-orbit, four-hour mission, engineers were able to evaluate the systems critical to crew safety, the launch abort system, the heat shield and the parachute system.

The capsule re-entered Earth's atmosphere at speeds approaching 20,000 mph, generating temperatures as high as 4,000 degrees Fahrenheit before splashing down in the Pacific Ocean. The data gathered during the mission will influence design decisions and validate existing computer models.

Future Missions

Altogether, LSP had about 44 missions in flow in either advanced planning, awarded contracts or advisory status being prepared for future flights. Mission work often begins anywhere from three to five years before launch.

Inside the Astrotech payload processing facility at Vandenberg, engineers and technicians prepared the Soil Moisture Active Passive spacecraft. SMAP launched on a

NASA's Orbiting Carbon Observatory-2 is ready for launch aboard a United Launch Alliance Delta II rocket following rollback of the mobile service tower at Space Launch Complex 2 on Vandenberg Air Force Base in California.





In the Astrotech payload processing facility on Vandenberg Air Force Base in California, Orbital Sciences workers and technicians secure NASA's Orbiting Carbon Observatory-2 (OCO-2) onto a test fixture. Testing and launch preparations now will get underway for its launch from Space Launch Complex 2 aboard a United Launch Alliance Delta II rocket, scheduled for July 1, 2014.

a laboratory to study the microphysics of three fundamental plasma processes: magnetic reconnection, energetic particle acceleration and turbulence. A magnetosphere is the area of space near an astronomical body in which charged particles are controlled by that object's magnetic field.

Scheduled to launch atop a SpaceX Falcon 9 rocket is Jason-3. It is the company's fourth in a series of U.S.-

Delta II on Jan. 31, 2015. Now on station in Earth orbit, SMAP will provide global measurements of soil moisture and its freeze and thaw state.

Operations also were ongoing to prepare a quartet of Magnetospheric Multiscale spacecraft. The MMS is part of a solar terrestrial mission comprising four identically instrumented satellites that will use Earth's magnetosphere as

European satellites that are part of missions to measure the height of the oceans' surface.

Looking ahead, LSP is working closely with SpaceX to certify the Falcon 9 version 1.1 launch vehicle. This edition of the rocket has extended propellant tanks, carries more propellant and has a significant increase in thrust compared to the initial version of the Falcon 9. The agency's certification



Workers inspect NASA's Soil Moisture Active Passive (SMAP) spacecraft Oct. 15, 2014, after its protective covering is removed in the Astrotech payload processing facility on Vandenberg Air Force Base in California during a post-shipment inspection.



Inside the Horizontal Integration Facility at Space Launch Complex 37 at Cape Canaveral Air Force Station in Florida, United Launch Alliance technicians prepare the second stage of a Delta IV Heavy rocket for mating to the central core booster of the three booster stages for the unpiloted Exploration Flight Test-1.

policy balances the demonstrated flight history with NASA technical evaluation to mitigate the initial risk of early failures of new vehicles.

For Falcon 9, NASA reviewed five sets of flight data in extensive detail, conducted a Design Certification Review to assess the qualification rationale for vehicle hardware, and conducted a number of audits of SpaceX's processes. Once the Falcon 9 version 1.1 is certified, it will be cleared to launch NASA payloads with a medium level of launch risk.

The Launch Services Program ensures the nation has dependable access to space for launching probes to low-Earth orbit and beyond. LSP also is part of NASA's exceptional team of experts with decades of experience in innovative technology and compelling scientific research. ✨



Nano CubeSats are deployed Feb. 11, 2014.

*A United Launch Alliance Atlas V rocket with
NASA's Tracking and Data Relay Satellite arrives
at Launch Complex 41 on Jan. 22, 2014, at Cape
Canaveral Air Force Station in Florida.*





07

Ground Systems Development & Operations Program

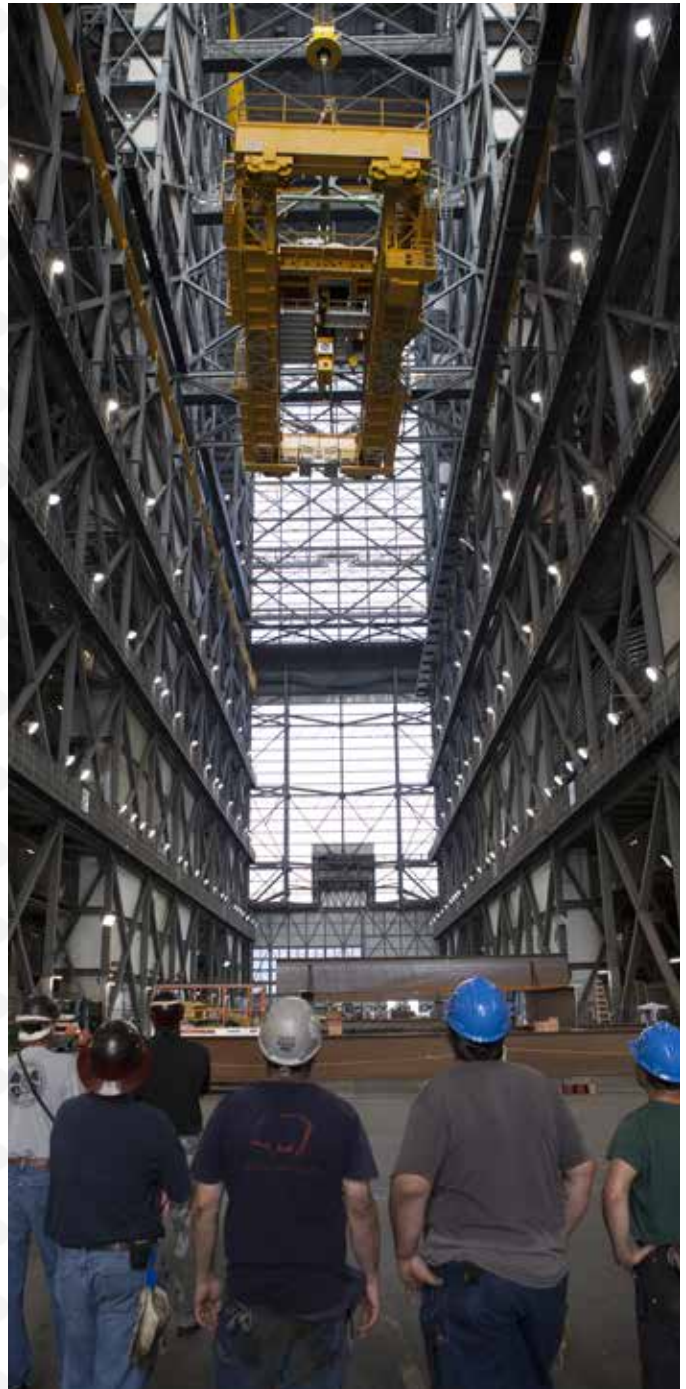
NASA's Ground Systems Development and Operations (GSDO) Program at Kennedy Space Center continued to make progress preparing the center to launch NASA's Space Launch System (SLS) rocket and Orion spacecraft that will take humans beyond Earth orbit and on to deep space.

Upgrading facilities, developing ground systems, creating new operations processes and transforming Kennedy into a multi-user spaceport to support NASA's exploration missions and other launch vehicles were some of the major tasks accomplished by GSDO during the year.

Perhaps two of the most significant accomplishments were the GSDO preliminary design review (PDR) in March 2014, and the Key Decision Point C (KDP)-C in September 2014. The PDR milestone provided an assessment of the preliminary designs and allowed development of the ground systems to proceed to detailed design for infrastructure at Kennedy. The thorough review validated the baseline architecture is sound and aligns with NASA's exploration objectives. The KDP-C was a rigorous review process of the transformation of Kennedy from a traditionally government-only launch complex to the world's premier multi-user spaceport. Marking the completion of the milestone, NASA officials approved the program's progression from formulation to development.

A contract was awarded to Hensel Phelps Construction Co. of Orlando, Florida, to modify High Bay 3 in the Vehicle Assembly Building (VAB). Structural component systems were removed and modified for reuse. New vehicle access platforms are being constructed, and new structural, mechanical and electrical systems and equipment are being installed. The high bay will be used to process the agency's SLS rocket.

Inside the Vehicle Assembly Building at NASA's Kennedy Space Center in Florida, construction workers watch as the 175-ton crane is lowered by crane from Level 16 down to the transfer aisle floor Sept. 18, 2014. Upgrades to the crane's 45-year-old controls are being performed in order to improve reliability, precision and safety.





Crawler-transporter 2 (CT-2) slowly enters the Vehicle Assembly Building on Jan. 31, 2014, at NASA's Kennedy Space Center in Florida. The Ground Systems Development and Operations Program completed a roller bearing assembly test on CT-2 truck sections A and C. The left- and right-hand steering was tested in both directions. The modifications are designed to ensure CT-2's ability to transport to the launch pad vehicles currently in development, such as the agency's Space Launch System.

The vehicle that will carry the SLS and Orion spacecraft, along with the mobile launcher to Launch Pad 39B, received several upgrades and modifications during the year. Inside the VAB, crawler-transporter 2 (CT-2) received a total of 88 new roller bearings on all four truck sections of the vehicle. New jacking, equalizing and leveling (JEL) hydraulic cylinders will replace the Apollo-era cylinders to help increase the crawler's load-carrying capacity from 12 million to 18 million pounds.

CT-1 also received new JEL hydraulic cylinders to test before installing them on CT-2. The vehicle underwent a leveling and turning test as it slowly moved along the crawlerway to Launch Pad 39A in December 2013. CT-2 underwent testing of its new roller bearings and steering as it moved out of the VAB and traveled along a portion of the crawlerway in January 2014.

Significant changes occurred at Launch Pad 39B. The Apollo-era flame trench bricks and flame deflector that served to protect the pad and space shuttles during 30 years of launches were removed. To support the SLS and possibly a

variety of other launch vehicles, construction of a new flame trench with heat-resistant bricks and a newly-designed flame deflector will begin in 2015.

A contract was awarded to Precision Mechanical Inc. of Cocoa, Florida, to refurbish the Environmental Control System beneath pad B. The completed system will provide conditioned clean purge air to various compartments of the SLS vehicle.

All of the old crawler track panels on the pad B surface were removed to allow construction workers to repair the concrete surface and catacomb roof below. New crawler track panels were installed.

The crawlerway leading to pad B was upgraded to improve the foundation and prepare it to support the weight of the SLS and mobile launcher on the crawler during rollout. Workers removed the original Alabama river rock and restored the layer of lime rock below its original depth of 3 feet. New river rock was added on top.

The mobile launcher is being bulked up in preparation

for the forces at liftoff of the new heavy-lift launch vehicle. Rising 355 feet from its base, the steel structure is undergoing modifications to strengthen it. The exhaust opening on the base was expanded to accommodate the configuration of the SLS, and massive support beams were rearranged within the launcher's platform to provide additional support.

Inside the Launch Control Center, Firing Room 4 underwent a metamorphosis. The room used to launch space shuttles was renovated into four separate firing rooms to serve NASA and potential commercial or private users' needs. A modern launch processing system to support SLS and Orion integrated test and checkout is being implemented in Firing Room 1.

The Multi-Payload Processing Facility underwent extensive upgrades and modernizations to support processing of the Orion spacecraft. Once used to process various payloads and spacecraft for the Space Shuttle Program, it now will be used for hypergolic fueling, ammonia servicing and high-pressure gas servicing and checkout of Orion before the spacecraft is

transported to the VAB for integration with the SLS.

GSDO led the effort to select an emergency egress vehicle that future astronauts could use to leave pad B quickly in case of an emergency. Kennedy received four refurbished Mine-Resistant Ambush-Protected (MRAP) vehicles from the U.S. Army Red River Depot in Texarkana, Texas. The MRAPs are undergoing modifications to meet NASA's emergency egress requirements.

Orion Exploration Flight Test-1 Recovery

GSDO coordinated efforts with the U.S. Navy and Lockheed Martin to capture and recover the Orion spacecraft after splashdown in the Pacific Ocean during Exploration Flight Test-1 (EFT-1) on Dec. 5, 2014.

To prepare for recovery, GSDO rehearsed procedures during a pre-transportation simulation in May 2014 at Naval Base San Diego in California. Using the Orion boilerplate test vehicle, the team practiced fit-check testing of support equipment and lifted Orion by crane and placed it in the crew



By Aug. 6, 2014, the outer walls, inner walls, windows and doors for four separate firing rooms were completed in Firing Room 4 in the Launch Control Center at NASA's Kennedy Space Center in Florida. Three rows of upper level management consoles remain and could be used as a fifth firing room.

module transportation fixture.

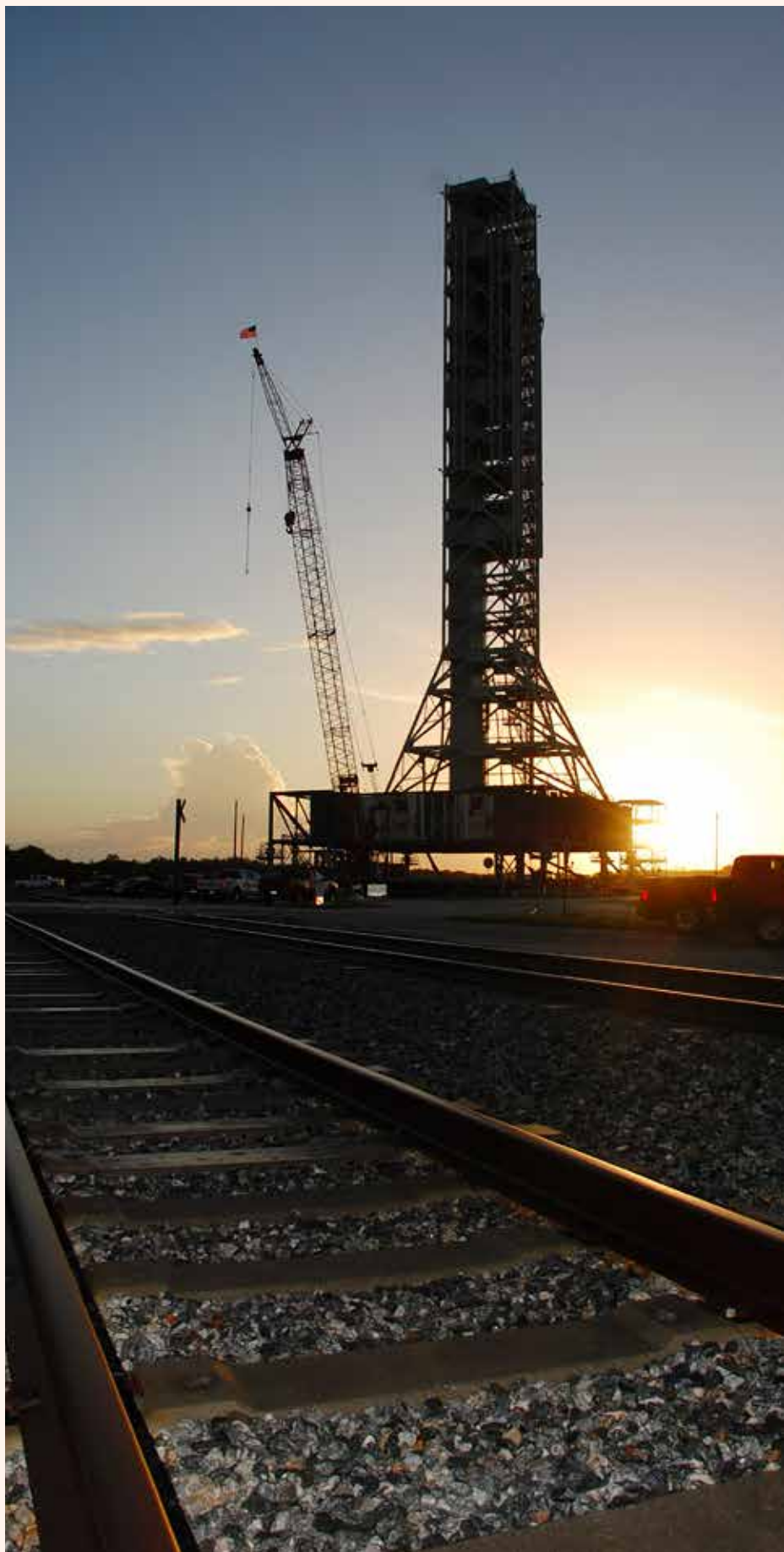
In July and August, the team tested techniques and practiced with hardware in the Pacific Ocean off the coast of San Diego to recover the Orion test vehicle from the water. Two Navy ships, several support boats, two helicopters and associated hardware and equipment were used for the tests. The well deck of the USS Anchorage was flooded, and Orion was retrieved from the ocean using a tow line. New hardware tested in August included a load-distributing collar for placement around the crew module.

In September, the teams practiced two methods for recovery. First, the test vehicle, equipment and hardware were loaded onto the USNS Salvor, a safeguard-class rescue and salvage ship, and an alternate recovery method was tested at sea. Using the ship's 40-ton aft boom crane, Orion was retrieved from the water and secured on the deck. Then, using the USS Anchorage, the team practiced recovering Orion and stabilizing the vehicle in the flooded well deck using improved tether lines, new speed bumps and a recovery winch.

On Dec. 5, all of the preparations and tests paid off as GSDO, the U.S. Navy and Lockheed Martin retrieved the Orion spacecraft from the ocean after splashdown from EFT-1. With Orion secured inside the ship, the team headed back to Naval Base San Diego where the spacecraft and equipment were offloaded. Orion was secured inside its transportation fixture and made the trek back to Kennedy on a flatbed truck.

The ground systems team continues to upgrade its processes, facilities and ground support equipment to safely handle rockets and spacecraft during assembly, transport and launch. The GSDO team and Kennedy are well positioned to support future vehicle processing and launch operations into the middle of this century. 🚀

Sunrise on Feb. 5, 2014, partially illuminates the Mobile Launcher (ML) at NASA's Kennedy Space Center. The ML is one of the key elements of ground support equipment that is being upgraded by the Ground Systems Development and Operations Program. The ML will carry the SLS rocket and Orion spacecraft to Launch Pad 39B for its first mission, Exploration Mission-1.







The Orion crew module is recovered after splashdown in the Pacific Ocean about 600 miles off the coast of San Diego, California on Dec. 5, 2014. NASA, the U.S. Navy and Lockheed Martin coordinated efforts to recover Orion and secure the spacecraft inside the well deck of the USS Anchorage.

08

Orion Processing & Launch

Orion Flight Test and Recovery

Processing and Launch

NASA's exploration beyond low-Earth orbit took a giant step forward when the Orion spacecraft launched aboard a United Launch Alliance Delta IV Heavy rocket from Space Launch Complex 37 at Cape Canaveral Air Force Station in Florida on Dec. 5, 2014 at 7:05 a.m. EDT. During its two-orbit, 4.5-hour flight test, Orion reached a peak altitude of 3,604 miles above Earth. The spacecraft plummeted through the atmosphere and splashed down in the Pacific Ocean at 11:29 a.m. EST.

Orion's journey into space began inside the high bay at the Neil Armstrong Operations and Checkout Building at Kennedy

Space Center. During the year leading up to launch, Orion prime contractor Lockheed Martin and NASA engineers and technicians processed and prepared the spacecraft for its flight test.

More than 1,200 sensors were placed inside and outside the crew module to find out more details about all the elements of the spacecraft and the details of their performance. The largest heat shield in diameter ever built was attached to the bottom of the spacecraft and the back shell tile panels were installed around it. Orion was stacked atop its service module and transported to the Payload Hazardous Servicing Facility where it was fueled ahead of launch. Next it was transported to the Launch Abort System Facility where the launch abort system was added and four ogive panels

were installed to protect the spacecraft. Orion then was transported to the launch pad and hoisted up for installation on the Delta IV Heavy launch vehicle.

Orion did not carry people into space during the flight, but is designed to take astronauts on deep-space missions in the future. It became the first spacecraft designed for human missions beyond low-Earth orbit since the Apollo 17 mission, the last moon landing by NASA.

Recovery and Transport Back to Kennedy

Ships were deployed, helicopters circled above, weather balloons were launched, and U.S. Navy divers embarked in several small boats about



Lockheed Martin technicians and engineers attach the heat shield to the Orion crew module inside the Neil Armstrong Operations and Checkout Building high bay at NASA's Kennedy Space Center. Technicians have installed more than 200 instrumentation sensors on the heat shield for Exploration Flight Test-1. The flight test will provide engineers with data about the heat shield's ability to protect Orion and its future crews from the 4,000-degree heat of re-entry and an ocean splashdown following the spacecraft's 20,000-mph re-entry from space.



A Delta IV Heavy rocket lifts off from Space Launch Complex 37 at Cape Canaveral Air Force Station in Florida carrying NASA's Orion spacecraft on an unpiloted flight test to Earth orbit. Liftoff was at 7:05 a.m. EST on Dec. 5, 2014.

600 miles southwest off the coast of San Diego, California, to aid in recovery of the Orion spacecraft. All of the planning, rehearsals and hard work paid off for the Orion Recovery Team, led by the Ground Systems Development and Operations Program at Kennedy.

NASA, the U.S. Navy and Lockheed Martin personnel aboard the USS Anchorage, an amphibious ship, and the USNS Salvor, a safeguard class salvage ship, were stationed in the Pacific Ocean near the target splashdown area. One hour after splashdown, the flight control team handed off control of the vehicle to the recovery team. Orion was powered down and the recovery process began.

Divers took underwater photos of Orion's heat shield. Then they attached a collar and winch line to the spacecraft, along with a series of tending lines. Orion was towed into the flooded well deck of the USS Anchorage and positioned over



NASA's Orion spacecraft is lowered gently to the Pacific Ocean under its three massive main parachutes at 11:29 am EST on Dec. 5, 2014. Orion launched on its first test flight at 7:05 am and over the course of two orbits and 4.5 hours, traveled 3,600 miles above Earth to test systems critical to human deep-space exploration.

rubber "speed bumps." Team members inside the well deck secured the tending lines as the water drained and Orion settled onto its landing area. Two of the three main parachutes were recovered and lifted by crane onto the ship. As both ships headed back to land, the USS Anchorage's well deck was flooded again so that Orion could be secured on its crew module recovery cradle, built by Lockheed Martin.

After docking at Naval Base San Diego, the Orion crew module was transported out of the ship's well deck and prepared for its journey back to Florida. The spacecraft was placed in the crew module transportation fixture, which includes an environmental control system and generator to maintain a good environment for the crew module during transport. The container was placed on a flatbed truck and transported over land back to Kennedy, arriving at the center in late December. 🌟

09

ISS Ground Processing
& Research

Science experiments from NASA's Kennedy Space Center formed a significant portion of the research backbone of the International Space Station in 2014 as the orbiting laboratory continued to prosper with regular cargo resupply missions launched from Florida and Virginia.

The VEGGIE experiment, developed by Orbitec and tested at Kennedy before flight, was sent to the station on the third cargo resupply mission by SpaceX. Focused on growing lettuce in the weightlessness of space, the experiment was activated and monitored by astronauts on the station, including Expedition 39 flight engineer Steve Swanson. The work is seen as critical to prospects for producing food by astronauts on long missions into deep space or to distant worlds such as Mars.

The fourth cargo resupply mission by SpaceX also ferried a host of scientific payloads to the station, including Biological Research in Canister-housed experiments studying seedling growth in space. The BRIC units were developed at Kennedy as a way to serve the needs of experiments while making

minimal demands on crew time on the station.

The year also saw the completion and opening of the Science Annex at the Space Station Processing Facility.

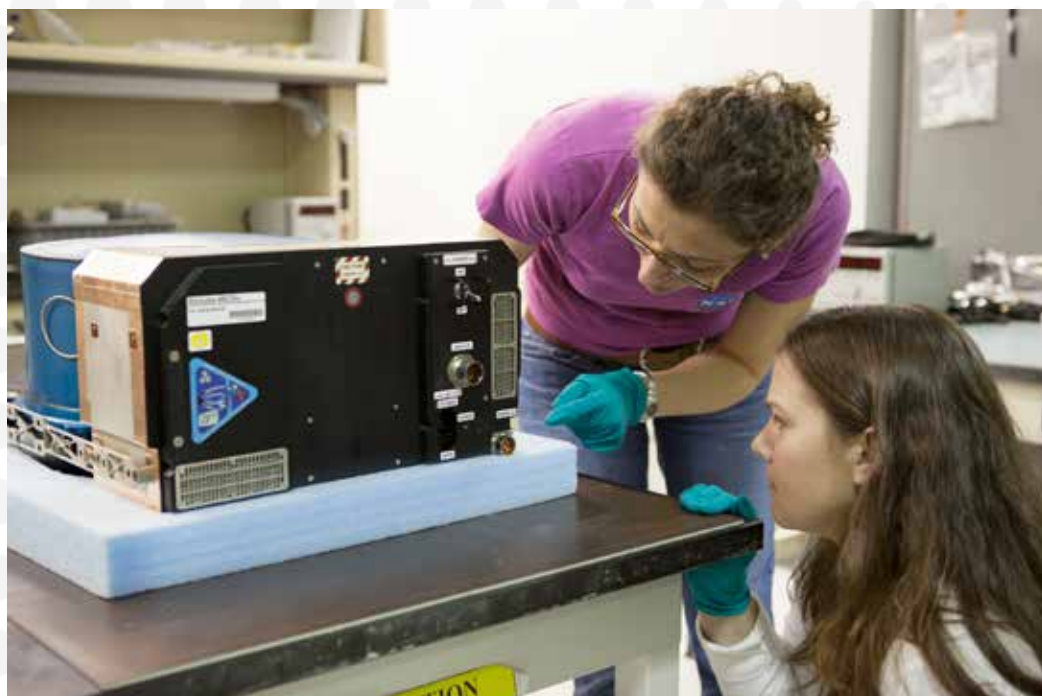
During the year, the first set of high-pressure gaseous air tanks filled at Kennedy was used on the station. The carbon-wrapped tanks are known as NORS, for Nitrogen/Oxygen Recharge System, and are used to provide air inside the station's pressurized modules and for spacewalkers. Although they are comparatively small at 3 feet long and 21 inches in diameter, each tank is pressurized to 6,000 pounds per square inch, or about twice the pressure of previous tanks. Their servicing requires equipment capable of handling pressures up to 10,000 pounds psi, along with procedures that keep engineers and technicians safe.

Kennedy continues to play a vital role in providing supplies and equipment for the International Space Station and its crew of astronauts and cosmonauts. The world-class processing skills of the workforce and Kennedy's specialized equipment and proven techniques are instrumental in

assembling cargo for launch to the station. The work also is critical to the safe recovery of completed experiments as they are packaged in space for the flight back to Earth and recovery for further study.



In the Space Station Processing Facility at NASA's Kennedy Space Center on March 7, 2014, QinetiQ North America Project Manager Carole Miller, left, works with Allison Caron, a QinetiQ mechanical engineer, in preparing the Biotube experiment that was launched to the International Space Station aboard a SpaceX Dragon spacecraft atop a Falcon 9 rocket March 16.



Researchers activated the red, blue and green light emitting diode (LED) lights on the Veggie plant growth system inside a control chamber at the Space Station Processing Facility at NASA's Kennedy Space Center. Jim Smodell, a technician with SGT, inserts the root mat and plant pillows containing outredgeous red romaine lettuce seeds into the Veggie unit. The growth chamber was used as a control unit, and procedures were followed identical to those being performed on Veggie and the Veg-01 experiment on the International Space Station.



10

Engineering & Technology

The Engineering and Technology Directorate made significant contributions to Kennedy Space Center during 2014 by providing innovative, effective and space exploration solutions to a wide variety of programs across the center.

Engineering is actively helping the center transform to a multi-user spaceport, and continues to support NASA's space exploration mission.

Kennedy's engineering expertise and technical capability enabled the Ground Systems Development and Operations Program to meet several key accomplishments and milestones. Ground systems that will support future Orion and Space Launch System (SLS) integration, launch and recovery operations are being designed, tested, installed and activated in locations across Launch Complex 39 and the Industrial Area.



Technicians check out NASA's Project Morpheus prototype lander, which just touched down on a dedicated pad inside the ALHAT hazard field near the Shuttle Landing Facility at Kennedy Space Center in Florida. The efforts in Advanced Exploration Systems pioneer new approaches for rapidly developing prototype systems, demonstrating key capabilities and validating operational concepts for future human missions beyond Earth orbit.

Ground support equipment subsystems under development include work platforms, commodities, signal communications, and electrical, mechanical, control and safety systems required for the operations teams of tomorrow to conduct the nation's human space exploration beyond low-Earth orbit.

In support of the Launch Services Program (LSP), the engineering team maintained technical insight and provided mission assurance to LSP's commercial launch providers, including SpaceX (Falcon 9), Orbital Sciences Corp. (Antares, Minotaur and Pegasus XL), Lockheed Martin Space Systems Co. (Athena Ic/Illc), and United Launch Alliance (Delta II and Atlas V).

As part of the LSP team, the Engineering Directorate supported certification efforts as well as commercial launches from Cape Canaveral Air Force Station and Vandenberg Air Force Base, including the Tracking Data and Relay Service (TDRS)-L and Orbiting Carbon Observatory (OCO)-2 missions. The Engineering team also supported LSP's Educational Launch of Nanosatellites (ELaNa-X) integration effort. The ELaNa Project was developed to provide flight opportunities for educational CubeSats. The integrated ELaNa-X mission P-PODs were delivered to the Delta II launch complex at Vandenberg for final mate to the Soil Moisture Active Passive launch vehicle.

As the Commercial Crew Program continues to make progress toward restoring U.S. capabilities of launching astronauts to the International Space Station, Engineering supported the completion of 23 agreement and contract milestones by Blue Origin, Boeing, SpaceX and Sierra Nevada Corp.

NASA Engineering also supported the ISS Program. The team provided engineering support for several experiments, including the Vegetable Production System (VEGGIE) and Plant Habitat (PH). VEGGIE was designed and developed by Kennedy and Orbital Technologies Corp., and was successfully delivered to the space station aboard the SpaceX

CRS-3 mission in April 2014. Engineering provided mission console support and also provided support for various product deliverables for the PH project.

Engineering also engaged in technology development and innovation during the past year, and continues to support many projects to help enable routine access to space, affordably explore other worlds and create new approaches to problem-solving.

Groundbreaking research continues at Kennedy's Swamp Works laboratory where new ideas for in situ resource utilization on distant locales in the solar system are conceptualized, prototyped and demonstrated in collaboration with academia and commercial partners. Robotic excavators using technologies developed at the Swamp Works could serve as the automated "pioneers" of tomorrow, converting regolith and planetary soil into water, fuels, landing pads and habitat construction materials.

A regolith testing area, called the "Big Bin," was established at the Swamp Works to allow engineers and scientists the ability to demonstrate new concepts and further test robots in a simulated off-world environment.

As part of the Integrated Ground Operations Demonstration Unit (IGODU) project, 24 separate liquid nitrogen propellant loading tests were successfully conducted at the Cryogenics Test Lab to demonstrate new composite materials technologies and automated propellant loading concepts. Low-loss, cryogenic fluid transfer is a key technology challenge that IGODU is working to address.

Also among the year's highlights were 14 highly successful flight tests of Morpheus, a prototype planetary spacecraft capable of vertical takeoffs and landings. It is serving as a test bed of advanced technologies to help future spacecraft avoid rocks, craters and other hazards when touching down on distant planets.

Work continued on the Resource Prospector Mission payload. A dedicated team of engineers is creating an advanced science lab that will excavate lunar soil and convert it into water. Scheduled to launch later this decade, the prospector will be a tremendous achievement enabling humans to live and reside on other worlds. ✨



A torso model of Robonaut 2, identical to R2 already on the International Space Station, is introduced to a crowd of onlookers by Ron Diftler of NASA's Johnson Space Center in Houston. The March 14, 2014, demonstration was one of several provided during the Robot Rocket Rally. The three-day event at Florida's Kennedy Space Center Visitor Complex was highlighted by exhibits, games and demonstrations of a variety of robots, with exhibitors ranging from school robotics clubs to veteran NASA scientists and engineers.



Andrew Nick of Kennedy Space Center's Swamp Works shows off RASSOR, a robotic miner, at the Robot Rocket Rally on March 14, 2014.

11

Center Operations

From upgrading critical infrastructure to protecting natural resources to maintaining a focus on long-term sustainability, Kennedy's Center Operations Directorate is paving Kennedy's path to the future as a modernized, multi-user spaceport.

A new, state-of-the-art, energy efficient Headquarters building will serve as the cornerstone for the center's consolidated Central Campus. NASA awarded a two-year contract to Hensel Phelps Construction Co. of Orlando in July 2014 to build the facility, which will significantly reduce KSC operations, maintenance, and utility costs.

Construction of a new Kennedy Data Center also is part of the Central Campus effort. The 16,500-square-foot facility replaces multiple data centers and IT support areas that totaled 45,000 square feet.

Eleven facilities totaling 70,000 square feet already were demolished this fiscal year, and the completion of the new Headquarters building and Data Center will allow Kennedy to further reduce its footprint by approximately 600,000 square feet through deconstruction of both the existing KSC Headquarters Building and the Central Instrumentation Facility.

Kennedy's Emergency Response Team showcased its



An artist's illustration of the new Kennedy Space Center Central Campus.



NASA Fire Rescue Lt. David Tacy, background, and firefighter Alvis Hickey direct an agency helicopter in for a landing during a training exercise. Tacy and Hickey both work for Chenega Security & Support Solutions and serve in Kennedy Space Center Fire Rescue Operations.

skills and placed fourth at the 31st annual SWAT Roundup International in Orlando. An eight-member team from Chenega Security Support and Solutions participated alongside more than 50 teams from Florida and around the globe.

The center's Fire Rescue Services also notched important achievements during the year. The team achieved Pro Board accreditation in aerial fire truck operations and collaborated with NASA Aircraft Operations in a new training program at Kennedy to help rescue personnel learn how to collaborate with helicopter pilots in taking injured patients to hospitals. Aircraft Operations also conducted specialized training to ensure they can properly and safely use aircraft that drop water and flame retardants on wildfires.

Investing in employee health and safety is an investment in Kennedy's future. This attitude took center stage as Kennedy launched the "NASA Moves!" challenge, part of NASA's Health4Life initiative designed to help participants track their health, fitness and nutrition. Center Director Bob Cabana and Florida Surgeon General John Armstrong kicked off the event by leading a group of employees on an early morning run on

the orbiter-shaped Pathfinder Fitness Trail at Launch Complex 39. Two Executive Safety Forums also gave the workforce opportunities to expand its knowledge about prescribed burns at the spaceport as well as best practices in emergency management.

Kennedy celebrated Earth Day with a Sustainability Fair featuring booths by a dozen sustainable companies and environmental organizations, displays on organic gardening, recycling and more, and test-drives of alternative-fuel vehicles.

Protective sand dunes lining Kennedy's shores were repaired in a six-month restoration effort after years of pounding due to hurricanes and other weather systems. Once the dunes were rebuilt, vegetation was planted to help prevent erosion in years to come.

Endangered sea turtles rely on nearby beaches during nesting and hatching season. Kennedy's Dark Skies campaign was developed to spread awareness and encourage adjustments to lighting at Kennedy in order to minimize the disorienting effects of light pollution, allowing female turtles and their hatchlings to find their way to the ocean. ✨

12

Education

During fiscal year 2014, Kennedy Space Center's Education Office reached students and teachers throughout the state of Florida and around the country with a variety of educational programs, events and outreach activities.

Kennedy's Education Office provided hands-on science, technology, engineering and mathematics (STEM) workshops and career panels at some 1,015 events, impacting 212,923 participants. These events reached students at schools, 36 different youth-serving organizations, and participants at museum groups, church groups and more.

Kennedy's efforts included focusing on one of the NASA Education outcome goals for 2014: attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers and faculty.

Kennedy's Education Office managed two agencywide

programs: the Experiment to Stimulate Competitive Research (EPSCoR), and the Minority University Research and Education Programs (MUREP) Small Programs/Minority Innovation Challenges Institute (MICI).

EPSCoR funded 15 new projects for a maximum of \$750,000 each during a period of 36 months totaling \$11,237,489, and funded year three of the 2012 EPSCoR Research Infrastructure development grants at about \$125,000 each. Also, five awards of \$100,000 each were funded to integrate EPSCoR research payloads on the International Space Station.

The Florida Agricultural & Mechanical University's MICI project has been extremely successful in securing the involvement of Minority Serving Institution (MSI) faculty and underserved/underrepresented students in NASA

opportunities. MICI is an online virtual conference format, with live technical sessions on NASA opportunities and challenges, which are archived for availability on-demand. Some 455 students and 265 faculty members are registered in MICI. These students represent a total of 214 different colleges/universities including 76 MSIs.

During the Fifth Annual Robotic Mining Competition, May 19-23, Kennedy welcomed more than 600 university-level students from 24 states for the five-day event. The mining robots traversed and excavated the simulated Martian chaotic terrain and deposited the regolith into collector bins. Teams were required to submit systems engineering papers and perform outreach activities. The event included a College Recruitment Fair for high-school students and STEM activities for students in K-12.

For NASA Schools Connection (NSC),



Students from Titusville High School participate in a rocketry activity Oct. 29, 2014, at the Center for Space Education at NASA's Kennedy Space Center Visitor Complex in Florida.

Coordinated by Kennedy Space Center's Education Office, students in fourth through ninth grades get hands-on experience and learn about rocketry during a Central Florida YMCA Summer Camp experience July 16, 2014.

Kennedy selected two low-performing middle schools – Southwest Middle School and McNair Middle School – and was invited to partner with two middle schools – Cocoa Beach Jr./Sr. High and Calvary Christian – through the 2013-2014 school year. NSC's aim is getting eighth-grade students excited about STEM fields of study before entering high school.

The 2014 First Nations Rocket Competition, April 5 through 8, provided Native American college student teams a competition that enabled learning concepts in guidance, navigation and control, propulsion, and related electrical systems and flight software necessary for a successful launch, as well as the basic parts to build the rocket. Kennedy provided funds for travel to the competition, technical assistance to teams at nine different colleges, and a judge for the competition itself.

The International Space Station (ISS) Division and the Education Office collaborated to run three one-week ISS Educator Professional Development Institutes for the Pre-



Service Teachers Institute (PSTI). This program offered educators an in-depth look into some of the new research being performed on the station, and engaged them in classroom instruction and hands-on activities that they can take back to the classroom. The three PSTI groups included 90 participants from the University of Central Florida Resident Teacher Professional Preparation Program (RTP3); Daytona State College; and the NASA Pre-Service Teacher Institute, which specifically is for pre-service teachers from minority serving institutions.

Kennedy's Education Office hosted its fifth annual NASA Family Education Night (NFEN) on Saturday, Sept. 20, at the Kennedy Space Center Visitor Complex. NFEN reached about

Students in third through ninth grades learn about non-Newtonian fluids during Girls Inc. science activities Aug. 9, 2014, at the Museum of Science and History in Jacksonville, Florida. The activities were coordinated by the Education Office at NASA's Kennedy Space Center in Florida.





A visitor to the Robot Rocket Rally tries his hand at virtual reality in a demonstration of the Oculus Rift technology, provided by the Open Source Robotics Foundation. The three-day event at Florida's Kennedy Space Center Visitor Complex on March 14, 2014, is highlighted by exhibits, games and demonstrations of a variety of robots, with exhibitors ranging from school robotics clubs to veteran NASA scientists and engineers.

775 students in grades one through six and their families, and stimulated their interest in STEM by offering various educational experiences, hands-on activities and gee-whiz demonstrations. Attendees also had the opportunity to meet an astronaut and experience all the exhibits the visitor complex had to offer.

Parramore Kidz Zone (PKZ), in collaboration with Cox Radio, STAR 94.5, and Kennedy's Education Office, offered a NASA STEM Day experience to 192 students at Orlando's Downtown Recreation Center on Aug. 5, 2014. PKZ's mission is to level the playing field for Parramore's children, equipping them to become successful, well-educated adults, reducing juvenile crime, teen pregnancy and high school drop-out rates in Orlando's highest poverty and crime neighborhood. NASA STEM Day engaged PKZ youth through hands-on exhibits and experiential learning activities.

The Education Office participated in Florida Space Day in Tallahassee on March 12, 2014, by providing a NASA STEM day at nearby Fairview Middle School. Three different STEM workshops were presented to the middle-school students and were repeated seven times throughout the school day. About 900 students and their teachers were reached.

Of the 121 Education interns hosted at Kennedy in 2014, 29 attended MSIs. Interns work at Kennedy for the duration of one academic semester for either 10 or 16 weeks. Throughout each "semester," interns participated in six to eight enrichment activities, including NASA program overviews, facilities tours, and networking activities with Kennedy senior management. ✨



Grade-school students at North Orange Apopka Library participate July 16, 2014, in a "Fizz, Boom, Lift-Off" themed activity in which they learned about Newton's laws of motion. NASA Kennedy Space Center's Education Office coordinated the library event..

Students gather to watch as a DARwin-OP miniature humanoid robot from Virginia Tech Robotics demonstrates its soccer abilities at the Robot Rocket Rally on March 14, 2014. The three-day event at Florida's Kennedy Space Center Visitor Complex is highlighted by exhibits, games and demonstrations of a variety of robots, with exhibitors ranging from school robotics clubs to veteran NASA scientists and engineers.





A Florida scrub jay perches on a tree branch at Kennedy Space Center. The birds are one of several threatened species that reside on the Merritt Island National Wildlife Refuge which coexists with the center.

13

Outreach to the World

Kennedy Space Center's events and launches garnered world attention during Fiscal Year 2014.

News Media Operations

Thousands of traditional news and social media experts covered dozens of televised media events in support of the International Space Station, Orion and the Space Launch System, and the Journey to Mars. The audience of these professionals had a busy viewing year. From launch of the Mars Atmosphere and Volatile Evolution (MAVEN) to the renaming of the Neil Armstrong Operations and Checkout Building, media operations at Kennedy remained steady.

In addition to supporting requests from external news organizations, Kennedy's Public Affairs Directorate wrote news stories, shot and edited feature videos, and coordinated community engagement activities to better inform and inspire the general public.

Communication specialists at Kennedy took thousands of pictures and wrote more than 150 news stories. The staff created a new digital monthly publication, Spaceport Magazine, as well as a new one-minute YouTube video series, Inside KSC. These two products alone reach an additional 10,000 people.

Kennedy Web Presence

The Kennedy Space Center website remained a top-flight online destination during 2014. The center's home page at <http://www.nasa.gov/kennedy> attracted nearly 10.5 million views, again outpacing the performance of other NASA centers, government agency websites and many commercial sites.

The launch of the MAVEN mission drew the largest audience with more than 700,000 views.

NASAKennedy is the username of Kennedy's social media presence. By the end of FY14, the Facebook fan base grew to more than 760,000 likes. Twitter grew to 723,000 followers and YouTube had almost six million video views. By the end of FY14, Kennedy had more than 150 million social media interactions. These platforms include Twitter, Facebook, Google+ and Instagram.

During the year, the web team provided coverage of launch processing and countdown for three expendable launch vehicle missions: MAVEN, Tracking and Data Relay Satellite-L (TDRS-L), Orbiting Carbon Observatory-2, along with two SpaceX resupply missions to the International Space Station. A worldwide audience was kept up-to-date during countdowns and landings with frequent updates to the mission's main page along with photo and video galleries.

NASA's Launch Blog provided live commentary and up-to-the-minute information straight from a control room console to readers. Kennedy's web



In the NASA News Center annex at the Kennedy Space Center, social media participants listen to a briefing by acting administrator of the U.S. Small Business Administration Jeanne Hulit, left, and NASA administrator Charles Bolden on Jan. 23, 2014. The social media participants gathered at the Florida spaceport for the launch of the Tracking and Data Relay Satellite-L spacecraft. Their visit included tours of key facilities and participation in presentations by key NASA leaders who gave updates on the space agency's current efforts.



An aerial view of the “Rocket Garden” at the Kennedy Space Center Visitor Complex. The full-scale launch vehicles allow guests to see rockets representing the history of NASA’s space programs.

video products included feature videos and podcasts, as well as highlights of launches and landings.

The web team wrote and published slightly more than 300 web features and assisted with the publishing of nearly 100 web videos.

Government Relations

In February, the House Oversight and Government Reform Committee Subcommittee on Government Operations held a hearing at Kennedy Space Center on unused and underutilized facilities after touring the center.

Center Director Bob Cabana joined industry representatives at the state capital in Tallahassee to visit with state legislators during Florida Space Day in March.

Cabana spoke to local, state and federal elected officials and staff in March at his annual community briefing.

Cabana met with members of the Florida Congressional delegation in Washington, D.C., in support of NASA’s Office of Legislative and Intergovernmental Affairs where he shared Kennedy’s plans and activities with the Brevard legislative delegation.

Elected officials from federal, state and local levels toured Kennedy facilities to learn more about the wide range of activities happening at the center in 2014, including the three

programs headquartered at the center. They also attended the SpaceX CRS-3 launch and the launch of TDRS-L from Cape Canaveral Air Force Station.

Center Exhibits Program

The Center Exhibits Program supported 125 events that reached out to more than 1.5 million people. The events took place in six regions of Florida. The team also supported several nationwide agency events. In all of the outreach efforts, the Center Exhibits Program focused on informing the public about Kennedy Space Center’s future missions and programs and how NASA technologies impact the lives of people on Earth every day.

Visitor Complex

The Kennedy Space Center Visitor Complex was a vacation destination for more than 1.4 million guests during Fiscal Year 2014. Nearly 4,000 guests were transported for an up-close view of each rocket launch, as well.

The visitor complex supported Exploration Flight Test-1 in December with several NASA and contractor exhibits and a two-day speaking series highlighting Orion that were attended by more than 15,000 guests. A live prelaunch and post-launch webcast with former CNN space correspondent John Zarrella

was broadcast.

Major changes to the primary complex and other tour stops on Kennedy Space Center and Cape Canaveral Air Force Station progressed throughout the year.

The renovation of the Rocket Garden was completed, which included repainting seven rockets and one engine, and redoing the gantry and three climb-in modules.

In July, the “Great Balls of Fire” exhibit opened, which shares the story of the origins of our solar system, asteroids and comets and their possible impacts and risks. The exhibit included an Asteroid Encounter featuring interactive displays.

The Dream Rocket exhibit opened highlighting 130 pieces of children’s artwork, calling the young artists the “Mars Generation.”

The “Exploration Space: Explorers Wanted” exhibit was upgraded with the addition of three full-scale Mars rover models. A full-scale model of the Orion heat shield also was installed.

On Kennedy Space Center, the visitor complex took over the care and responsibility of the Banana Creek viewing site in early 2014, revamping the entire site, which included adding new graphics and launch pad viewing signs, upgrading three buildings, and landscaping the grounds.

On Cape Canaveral Air Force Station, restorations to the Launch Complex 5/6 blockhouse were completed, giving the entire building a makeover.

The visitor complex shared its resources with Kennedy employees and members of the community, as well.

A new exhibit featuring information from the Space Shuttle and Apollo eras was set up at the Melbourne International Airport during the summer of 2014.

An Apollo flight suit was loaned for display in the Operations and Checkout Building for the facility’s renaming ceremony July 21. Apollo astronauts and their families turned out to honor Neil Armstrong, the first person to walk on the moon, and celebrate the 45th anniversary of the historic event.

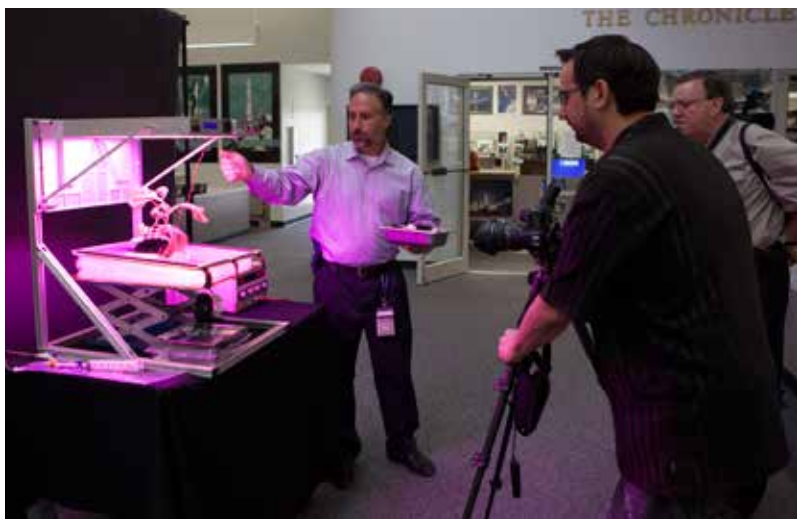
A Hubble Space Telescope exhibit was donated to the Brevard Museum of History and Natural Science. Visitor complex staff assisted with its design and setup for the opening Nov. 14.

Speakers Bureau

Kennedy’s engineers, technicians and other experts reached more than 55,600 children and adults in 2014. They attended more than 260 events throughout Florida, Georgia and as far away as Norway, sharing their expertise and unique perspectives through career days, science fairs, and community and professional events. ✿



The Brevard Symphony Orchestra performs beneath space shuttle Atlantis at the Kennedy Space Center Visitor Complex in Florida.



At the News Center at NASA’s Kennedy Space Center on April 13, 2014, Trent Smith of the agency’s International Space Station Research and Utilization Office, discusses the Vegetable Production System “VEGGIE” experiment being launched to the International Space Station.



The launch gantry is rolled back Dec. 3, 2014, to reveal NASA's Orion spacecraft mounted atop a United Launch Alliance Delta IV Heavy rocket at Cape Canaveral Air Force Station's Space Launch Complex 37.



An aerial view of the Launch Complex 39 area shows the transformation of pad B, at left, to a clean pad to support NASA's exploration missions. At right, a new processing hangar has been built at the base of pad A to support SpaceX's upcoming Commercial Crew Program and commercial customer launches.



Budget Highlights

The Kennedy Space Center Fiscal Year 2014 budget was nearly \$2.1 billion. The center also performed \$183.8 million in reimbursable work with other government and commercial entities.

In the spring of 2014, the Commercial Crew Program (CCP) concluded phase 1 of the initial certification phase for the program with the successful completion of the Certification Products Contracts (CPC) with SpaceX, Boeing and Sierra Nevada Corp. In September of 2014, CCP entered into the final development phase of the program with the award of the Commercial Crew Transportation Capability (CCtCap) contracts to Boeing and SpaceX. The CCtCap contracts will result in a human-rated certification of the Boeing and SpaceX Crew Transportation Systems (CTS). Under the contract, NASA will award at least two, and up to six, crew rotation missions to each provider for International Space Station (ISS) crew rotations.

The Launch Services Program (LSP) executed a \$503 million budget, both direct and reimbursable. LSP supported three successful mission launches: Mars Atmosphere and Volatile Evolution (MAVEN) and Tracking and Data Relay Satellite-L (TDRS-L) from Cape Canaveral Air Force Station in Florida, and Orbiting Carbon Observatory-2 (OCO-2) from Vandenberg Air Force Base in California. The program also procured launch vehicle services and other support for several manifested missions scheduled to launch in FY 2015 and beyond.

The Ground Systems Development and Operations (GSDO) Program budget of \$331 million included Exploration Ground Systems and the 21st Century Space Launch Complex. Key accomplishments included completion of recovery tests in

support of Exploration Flight Test-1 and successful completion of major programmatic milestones (including the preliminary design review and Key Decision Point-C). Modernization and compatibility efforts continue, including major infrastructure enhancements to prepare Launch Complex 39B, the Mobile Launcher and the Vehicle Assembly Building (VAB) to support the Exploration Mission-1 launch of the Space Launch System (SLS) and Orion Multi-Purpose Crew Vehicle, as well as development of ground operations infrastructure to facilitate the activities of future customers and stakeholders, including government agencies, commercial industry, and current and future programs.

The ISS Program provided \$56 million in budget to Kennedy, which allowed for continued success toward achieving and maintaining the ISS program mission of fully utilizing a permanent human outpost in space. Kennedy's mission efforts afforded provisions for ground processing support for experiment hardware, as well as orbital replacement units needed to maintain the space station. The budget also provided for ongoing development of hardware intended to promote full utilization of the space station through the establishment of fundamental biological research capabilities.

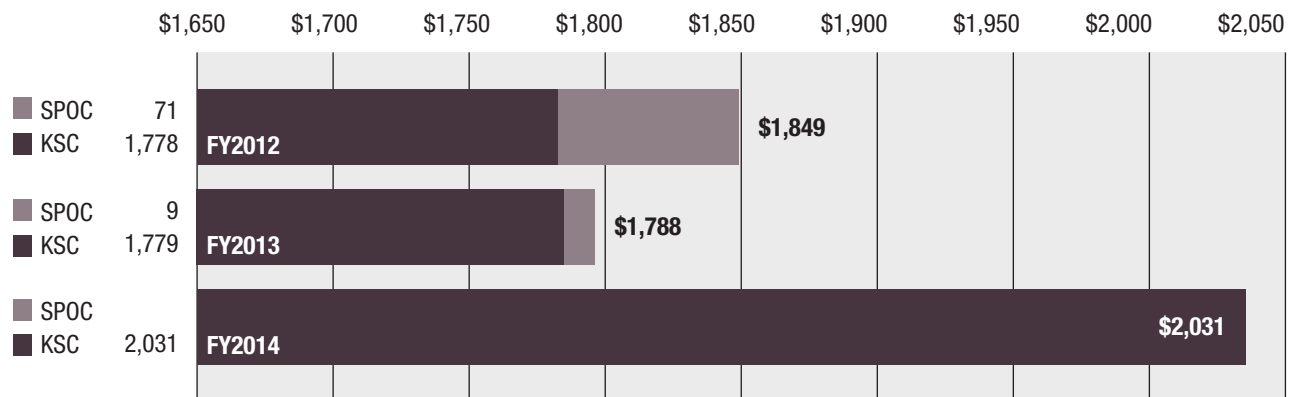
Kennedy's Center Management and Operations (CMO) budget provided \$346 million in FY 2014 to maintain the center's essential infrastructure, preserve its core technical capabilities, and sustain necessary safety and engineering technical authorities to support NASA's mission and help enable the development of a multi-user spaceport.

Kennedy Space Center FY 2014 Budget Authority (\$ in Millions)

Commercial Crew Program	\$644
Launch Services/Science	\$354
Ground Systems Development and Operations	\$331
Space Station	\$56
Center Management & Operations	\$346
Other	\$301
Total KSC*	\$2,031

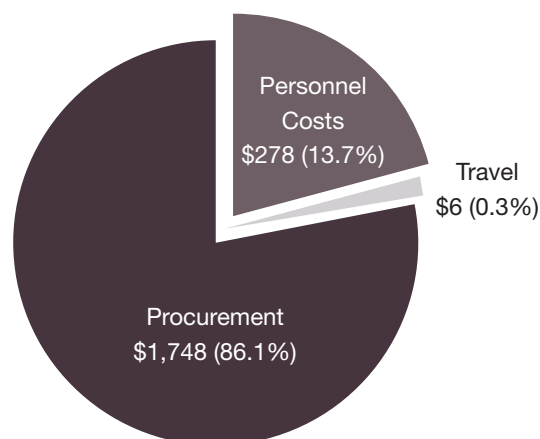
* Excludes \$9 million for Space Flight Operations Contract (SFOC)

NASA/KSC Budget Authority Summary FY 2012 through FY 2014 (\$ in Millions)



SPOC: Space Program Operations Contract

FY 2014 KSC Budget by Elements (\$ in Millions) Total \$2.031M



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Workforce Overview

Kennedy Space Center is the most broadly based, complex and successful launch center in the world. Both NASA and contract personnel working at the center are essential to the success of Kennedy

The workforce includes people with many skills who are dedicated to supporting the nation's space program and NASA's future explorations to destinations including an asteroid and Mars. To accomplish the agency's various missions, these individuals fulfill a multitude of tasks.

At the end of each year, the center takes a snapshot of its workforce. This picture includes all federal and contractor

employees chartered to work for Kennedy. Other organizations such as the European Space Agency and Patrick Air Force Base, have roles here but are not reflected in these numbers.

As of Sept. 30, 2014, the total Kennedy population was 8,310. This includes 1,963 NASA civil servants, 67 NASA civil servant interns, 4,421 on-site contractor employees, 221 off-/near-site contractor employees, 1,209 tenants and 429 construction workers. The civil servant skill mix includes those in science, technology, engineering and mathematics positions and those in professional administrative and clerical positions.

Kennedy Space Center Workforce Profile (through 9/30/14)

Civil Servants	1,963
Civil Servant Interns	67
Total Civil Servants	2,030
Civil Servant Skill Mix	
Scientific, Technology, Engineering and Mathematics	66%
Clerical and Professional Administrative	34%
On-site Contract Employees	4,421
Off-/Near-site Contract Employees (includes construction workers)	221
Total Contract Employees	4,642
Total Construction Employees	429
Total Tenants	1,209
TOTAL KSC POPULATION	8,310

The companies listed below were some of Kennedy Space Center's top support contractors or launch services contractors in terms of dollars obligated in FY 2014. Following is a brief description of their work for the agency:

United Launch Services LLC

United Launch Services (ULS), a subsidiary of United Launch Alliance, brought The Boeing Company, Delta Launch Services Inc. and Lockheed Martin Commercial Launch Services together. ULS provided launch services to NASA using the Delta II and Atlas V vehicles under two of three existing multiple-award, indefinite delivery, indefinite quantity task order contracts. Principal location for the Delta II vehicle assembly is Decatur, Alabama. Principal location for the Atlas vehicle assembly is Denver, Colorado. Both vehicles launch from Cape Canaveral Air Force Station (CCAFS) in Florida and Vandenberg Air Force Base (VAFB) in California.

The Boeing Company

The Boeing Company participated in NASA's goal toward developing orbital commercial crew transportation systems. Under the Commercial Crew Transportation Capability (CCtCap) contract for NASA's Launch America initiative, Boeing was tasked with developing safe, reliable and cost-effective crew transportation to and from the International Space Station on American spacecraft launched from the United States. Boeing also participated via a Space Act Agreement, supporting the agency's Commercial Crew Integrated Capability (CCiCap) initiative and also was involved in the initial certification phase called Certification Products Contract (CPC).

SpaceX

SpaceX (Space Exploration Technologies Corp.) participated in NASA's goal toward development of orbital commercial crew transportation systems. Under a Commercial Crew

Transportation Capability (CCtCap) contract awarded in 2014, SpaceX is working toward developing safe, reliable and cost-effective crew transportation to and from the International Space Station on American spacecraft launched from the United States. SpaceX also participated via a Space Act Agreement supporting the agency's CCiCap initiative and also was involved in the initial certification phase called CPC.

URS Federal Technical Services Inc.

URS Federal Technical Services provided base operations support for Kennedy. URS was responsible for operations, maintenance and engineering for specific Kennedy facilities, systems, equipment and utilities. URS also was responsible for calibration and propellants handling at the center.

Vencore Services and Solutions Inc.

Vencore Services and Solutions Inc. provided engineering products and services to Kennedy's Engineering and Technology Directorate and other center and agency operational customers. Support also included laboratory and developmental shop maintenance and operations, technical services, spaceflight systems engineering and engineering development. Vencore also provided technology outreach to foster awareness and utilization of Kennedy's unique capabilities.

Sierra Nevada Corporation

Sierra Nevada Corporation (SNC) participated in the design and development of the next generation of U.S. human spaceflight capabilities. SNC operated under a Space Act Agreement through NASA's CCiCap initiative intended to ultimately lead to the availability of commercial human spaceflight services for government and commercial customers. The company also was involved in the initial certification phase called CPC.

Abacus Technology Corp.

Abacus provided communication and information technology services under the Information Management and Communications Support (IMCS) contract. Abacus supported the majority of these requirements at Kennedy, which included support to agency programs, such as payloads, launch services and the International Space Station. Services provided included hardware and software integration development, computer administration and maintenance, voice and data transmission, library, graphics, publications, printing and reproduction, and IT security.

Jacobs Technology Inc.

Jacobs Technology Inc., prime contractor for the Test and Operations Support Contract (TOSC), is 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 included 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.

Chenega Security & Support Solutions LLC

Chenega Security & Support Solutions LLC provided protective services support for NASA at Kennedy under the Kennedy Protective Service Contract (KPSC). These comprehensive and cohesive services included physical security operations, Emergency Response Teams, personnel security, badging, 911 dispatch center, fire and rescue, fire prevention and fire protection engineering, aircraft rescue and firefighting, advance life support ambulance services, emergency management, as well as management of the NASA Protective Services Training Academy providing federal law enforcement training for all NASA centers.

Hensel Phelps Construction Co.

As part of Kennedy's Central Campus project, Hensel Phelps Construction Co. provided labor, equipment and materials to construct a new, seven-story office building and the related site work. The building will provide a cost-effective means of housing 500 Kennedy personnel with office space and conference facilities, food service, and retail, mail, library and other support services.



The Orion spacecraft passes by the iconic Vehicle Assembly Building at Kennedy Space Center on Nov. 11, 2014, as it is transported to Launch Complex 37 at Cape Canaveral Air Force Station.

Your Procurement Dollars at Work Geographical Distribution by State (Fiscal Year 2014 Obligations)

STATE	TOTAL DOLLARS
ALABAMA	10,541,553
ARIZONA	32,653
CALIFORNIA	162,442,203
COLORADO	372,472,443
CONNECTICUT	6,833,805
DISTRICT OF COLUMBIA	38,195
FLORIDA	266,201,696
GEORGIA	2,160,784
ILLINOIS	916,098
INDIANA	1,900,585
KANSAS	624,000
KENTUCKY	90,408
LOUISIANA	15,137
MARYLAND	220,500,721
MASSACHUSETTS	349,714
MICHIGAN	379,262
MINNESOTA	110,478
MISSOURI	162,385

STATE	TOTAL DOLLARS
MONTANA	70,000
NEW HAMPSHIRE	19,247
NEW JERSEY	1,004
NEW MEXICO	53,000
NEW YORK	1,082,237
NORTH CAROLINA	25,370
OHIO	1,698,348
OKLAHOMA	10,546,385
OREGON	58,865
PENNSYLVANIA	7,343,336
SOUTH DAKOTA	29,989
TENNESSEE	70,292,593
TEXAS	140,658,822
UTAH	5,386
VIRGINIA	218,060,635
WASHINGTON	421,860
WISCONSIN	3,965,741
TOTAL	\$1,500,104,847

Top 25 KSC Business Contractors for FY 2014

Contractor	Dollars
UNITED LAUNCH SERVICES LLC	364,613,332
THE BOEING COMPANY	272,193,000
SPACEX (SPACE EXPLORATION TECHNOLOGIES CORP.)	247,110,409
URS FEDERAL TECHNICAL SERVICES INC.	115,019,968
VENCORE SERVICES AND SOLUTIONS INC.	105,336,077
SIERRA NEVADA CORP.	79,000,000
ABACUS TECHNOLOGY CORP.	70,364,506
JACOBS TECHNOLOGY INC.	68,389,085
HENSEL PHELPS CONSTRUCTION CO.	64,997,000
CHENEGA SECURITY & SUPPORT SOLUTIONS LLC	36,364,994
AI SOLUTIONS INC.	32,812,416
MILLENNIUM ENGINEERING AND INTEGRATION CO.	22,467,640
ORBITAL SCIENCES CORP.	21,238,711
INOMEDIC HEALTH APPLICATIONS INC.	21,048,752
PRECISION MECHANICAL INC.	11,301,839
J.P. DONOVAN CONSTRUCTION INC.	11,131,420
REYNOLDS SMITH AND HILLS INC.	11,058,884
WICHITA TRIBAL ENTERPRISES LLC	10,542,937
SPEEGLE CONSTRUCTION II LLC	10,361,680
A-P-T RESEARCH INC.	9,372,493
FLORIDA POWER AND LIGHT CO.	8,274,225
BREVARD ACHIEVEMENT CENTER INC.	6,813,040
PRAXAIR INC.	6,512,283
PRECISION FABRICATING & CLEANING COMPANY INC.	6,429,469
AIR LIQUIDE LARGE INDUSTRIES U.S. LP	6,203,262
TOTAL	\$1,618,957,422



National Aeronautics and Space Administration

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