December 2017 Vol. 4 No. 12

National Aeronautics and Space Administration

KENNEDY SPACE CENTER'S

SPACEPORT magazine

WEATHER FORECASTING GETS A BOOST

NOAA's JPSS-1 Launches on Delta II Rocket

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National Aeronautics and Space Administration

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The United Launch Alliance Delta II rocket carrying NOAA's Joint Polar Satellite System-1 spacecraft launches from Space Launch Complex 2 at California's Vandenberg Air Force Base. Liftoff occurred on time at 1:47 a.m. PST on Nov. 18, 2017. Photo credit: NASA/Kim Shiflett

To get the latest Kennedy Space Center updates, follow us on our **Blog**, **Flickr**, **Facebook** and **Twitter**.

NASA'S LAUNCH SCHEDULE

Date: NET Dec. 8
Mission: SpaceX CRS-13
Description: NASA commercial cargo provider SpaceX will launch its 13th commercial resupply services mission to the International Space Station. The Dragon spacecraft will deliver supplies and equipment to the space station. Dragon also will deliver several science investigations, including a NASA instrument called Total and Spectral Solar Irradiance Sensor, or TSIS-1, and a fiber optic payload.
https://go.nasa.gov/2iDbbil

Want to see a launch?
The Kennedy Space Center Visitor Complex offers the closest public viewing of launches from Kennedy Space Center and Cape Canaveral Air Force Station. Launch Transportation Tickets are available for some, but not all, of these launches.
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I am KENNEDY SPACE CENTER

ANGELA KRENN

KSC RRM3 Liquid Methane Technical Lead
Exploration Payloads Branch, Engineering Directorate

I've been at Kennedy Space Center for 15 years, eight of them with NASA. For a little over a year and a half, I've been the Kennedy technical lead for developing the ground support equipment and processes required to load liquid methane onto the Robotic Refueling Mission 3 payload.

Working within a relatively small project brings unique challenges, but it's also very rewarding to have a direct impact on the development of technologies that are critical to a sustained human presence in space. RRM3 will accomplish a transfer of cryogenic propellant while in orbit. Cryogenic fluid management capabilities are essential for NASA missions beyond low-Earth orbit and will enable humans to explore further than ever before.

I began my career at Kennedy as a liquid hydrogen engineer supporting propellant loading of the space shuttle's external tank. After shuttle flyout, I briefly transitioned to design and development -- but then I was awarded a Kennedy Graduate Fellowship, through which I obtained a master's degree in physics. With that, I started working on research and technology development programs. I've worked on many different cryogenic propellant-related programs through the years, with RRM3 being the latest.

My favorite memory while working here was watching the launch of the New Horizons mission from the stairs of the Launch Control Center while I was pregnant with my son. I began telling him about the mission when he was little, and we both intently followed its progress 9.5 years later as it flew by Pluto.

LAUNCH SUCCESS

JPSS-1 to provide more accurate environmental forecasts

BY BOB GRANATH

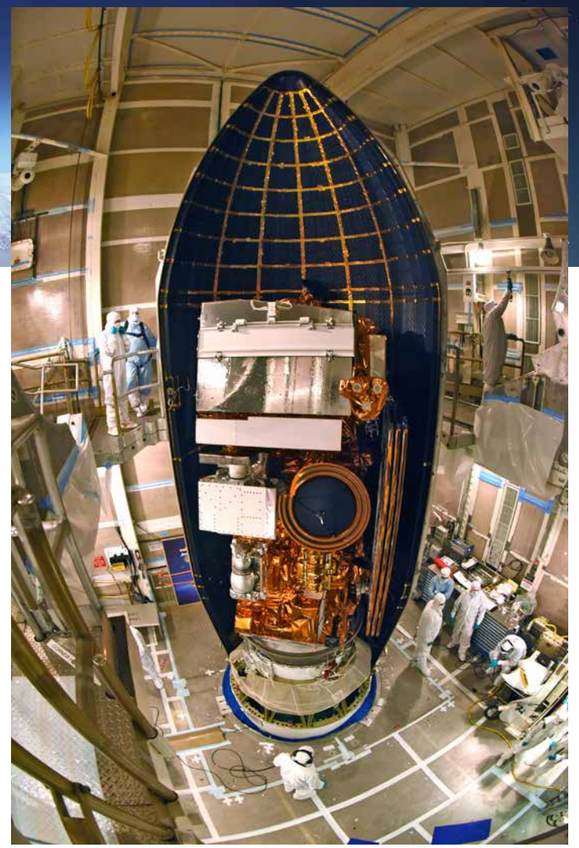
This illustration depicts JPSS-1, designed to provide forecasters with crucial environmental science data to provide a better understanding of changes in the Earth's weather, oceans and climate. Photo credit: Ball Aerospace

NASA successfully launched the **Joint Polar Satellite System-1,** or JPSS-1, satellite on behalf of the National Oceanic and Atmospheric Administration (NOAA) to provide essential data for timely and accurate weather forecasts and for tracking environmental events such as forest fires and droughts.

JPSS-1 is the first in NOAA's series of four next-generation operational environmental satellites designed to circle the Earth in a polar orbit. The JPSS program is a partnership between NOAA and NASA that will oversee all the satellites in the JPSS series. NOAA funds and manages the program, operations and data products. NASA develops and builds the instruments, spacecraft and ground system and launches the satellites for NOAA.

The mission began at 4:47 a.m. EST (1:47 a.m. PST), Nov. 18, 2017, with JPSS-1 atop a United Launch Alliance (ULA) **Delta II** rocket lifting off from Space Launch Complex 2 (SLC-2) at Vandenberg Air Force Base in California.

Built by Ball Aerospace of Boulder, Colorado, the satellite will pass over the equator about 14 times each day, covering the globe twice every 24 hours. As it works, JPSS-1 will gather measurements of atmospheric, terrestrial and oceanic conditions, including sea and land surface temperatures, vegetation, clouds, rainfall, snow and ice cover, fire locations, atmospheric temperature, water vapor and ozone.



The JPSS-1 satellite is encapsulated within the United Launch Alliance Delta II rocket's payload fairing. The two-piece fairing protects the payload during the climb to space. Photo credit: NASA/USAF 30th Space Wing

The United Launch Alliance Delta II rocket carrying NOAA's JPSS-1 satellite stands at Space Launch Complex 2 at California's Vandenberg Air Force Base following tower rollback Nov. 13, 2017. Photo credit: NASA/Kim Shiflett

With these varied observations, JPSS will give environmental experts more accurate warnings in advance of hurricanes, tornadoes and blizzards. During mission, JPSS-1 also will aid in assessing hazards such as droughts, forest fires, poor air quality and harmful coastal waters.

Preparations for the launch of JPSS-1 were underway for more than a year. The first stage of the Delta II rocket arrived at Vandenberg's NASA Hangar 836 on April 4, 2016. Later in the month, the Delta II interstage and second stage also reached the West Coast launch site.

On July 12, 2016, the first stage of the ULA Delta II rocket was transported to SLC-2 at Vandenberg and positioned on the launch pad. The rocket's second stage was hoisted into the pad's gantry on April 11, 2017, and mounted atop the first stage of the rocket.

The JPSS-1 satellite arrived at Vandenberg on Sept. 1, 2017, for preflight preparations in the Astrotech Processing Facility. Following checkouts, the spacecraft was encapsulated in its payload fairing and moved to SLC-2 and mounted atop the Delta II rocket.

JPSS-1 will follow the joint NOAA/NASA **Suomi National Polar-orbiting Partnership**, which was launched in 2011. Originally planned as a research and risk-reduction mission in the JPSS series, NOAA has been using Suomi NPP as its primary operational satellite for global weather observations since May 2014.

After it reaches orbit 512 miles above the Earth, JPSS-1 will be known as NOAA-20. Future satellites planned for the JPSS constellation include JPSS-2, scheduled for launch in 2021, JPSS-3 in 2026 and JPSS-4 in 2031. The series of four JPSS satellites are expected to span 20 years.

The U.S. government will make data from the JPSS system available to domestic and international users in support of U.S. commitments to the Global Earth Observation System of Systems (GEOSS).

HARDWARE HANDOFF

First SLS rocket hardware turned over to Ground Systems at Kennedy Space Center

BY BOB GRANATH

The Interim Cryogenic Propulsion Stage will provide Orion with the additional thrust needed to travel tens of thousands of miles beyond the Moon. During Exploration Mission-1, NASA's Orion spacecraft will venture 40,000 miles beyond the orbit of the Moon, farther than any spacecraft built for humans has ever traveled. Credits: NASA

NASA recently marked another key milestone in preparation for human deep space exploration near the Moon.

Mike Bolger, Ground Systems Development and Operations Program manager at NASA's Kennedy Space Center, speaks to guests during a ceremony in the high bay of the Space Station Processing Facility. The event marked the milestone of the Space Launch System rocket's Interim Cryogenic Propulsion Stage (ICPS) being turned over from NASA's Spacecraft/Payload Integration and Evolution organization to the spaceport's Ground Systems Development and Operations Program. The ICPS is the first integrated piece of flight hardware to arrive in preparation for the uncrewed Exploration Mission-1.
Photo credit: NASA/Bill White

Packed inside its canister on July 26, 2017, the Interim Cryogenic Propulsion Stage (ICPS) is moved inside the low bay entrance of the Space Station Processing Facility at NASA's Kennedy Space Center. Photo credit: NASA/Kim Shiflett

Officials with the **Space Launch System** (SLS) Spacecraft/Payload Integration and Evolution organization formally turned over processing of the rocket's **interim cryogenic propulsion stage** (ICPS) to the center's Ground Systems Development and Operations Program at NASA's Kennedy Space Center.

The SLS is a new heavy-lift rocket designed to send astronauts aboard the **Orion** spacecraft beyond low-Earth orbit to the vicinity of the Moon, and ultimately, the Red Planet.

During a recent ceremony in the high bay of the spaceport's Space Station Processing Facility, Mike Bolger, manager, GSDO Program at Kennedy, noted the ICPS is the first piece of hardware being turned over to GSDO for processing in preparation for the first integrated flight of SLS and Orion, which is an uncrewed mission known as Exploration Mission-1.

"It's great to be standing in front of flight hardware," he said. "Over the next year, the components of the most powerful rocket in the world will be delivered to the Kennedy Space Center."

John Honeycutt, SLS program manager at NASA's Marshall Space Flight Center in Huntsville, Alabama, thanked the Kennedy team for years of effort preparing the Florida spaceport's facilities for processing SLS and Orion.

"I've seen all your hard work that you're doing relative to the accomplishments you've made in the **Vehicle Assembly Building**, on the **mobile launcher** and out at the **launch pad**," Honeycutt said. "We're looking forward to getting you some more pieces of hardware to start moving over to the VAB so you can put the rocket together."

The ICPS arrived at Port Canaveral aboard the United Launch Alliance (ULA) Mariner barge earlier this year and is the first integrated piece of flight hardware completed for NASA's SLS rocket. It was shipped from the ULA facility in Decatur, Alabama.

After arrival, the ICPS was transported to the ULA Horizontal Integration Facility near Space Launch Complex 37 at Cape Canaveral Air Force Station. There it was removed from its shipping container for initial inspections. Next, the ICPS was moved to the Delta Operations Center for further checkouts. It then was packed inside a canister and transferred to the Space Station Processing Facility.

The ICPS now will be processed and prepared for Exploration Mission-1, the first integrated flight of SLS and Orion. NASA is **managing to December 2019** with four-to-six months schedule risk for launch. With the Orion attached, the ICPS sits atop the SLS rocket and uses liquid hydrogen and liquid oxygen propellants. The interim stage will provide Orion with the additional thrust needed to travel tens of thousands of miles beyond the Moon.

"Our human spaceflight mission at NASA is to push humans deeper out into the solar system," said Bill Hill, deputy associate administrator for Exploration Systems Development at NASA Headquarters in Washington. "We are going to take the Orion spacecraft, with the help of ICPS, farther into the solar system than any spacecraft built for humans has ever gone."

Technicians move the Orion heat shield for Exploration Mission-1 toward the thermal chamber in the Neil Armstrong Operations and Checkout Building high bay Oct. 23, 2017, at NASA's Kennedy Space Center. Protective pads have been attached to the heat shield surface. The heat shield will undergo a thermal cycle test to verify acceptable workmanship and material quality. The test also serves to verify the heat shield's thermal protection systems have been manufactured and assembled correctly. The Orion spacecraft will launch atop NASA's Space Launch System rocket on its first uncrewed integrated flight, Exploration Mission-1.
Photo credit: NASA/Ben Smegelsky

BRIDGE TO **ORION**

A heavy-load transport truck carrying the Orion crew access arm nears the mobile launcher (ML) at NASA's Kennedy Space Center on Nov. 10, 2017. The crew access arm will be installed at about the 274-foot level on the ML tower. It will rotate from its retracted position and interface with the Orion crew hatch location to provide entry to the Orion crew module. The Ground Systems Development and Operations Program is overseeing installation of umbilicals and launch accessories on the ML tower to prepare for Exploration Mission-1. Photo credit: NASA/Frank Michaux

Crew Access Arm for Space Launch System arrives at Kennedy Space Center

BY AMANDA GRIFFIN

When astronauts depart for missions to deep space, they will cross the Crew Access Arm about 300 feet above the ground to board their spacecraft. The access arm was delivered to NASA's Kennedy Space Center on Oct. 17, 2017, for installation on the **mobile launcher** in preparation for the first flight of the **Orion** spacecraft atop the **Space Launch System** rocket, or SLS.

The SLS will be the largest rocket in the world and will be stacked with Orion inside the historic **Vehicle Assembly Building**, or VAB, on the mobile launcher and rolled out to the pad prior to launch. The access arm will be one of 11 connection points to the rocket and spacecraft from the tower on the mobile launcher. After technicians install the arm, the mobile launcher will be rolled into the VAB for validation and verification tests.

For the first launch without crew, the access arm will provide a bridge to Orion for personnel and equipment entering the spacecraft during processing and prelaunch integrated testing while in the VAB and at the launch site. The arm is made up of two major components: the truss assembly and the environmental enclosure, or the white room. The arm will provide entry and emergency egress for astronauts and technicians into the Orion spacecraft.

On future human missions, astronauts outfitted with newly designed space suits will enter the white room, where they will be assisted by technicians into the spacecraft for launch. The arm will retract before launch, and the other connections will release at liftoff, allowing the rocket and spacecraft to safely clear the launch pad.

Two heavy-lift cranes are used to lower the Orion crew access arm onto a work stand in a storage location at Kennedy Space Center on Oct. 17, 2017. Photo credit: NASA/Kim Shiflett

The Orion crew access arm is moved by crane onto a flatbed truck at Precision Fabricating and Cleaning in Cocoa, Florida, on Oct. 16, 2017, for the trip to NASA's Kennedy Space Center. Photo credit: NASA/Kim Shiflett

How Does Your Space Garden Grow?

BY LINDA HERRIDGE AND AMANDA GRIFFIN

Astronauts aboard the International Space Station were busy in the early morning hours of Oct. 27, 2017, harvesting three varieties of leafy greens from the Veggie growth chamber and installing the next generation of plant research – the high-tech Advanced Plant Habitat.

SIMULTANEOUSLY GROWING THREE PLANT VARIETIES A FIRST FOR VEGGIE

The Veggie plant growth team kicked it up a notch with their sixth round of crops grown aboard the International Space Station with experiment VEG-03D. For the first time, three different plant varieties are simultaneously growing in the Veggie chamber.

Station astronaut Joe Acaba harvested Mizuna mustard, Waldmann's green lettuce and Outredgeous Red Romaine lettuce, providing himself and his crew with the makings of a salad — once they top it with salad dressing sent up by the ground crew at Kennedy Space Center, of course.

"It's an impressive harvest. Joe did a great job!" said Veggie project manager Nicole Dufour.

"As a continuation of our Veg-03 tech demo efforts, we wanted to try something a little bit different. Building on some of our current ground testing, we decided to attempt a mixed crop. We were hoping that the visual diversity of the plants would be more enjoyable to the crew, as well as the variety of flavors offered by the different types of leafy greens."

Above: Crew members aboard the International Space Station display some of their harvest from the Veggie plant growth system. From left are NASA astronauts Randy Bresnik and Joe Acaba, Paolo Nespoli with the European Space Agency, and Roscosmos cosmonaut Alexander Misurkin. Photo credit: NASA

During the harvest, Acaba only clipped about half of the leafy greens, leaving the rest to continue growing for a future yield. This technique, called cut-and-come-again repetitive harvesting, allows the crew to have access to fresh produce for a longer period of time.

Growing three different crops at the same time wasn't without its challenges.

Three different varieties of plants growing in the Veggie plant growth chamber on the International Space Station were harvested Oct. 27, 2017. Photo credit: NASA/ISS

Charles Spern, project manager on the Engineering Services Contract, communicates instructions for the Veggie system to astronaut Joe Acaba on the International Space Station. Spern is in the Experiment Monitoring Room in the Space Station Processing Facility at Kennedy Space Center. Three different varieties of plants from the Veg-03D plant experiment were harvested. Photo credit: NASA/Amanda Griffin

`"The biggest complication we have faced thus far has been how well the Mizuna has been growing," Dufour said. "Its long, spear-like stalks tend to get caught in the bellows as the crew opens and closes the unit to water the plants."

After the Veggie harvest, the crew kept on their virtual overalls and went on to install the Advanced Plant Habitat (APH), NASA's largest plant growth chamber.

ADVANCED PLANT HABITAT TURNS ON, TURNS UP RESEARCH

Acaba switched gears from Veggie to the new plant habitat around 5:45 a.m. EDT. APH project manager Bryan Onate and his team, in a monitoring laboratory in the Space Station Processing Facility, walked Acaba through procedures to install the plant habitat into an Expedite the Processing of Experiments to Space Station, or EXPRESS, rack in the Japanese Experiment Module Kibo.

"It's amazing that a plant growth system that began from a blank sheet of paper about five years ago now is installed on the space station," Onate said. "Plant scientists are really going to be able to learn utilizing this system."

The plant habitat is a fully enclosed, closed-loop system with an environmentally controlled growth chamber. It uses red, blue and green LED lights, and broad spectrum white LED lights. The system's more than 180 sensors will relay real-time information, including temperature, oxygen content and moisture levels back to the team at Kennedy.

"APH will be the largest plant growth system on the space station," Howard Levine, the chief scientist in Kennedy's Utilization and Life Science Office who started working on APH seven years ago, said. "It will be capable of hosting multigenerational studies with environmental variables tracked and controlled in support of whole plant physiological testing and bioregenerative life support system investigations."

Once the team at Marshall Space Flight Center completes an EXPRESS rack water flow test, the Kennedy team will power up the system. After the water cooling system with the APH passes the test, functional checkout of the plant habitat will begin and take about one week to complete.

Four power feeds to the plant habitat will be turned on and the Kennedy team will monitor the system's Plant Habitat Avionics Real-Time Manager, or PHARMER, for a response. This unique system provides real-time telemetry, remote commanding and photo downlink to the team at Kennedy.

After the PHARMER has verified all subsystems are a go, space station crew members will install the science carrier and initiate the growth of test crops - Arabidopsis seeds, small flowering plants related to cabbage and mustard, and dwarf wheat - during an overlapping timetable of about five weeks. During this time, the system will be monitored for its capability to grow plants, capture and reuse water, and maintain the atmosphere in the growth chamber.

Nicole Dufour, flight integration lead, communicates directly with astronaut Joe Acaba during installation of NASA's Advanced Plant Habitat in the Japanese Kibo module on the International Space Station. Dufour is in the Experiment Monitoring Room in the Space Station Processing Facility at Kennedy Space Center. The procedures to install the system took about six hours. Photo credit: NASA/Amanda Griffin

"The test will help us to determine if the planting procedure is good and the habitat is operating as designed," Onate said. "The results of plant growth in the habitat will be compared with the results of tests completed in the control unit here at Kennedy."

All of these preparations are leading up to the initiation of PH-01, which will grow five different types of Arabidopsis and is scheduled to launch on Orbital ATK's ninth commercial resupply mission to the space station.

The nutritional boost of fresh food and the psychological benefits of growing plants become paramount as the agency plans for future missions to deep space destinations.

NASA Kennedy Space Center honored Veterans Day and celebrated Native American Heritage Month on Nov. 2, 2017. Retired NASA astronaut Dr. John Herrington visited the center and shared his presentation “Living Your Dreams” with the Kennedy workforce. Herrington is a retired United States Navy commander and a former astronaut. He flew aboard space shuttle Endeavour as a crew member of the STS-113 mission in November 2002. During the mission, Herrington installed the P-1 truss on the International Space Station. He was the first enrolled member of a Native American tribe to fly in space and currently serves as an ambassador for the Chickasaw Nation.
Photo credit: NASA/Tony Gray

Sierra Nevada Corp's Dream Chaser rolls out on the runway at Edwards Air Force Base in California following the vehicle's successful free flight. Photo credit: NASA

SUCCESSFUL GLIDE

Free flight completes crucial milestone for Dream Chaser

BY BOB GRANATH

Sierra Nevada Corp.'s **Dream Chaser** spacecraft recently glided to a successful landing at NASA's Armstrong Flight Research Center located on Edwards Air Force Base in California. Completion of Dream Chaser's free-flight test on Nov. 11, 2017, was a major milestone under a Space Act Agreement with NASA's **Commercial Crew Program.**

NASA selected Sierra Nevada Corp., along with Orbital ATK and SpaceX, for the agency's second commercial resupply contracts to deliver critical science, research and technology demonstrations to the **International Space Station** from 2019 to 2024.

For the free-flight test, a Columbia Helicopters model 234 UT heavy-lift helicopter carried aloft an uncrewed Dream Chaser test article, suspended at the end of a cable. The lifting-body, winged spacecraft had all the same outer mold line specifications as a flight-ready vehicle. A lifting body is a fixed-wing aircraft or spacecraft shaped so that the vehicle body itself produces lift.

After release, Dream Chaser glided on its own and landed in a manner similar to NASA's space shuttles.

"It is very exciting that Sierra Nevada Corp. successfully completed this important free-flight test," said Steve Stich, deputy manager, NASA Commercial Crew Program. "The Dream Chaser team has done an amazing job preparing for and executing this test, and the Commercial Crew Program has been with them along the way. The flight computers and avionics systems are the same as the orbital vehicle so this test will pave the way for future landings for the International Space Station missions."

The current tests are helping Sierra Nevada Corp. validate the aerodynamic properties, flight software and control system performance of the Dream Chaser under the Commercial Crew Integrated Capability Contract, or CCiCap, for commercial crew.

"This test represents the culmination of many years of work by the Sierra Nevada team in developing a lifting-body spacecraft with the capability of performing both crewed and uncrewed cargo-carrying missions to the space station," said Mike Lee, NASA Commercial Crew Program Space Act Agreement partner manager. "It was a significant achievement that successfully demonstrated the final phase of atmospheric flight that will occur after re-entry from an orbital mission."

The spacecraft arrived at Armstrong on Jan. 25. Evaluations included a series of tests, including successful **captive carry tests** where the Dream Chaser test vehicle was carried over the California desert by the heavy-lift helicopter, clearing the way for the recent release and free flight.

"We had an outstanding free-flight test and are very grateful to both our SNC team and NASA for getting us here," said Steve Lindsey, vice president, Sierra Nevada Corp.'s Space Exploration Systems. "We are excited to complete this critical milestone and can't wait to move forward with the program. This fully successful Dream Chaser free-flight test gets us one step closer to space."

The data from these tests also will help in the final design of the cargo Dream Chaser, scheduled for at least six supply delivery missions to the space station. With its capability to return to a runway landing, the spacecraft will be able to bring back experiments and other cargo.

"Dream Chaser is planned to be the newest addition to the fleet of vehicles delivering and returning critical science samples and hardware to and from the International Space Station." said Kirk Shireman, NASA's Space Station Program manager. "This test is a critical next step for our commercial partners on their path to their first flight."

The free flight and landing were similar to five approach and landing flight tests of the space shuttle in 1977. The space shuttle Enterprise was released from a NASA 747 shuttle carrier aircraft, gliding to a piloted landing at Edwards. Dream Chaser is being designed to make automated, pilotless flights back to Earth from the space station.

Having been dropped from an altitude of 12,400 feet, Sierra Nevada Corp.'s Dream Chaser lands at Edwards Air Force Base in California as part of a successful free flight on Nov. 11, 2017. It was a crucial milestone to help finalize the design for the cargo version of the spacecraft for future resupply missions to the International Space Station. Photo credit: NASA/Carla Thomas

Following its free flight, Sierra Nevada Corp's Dream Chaser rolls out on the runway at Edwards Air Force Base in California. Photo credit: NASA

A worker tries out a virtual reality experience during the 2017 Innovation Expo at NASA's Kennedy Space Center. Photo credit: NASA/Frank Michaux

NEW IDEAS

Innovation Expo focuses on future technologies

BY LINDA HERRIDGE

Creation of new and innovative technologies to help advance NASA's exploration capabilities is alive and well at NASA's Kennedy Space Center. With a focus on future technologies, the center's annual Innovation Expo kicked off Oct. 31 and continued through Nov. 1. It featured keynote presentations, the KSC KickStart Competition, several training opportunities and a showcase of new technologies being developed by engineers, researchers and scientists from around the spaceport.

"The events of the expo are a place where Kennedy employees can learn and explore the innovations of our center while making new connections for future discoveries," said Meredith Reeves, event co-chairperson. Reeves is a management and program analyst in the Research and Technology Management Office within the Exploration Research and Technology Programs directorate.

Event co-chairperson Kelley Jones-McDowall, a propulsion engineer for the Launch Services and Commercial Crew programs, hopes that employees attending the events take back a new perspective or tool to their daily jobs that helps foster innovation throughout the center.

Daniel Coleman, editor-in-chief of NASA Spinoffs publication, shared NASA technologies through the decades, and how more than 2,000 NASA technologies have an everyday impact on people around the world.

While Kennedy Space Center is usually known for launching rockets, it also is home to many inventors. Many spinoffs have been developed right here at the spaceport.

One very practical technology is shock absorbers originally developed for the space shuttle that crossed over to become seismic dampers for wobbly bridges and also are used to help reduce the effects of earthquakes on buildings.

Emulsified Zero-Valent Iron, or EZVI, developed by Dr. Jacqueline Quinn, a NASA environmental engineer, removes pollutants from groundwater and is the most-patented NASA technology to date.

The aerogel composite blanket was developed by Dr. James Fesmire, senior principal investigator in cryogenics, for NASA for use as a barrier to the extreme temperatures that occur during rocket launches and affect spacecraft as they are exposed to high heat and severe cold. The technology crossed over to commercial applications for insulating millions of miles of piping and shipping vessels in the oil and gas industry. Consumer goods all over the world contain the material under various brand names. According to Fesmire, It is the lowest thermal conductivity insulation in the world.

Shaun Daly, an integration engineer in the Launch Services Program, explains a new outreach activity for young students during the 2017 Innovation Expo showcase at NASA's Kennedy Space Center. Photo credit: NASA/Frank Michaux

Keynote speaker Bill Gerstenmaier, associate administrator for NASA's Human Exploration and Operations Mission Directorate, packed the house as he discussed the agency's concept for a deep space gateway – which would be a crew-tended outpost near the Moon.

Gerstenmaier discussed the innovative work underway for missions to the vicinity of the Moon, and future crewed missions to Mars. He acknowledged the role Kennedy would play in helping launch potential components of the deep space gateway, and called NASA's Orion, Space Launch System and ground systems "the building blocks to human deep space exploration."

During the annual KickStart competition, employees presented their proposals for seed money that could turn an innovative idea into an actual project in front of a panel of senior leaders. Criteria considered were innovativeness, relevance and impact to Kennedy, and the likelihood of success, value and sustainability. Ten winning proposals were announced and will share in a total of $40,000 of NASA funding to continue developing their projects.

During the 2017 Innovation Expo showcase, Trent Smith, a project manager in the ISS Exploration Research and Technology Program, displays microgreens grown in the same space dirt (arcillite) that is used in the plant pillows for the Veggie plant growth system on the International Space Station and in a 3-D-printed plastic matrix.
Photo credit: NASA/Frank Michaux

The Innovation Showcase featured more than 20 new and developing technologies ranging from virtual reality software programs, to 3-D printed parts designed to collect and deposit moon dirt more efficiently, to an outreach activity for children to build and launch small rockets.

"We know small steps lead to giant leaps and it's not just major innovations that have marked and will continue to mark our success," said Kennedy Chief Technologist Barbara Brown. "It's also the small, everyday innovations – the results of asking and answering questions such as, *Is there a better way? A faster way? A way that reduces mistakes?* It is this kind of innovation that will enable future NASA missions and bolster U.S. competitiveness."

A "moon dust" beehive is on display during the 2017 Innovation Expo showcase at NASA's Kennedy Space Center. Photo credit: NASA/Frank Michaux

> ***"The events of the expo are a place where Kennedy employees can learn and explore the innovations of our center while making new connections for future discoveries."***
>
> **Meredith Reeves**
> Management and Program Analyst
> Exploration Research and
> Technology Programs Directorate

REACHING OUT

NASA Night gives Dreamflight kids opportunity of a lifetime

BY BOB GRANATH

Several young people in the Dreamflight group participated in a virtual reality demonstration. Photo credit: Dreamflight

A group of seriously ill or disabled children and their caregivers from the United Kingdom recently had an opportunity for a special vacation in Orlando, Florida. For the past 30 years, UK-based Dreamflight has chartered a 747 jumbo jet for 192 children facing a disability. The children spent 10 days in exciting events, including an evening of space-themed activities with NASA.

The "SpacePerson" from the Kennedy Space Center Visitor Complex posed for photos with Dreamflight children. Photo credit: Dreamflight

While in Central Florida, the children, ages 8 to 14, spent time at Orlando's theme and water parks. For the past five years, NASA has been part of the experience for these youngsters with an interactive NASA Night created by volunteers from NASA's Kennedy Space Center.

Dreamflight was co-founded in 1986 by Patricia Pearce and Derek Pereira, both of whom worked for British Airways. They began raising funds to take deserving children to Orlando theme parks and Dreamflight was born. The program's goal is to change the kids' young lives. But to the Kennedy employees who spent a few hours with these special children, Dreamflight and the children made a lasting impact.

Peter Karikas is 14 years old and is a member of the Stargazing Club at his school in Scotland. He stated that NASA Night was his favorite activity of the entire trip.

"I'm quite interested in this as I aspire to do something like that," he said. "I would love to work for NASA – that's my dream job!"

A total of 40 participants from Kennedy included employees from the center's Education Projects and Youth Engagement Office, Commercial Crew Program, Launch Services Program, Ground Systems Development and Operations, as well as contractor representatives from Jacobs and Delaware North at the Kennedy Space Center Visitor Complex.

In addition to Kennedy employees, the Orlando Science School's "Clockwork Mania" FIRST Robotics team, including five students and two mentors, presented a robotic demonstration and answered questions.

While there were many fun activities, the young people were thrilled to hear from someone who had flown aboard the space shuttle. Florida Tech professor of physics and space sciences, Dr. Sam Durrance, gave a presentation called "Astronaut Talk." He was a payload specialist on STS-35 in 1990 and STS-67 in 1995.

Karikas said he enjoyed meeting and talking to Durrance.

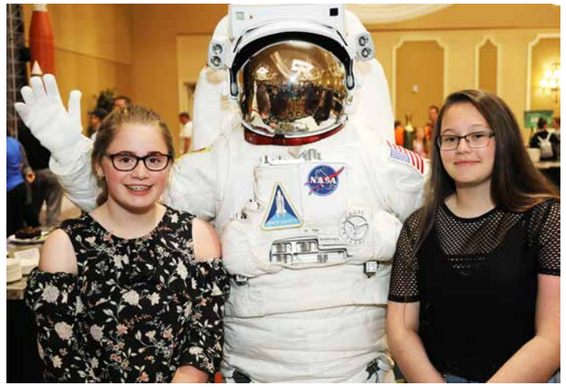
"I loved hearing his stories and seeing the pictures from space," he said. "There is so much out there to do and learn about. It's all fascinating to me."

After hearing about what it's like to fly in space, the young people participated in a virtual reality demonstration, gee-whiz science presentation, rode a hovercraft and had their picture taken with the "SpacePerson" from the Kennedy visitor complex.

Dreamflight team leader Jason Beamish-Knight has been volunteering with the organization for 15 years.

"I enjoy the satisfaction of working with the kids," he said. "It's all about helping them have the holiday of a lifetime."

There were lots of smiles as children ages 8 to 14 participated in NASA Night as part of their Dreamflight experience. For the past five years, NASA has been part of the experience for these youngsters with an interactive NASA Night created by volunteers from NASA's Kennedy Space Center. Photo credit: Dreamflight



The "SpacePerson" from the Kennedy Space Center Visitor Complex posed for photos with Dreamflight children. Photo credit: Dreamflight

A Dreamflight participant tries out a hovercraft during the recent NASA Night event in Orlando. The children spent 10 days in exciting events, including an evening of space-themed activities. Photo credit: Dreamflight

Launching STEM Careers

NASA retirees launch new project reaching out to local students

BY BOB GRANATH

After retiring from NASA's Kennedy Space Center, five NASA women engineers are sharing their experiences and giving back to the Space Coast community by mentoring young women from fourth grade through college seniors.

Following a mentoring event with girls from low socioeconomic backgrounds in the Tampa area, Rita Willcoxon and Roselle Hanson discovered that many were unfamiliar with professions in science, technology, engineering and math, or STEM.

That triggered an idea to reach out to students with a program to demonstrate to girls at all levels what it would be like to be in a STEM career, especially engineering.

"We started asking other Kennedy retirees to share in the vision and start a program in two elementary schools to work with young women doing real hands-on activities that would simulate a career in STEM," said Willcoxon, Kennedy's former director of Launch Vehicle Processing. "What resulted is now called the Launch STEM Careers Project."

Read the full story at **https://go.nasa.gov/2isf3m1**

The goal of the Launch STEM Careers Project is to reach out to students with a program to demonstrate to girls at all levels what it would be like to be in a science, technology, engineering and math, or STEM, career, especially engineering. Team members, from the left, are Maria Lopez-Tellado, Rita Willcoxon, Roselle Hanson and Ruth Gardner. Photo credit: NASA

Members of the Launch STEM Careers Project team are building rockets from foam materials for student hands-on activities. From the left are Rita Willcoxon, Maria Lopez-Tellado, Roselle Hanson and Ruth Garner. Photo credit: NASA

The prestigious 2017 Pulaski Award, presented to the Spaceport Integration Team and its partners, is on display on the Merritt Island National Wildlife Refuge. The multi-agency team includes representatives from NASA's Kennedy Space Center, Cape Canaveral Air Force Station's 45th Space Wing, the Merritt Island National Wildlife Refuge, as well as the Florida Forest Service and Brevard County Fire Rescue.
Photo credit: NASA/Kim Shiflett

Ceremonial Pulaski tools are positioned in front of a new memorial marker Nov. 1 on the Merritt Island National Wildlife Refuge. During a joint ceremony, the Spaceport Integration Team and its partners were presented with the prestigious 2017 Pulaski Award and the new memorial marker was dedicated. The memorial marker honors two fallen firefighters, Scott Maness and Beau Sauselein, who died fighting a wildfire on space center property in 1981.
Photo credit: NASA/Kim Shiflett

MULTI-AGENCY COOPERATION RECOGNIZED

Prescribed Burn Working Group wins 2017 Pulaski Award

BY KAY GRINTER

The multi-agency Prescribed Burn Working Group was presented with the prestigious 2017 Pulaski Award by the governing board of the National Interagency Fire Center (NIFC) in Boise, Idaho. The group includes representatives from NASA's Kennedy Space Center, Cape Canaveral Air Force Station's 45th Space Wing and the Merritt Island National Wildlife Refuge, recognized as the Spaceport Integration Team, and their partners with the Florida Forest Service and Brevard County Fire Rescue.

The Pulaski Award recognizes groups demonstrating outstanding performance in the areas of interagency collaboration, cooperation and coordination, as well as the safety of wildland firefighters or the American public during a wildfire, outstanding group performance in fire management and fire operations activities, outstanding performance on a wildland fire management project or activity and development of partnerships or communication tools.

The honor was given to the team in recognition of a unique government partnership at Kennedy Space Center, Cape Canaveral Air Force Station and the surrounding refuge lands as a model of success in wildland fire management. Kennedy was represented on the team by employees from Spaceport Integration and Services, under the direction of Nancy Bray. Spaceport Integration and Services is responsible for coordinating and integrating the prescribed burns on space center property with all the NASA programs and the commercial and government partners operating on the multi-user spaceport.

The U. S. Fish and Wildlife Service hosted the ceremony Nov. 1 at their headquarters building on the Merritt Island National Wildlife Refuge, combining it with the dedication of their memorial marker honoring two fallen firefighters who died fighting a wildfire on

Representatives of the Spaceport Integration Team and its partners display the Pulaski Award plaques presented at a ceremony Nov. 1 on the Merritt Island National Wildlife Refuge. From left are Col. Z. Walter Jackim, vice commander, 45th Space Wing, Cape Canaveral Air Force Station; Michael Good, assistant fire management officer, Merritt Island National Wildlife Refuge; John Fish, chief, Florida Forest Service; Mark Schollmeyer, chief, Brevard County Fire Rescue; and Kelvin Manning, associate director, NASA's Kennedy Space Center. Photo credit: NASA/Kim Shiflett

Kennedy property in 1981, a tragedy that lead to the establishment of a prescribed burn program to better manage the land and reduce the threat of future wildfires. A statue, the Pulaski Award will remain on display on the wildlife refuge for a year.

"It is great honor to receive the award because it recognizes the dedication of the men and women who work together to accomplish our fire management goals," said Michael Good, assistant fire management officer for the Merritt Island National Wildlife Refuge and organizer of the event. "The high level of teamwork and collaboration that the Spaceport Integration Team members display should stand as a model for other fire management agencies to follow."

The ceremony opened with the six-person uniformed FWS National Honor Guard presenting colors and symbolically placing firefighting tools at the inscribed granite marker, followed by the 2017 Pulaski Award plaque presentations. Kennedy Space Center Associate Director Kelvin Manning accepted the plaque on behalf of the center.

"It has been 36 years since the Ransom Road Fire occurred on June 8, 1981, which took the lives of Scott Maness and Beau Sauselein," Good said. "The memorial was designed and built by local fire management staff to serve as a daily reminder of their sacrifice. On a personal note, I must say that dedicating this memorial has been the most satisfying accomplishment of my career. There is nothing more prideful than honoring your fallen brothers and sisters."

Jon Wallace, deputy regional fire management coordinator for the U.S. Fish and Wildlife Service in Atlanta, praised the Spaceport Integration Team in his nomination letter for the award: "The success we realized in 2016 is due to our partners' understanding that technology and nature can and should co-exist on an island off the east coast of Florida. Collectively, we can be proud that our efforts have resulted in thousands of acres of prescribed burns, and hundreds of acres of mechanical hazard fuel reduction projects, for the end goal of restoring native habitats for a threatened species, and protection of our neighbor's homes and the nation's space program infrastructure.

"Through the leadership of the Spaceport Integration Team," he stated, "these treatments were scheduled and accomplished around 36 successful rocket launches."

An exhibitor with NASA answers questions at Kennedy Space Center's 27th Business Opportunities Expo. Photo credit: NASA/Ben Smegelsky

NETWORKING BONANZA

Annual Business Opportunities Expo provides guidance, advice

BY LINDA HERRIDGE

For business owners like Theresa Cooper and Brian Larson, participating as vendors at NASA Kennedy Space Center's Business Opportunities Expo on Oct. 24, 2017, the exhibition was indeed a unique opportunity.

"With each handshake, I could feel the excitement of new opportunities and growth within the space industry," Cooper said. "One of the takeaways I found helpful was the ability to network with large and small businesses, share our capability and experience, and form new prospective partnerships."

Her company, GP Strategies in Titusville, Florida, has been participating in the event since the mid-1990s.

"This is our second year participating," said Larson, of Kardex Storage Systems LLC in Jacksonville, Florida. "We do a lot of business on the Space Coast. It's a good fit for us."

Hundreds of business leaders interested in learning about government contracting opportunities and what local and national

Attendees visit exhibitor booths at Kennedy Space Center's 27th Business Opportunities Expo held Oct. 24, 2017, at Cruise Terminal 5 at Port Canaveral in Florida. Photo credit: NASA/Ben Smegelsky

An exhibitor with Teledyne Brown Engineering answers questions at Kennedy Space Center's 27th Business Opportunities Expo. Photo credit: NASA/Ben Smegelsky

vendors have to offer attended the business expo, held this year at Cruise Terminal 5 at Port Canaveral in Florida. The event drew more than 180 exhibitors and about 1,700 registered participants.

First-year participant David Turcios, a surety bond specialist with Nielson Bonds based in Miami Lakes, Florida, said his business partner attended the expo last year and was so impressed with the turnout that she insisted they be an exhibitor this year.

"What an incredible event," Turcios said. "One of the positives of participating is seeing all of the opportunities available for small businesses and emerging contractors."

Now in its 27th year, the annual expo is sponsored by Kennedy's Prime Contractor Board, the U.S. Air Force 45th Space Wing and the Canaveral Port Authority. Kennedy's Central Industry Assistance Office provides support to small companies that want to do business at the center. The office works with the Prime Contractor Board to help small businesses learn how to navigate in the world of government contracting.

"This is, by far, probably the largest outreach event for small businesses on the east coast," said Glenn Delgado, associate administrator of NASA's Office of Small Business Programs. "Opportunities like this don't come along very often."

Delgado said federal agencies, small business specialists and NASA's large prime contractors can help smaller firms learn how to do business with the government. The last fiscal year, through the Small Business Program, NASA awarded about $2.7 billion directly to small businesses working with the agency.

Michael McCarty, Kennedy's director of Procurement, said the benefits of this event are tremendous. "It's a great opportunity for the small business community to take advantage of NASA's Small Business specialists and learn as much as possible on how to do business with us," McCarty said. "Industry is extremely important to us."

McCarty said Kennedy spends more than $2 billion a year, with more than 80 percent of its budget spent through procurements with commercial firms.

Valerie Muck, Small Business director for the U.S. Air Force, said her team is responsible for directing, managing, measuring and overseeing the execution of the small business programs for the Air Force. "We play an important role in bridging the gap between Air Force requirements and strategies and the technologies small business can bring to the table," Muck said.

A Small Business panel question-and-answer session allowed participants to learn about the different programs in place to help small companies do business with NASA and the U.S. Air Force. Panelists included Valerie Muck, Small Business director, U.S. Air Force; Margot Dorfman, chief executive officer, U.S. Women's Chamber of Commerce; Andrew Harold, co-founder and board chairman, Florida 8(a) Alliance; Ileana Serrano, data dissemination specialist, Illinois and Indiana, U.S. Census Bureau; and Eduardo Ramos, senior area manager, U.S. Small Business Administration, North Florida District Office.

Erica Lemp, executive director, weVenture at the Florida Institute of Technology in Melbourne, attended the expo the last four years.

"It's an opportunity to meet and network with some of the great small businesses in Brevard and other areas of Florida who we don't usually get the opportunity to meet. As a small business resource organization, this event provides us with great exposure and access to businesses who might require our assistance as they grow," Lemp said.

A memorial wreath was placed in the Heroes and Legends exhibit at the Kennedy Space Center Visitor Complex following a ceremony Nov. 9, 2017, to honor the memory of former NASA astronaut Richard Gordon. He performed two spacewalks during Gemini XI in 1966 and was command module pilot on Apollo 12 in 1969. Gordon died Nov. 6, 2017, at the age of 88. Photo credit: NASA/Michelle Stone

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SP-2017-11-1172-KSC