



KENNEDY SPACE CENTER'S
SPACEPORT
m a g a z i n e



NASA's Launch Services Program
Celebrates 20 Years at KSC

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NASA's Launch Services Program at Kennedy Space Center celebrated its 20th anniversary on Oct. 1, 2018.

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KENNEDY SPACE CENTER

TRIP HEALEY

**Mission Manager
Commercial Crew Program**



I am one of two mission managers assigned to Boeing within the Commercial Crew Program. I facilitate collaboration between NASA and Boeing, and ensure the requirements and processes necessary to conduct a successful flight are in place and ready prior to the flight. I will manage Boeing's Orbital Flight Test and first crew rotation mission from a NASA perspective, while my teammate in Houston will manage the company's Crew Flight Test and second crew rotation mission.

I spent hundreds of hours as a door gunner for a helicopter squadron in the U.S. Marine Corps, and my love for military aviation was one reason I pursued a degree in aerospace engineering. I started working with NASA as a contractor, then became a NASA civil servant in 2005. I've been supporting Commercial Crew for more than eight years.

My time in the Marines has served me well at NASA, teaching me to adapt, improvise and overcome, no matter the circumstances. There are so many lessons learned from the military environment that transitioned into the NASA workforce – like teamwork, mission accomplishment, and watching out for one another.

Commercial Crew launches are just around the corner now, and the entire team is fully committed to flying safely. We feel as though what we are doing is bigger than any of us.

Marking a MILESTONE



NASA's Launch Services Program Celebrates 20th Anniversary at Kennedy Space Center

BY LINDA HERRIDGE

While NASA is celebrating its 60th anniversary as an agency, NASA also is celebrating the 20th anniversary of the **Launch Services Program (LSP)**, the first agency program managed at NASA's Kennedy Space Center in Florida. Two decades ago, on Oct. 1, 1998, NASA consolidated expendable launch vehicle services shared by Glenn Research Center in Cleveland, Ohio; Goddard Space Flight Center in Greenbelt, Maryland; and Kennedy, creating the Expendable Launch Vehicle Program. It was then formally named the Launch Service Program in 2002.

Before consolidation, Glenn handled the intermediate and large rockets, (i.e. the Atlas and the Titan launch vehicles at the time), and did all of the early mission work and then turned over the responsibility to Kennedy just prior to when the rocket was stacked on the pad. Goddard managed the ultra-light, small and medium launch vehicles, including the Pegasus and Delta II, and then turned over responsibility to Kennedy in the same manner. Kennedy began procuring small class vehicles from Goddard with the Small Expendable Launch Vehicle contract awarded in 1998.

"In the 1980s and early 90s, we owned the launch pads and the rockets. Even when it wasn't a NASA or NASA-sponsored payload, we worked on it," said **Chuck Dovale**, LSP deputy program manager. "This is something that most people aren't aware of."

Boeing's (at the time) Delta II rocket is bathed in light as it awaits its destiny, hurling NASA's Deep Space 1 into space. Launch occurred just after midnight Oct. 24, 1998, from Launch Complex 17 at Cape Canaveral Air Force Station. The first flight in NASA's New Millennium Program, Deep Space 1 was designed to validate 12 new technologies for scientific purposes of the next century, including the ion propulsion engine. It was the first launch for NASA's new Launch Services Program, managed at Kennedy Space Center. Photo credit: NASA



NASA's Tracking and Data Relay Satellite (TDRS-H) rises into the blue sky at 8:56 a.m. EDT on June 30, 2000, aboard an Atlas IIA/Centaur rocket, from Launch Complex 36A at Cape Canaveral Air Force Station in Florida. At the time, TDRS satellites served as the sole means of continuous, high-data-rate communication with the space shuttle, the International Space Station, and dozens of unmanned scientific satellites in low-Earth orbit. Photo credit: NASA

became the Avionics Branch chief. He served as alternate launch director for the **Cassini** mission to Saturn in 1997, and worked his way up to senior launch director before becoming deputy of the program in 2010.

Dovale's first mission as launch director was **Landsat-7**, which launched April 15, 1999, on a Delta II rocket from Vandenberg. His final mission as launch director was the **Wide-field Infrared Survey Explorer**, launched Dec. 14, 2009, also on a Delta II rocket from the California launch site.

"It's good to stand back and take a look at what LSP provides," Dovale said. "Some highlights include missions to other planets, landing rovers on Mars, satellites orbiting our planet and others to study land, sea, ice, carbon buildup, and sending back images. Ultimately, we're also helping humans get to Mars."

One of his favorite missions is the **Phoenix Mars Lander**, for which he was launch director.

"I was launch director for this mission. I was at the Jet Propulsion Laboratory in Pasadena, California, when it landed on Mars," Dovale said.

The current NASA Launch Directors, Omar Baez and Tim Dunn, each have unique paths that brought them to LSP and eventually to their current roles. Baez was a hydrogen engineer for the Space Shuttle Program before

When rocket launches were commercialized in 1989, NASA began working only its own missions. Nearly 10 years later, the transition to LSP took place. The consolidation brought together technology, business, procurement, engineering best practices, strategic planning, and cutting-edge techniques under one roof.

LSP achieved its 90th mission with the recent launch of NASA's **Ice, Cloud and land Elevation Satellite-2 (ICESat-2)**, on the final Delta II rocket, provided by United Launch Alliance, from Vandenberg Air Force Base in California, on Sept. 15, 2018. The program also has served in a launch "advisory role" for other missions, such as Commercial Resupply Services for the International Space Station, and the recent **Gravity Recovery and Climate Experiment Follow-on (GRACE-FO)**.

As LSP enters the next 20 years, the team takes stock of its past and looks ahead to the future.

With his tagline, "I was LSP before LSP was LSP," Dovale has been at Kennedy since 1982. He's worked in LSP since starting as a co-op student in 1984. In 1994 he



Four Launch Service Program team members stand in front of Hangar AE in August 2016 at Cape Canaveral Air Force Station (CCAFS). From left, are Chuck Dovale, deputy program manager; Amanda Mitskevich, program manager; Omar Baez, NASA launch director; and Bobbi Gnan, chief of the LSP Business Office. They are holding the retired Expendable Vehicles sign that was on the front of the E&O Building at CCAFS. Photo credit: NASA



With the Atlantic Ocean as a backdrop, a Lockheed Martin Atlas V rocket, 19 stories tall, launches on Aug. 12, 2005, at 7:43 a.m. EDT from Launch Complex 41 at Cape Canaveral Air Force Station in Florida. It carried NASA's Mars Reconnaissance Orbiter for its mission to investigate the Red Planet. Photo credit: NASA/JPL/KSC/Lockheed Martin Space Systems.

moving to LSP in May 1993, while Dunn came from the U.S. Air Force.

Baez was a mechanical and propulsion engineer for the Titan, and also worked on Atlas, Delta and the Scout Program for several years. He also worked on the Titan IV and the Titan IVB, which was used to launch Cassini.

After Cassini launched in 1997, Baez transitioned from being a systems engineer to a mission manager even before the transition or consolidation at Kennedy became official. He was one of the original mission managers, and worked on **Genesis** before becoming launch director in 2000. Baez' first mission was **Tracking and Data Relay Satellite-H**, which launched on June 30, 2000, on an Atlas II-A, from Cape Canaveral Air Force Station in Florida.

Baez' memorable missions include **Mars Exploration Rovers A and B**, which were renamed Spirit and Opportunity, and the **Spitzer Space Telescope**. He was launch director for the recent **Parker Solar Probe**, launched Aug. 12, on a Delta V Heavy rocket from the Cape.

"Looking ahead, I think the next big mission will be Mars 2020, on an Atlas V from Space Launch Complex 41," Baez said. "I am also looking forward to some of the new smaller-class rockets such as RocketLab's Electron rocket or Virgin Orbit's Launcher One!"

In the late 1980s, Dunn worked on Global Positioning Satellites with the Air Force in Colorado. He made the move to the Cape to work on the Titan IV as an Air Force launch controller in 1993. In 1996, he made the move to McDonnell Douglas to work on the Delta II, a rocket that would become a favorite.

Dunn joined LSP in late 2000 as an electrical engineer for Guidance and Navigation, and then a vehicle systems engineer, both for the Delta II. "At that time, the Delta II was the industry workhorse," Dunn said.

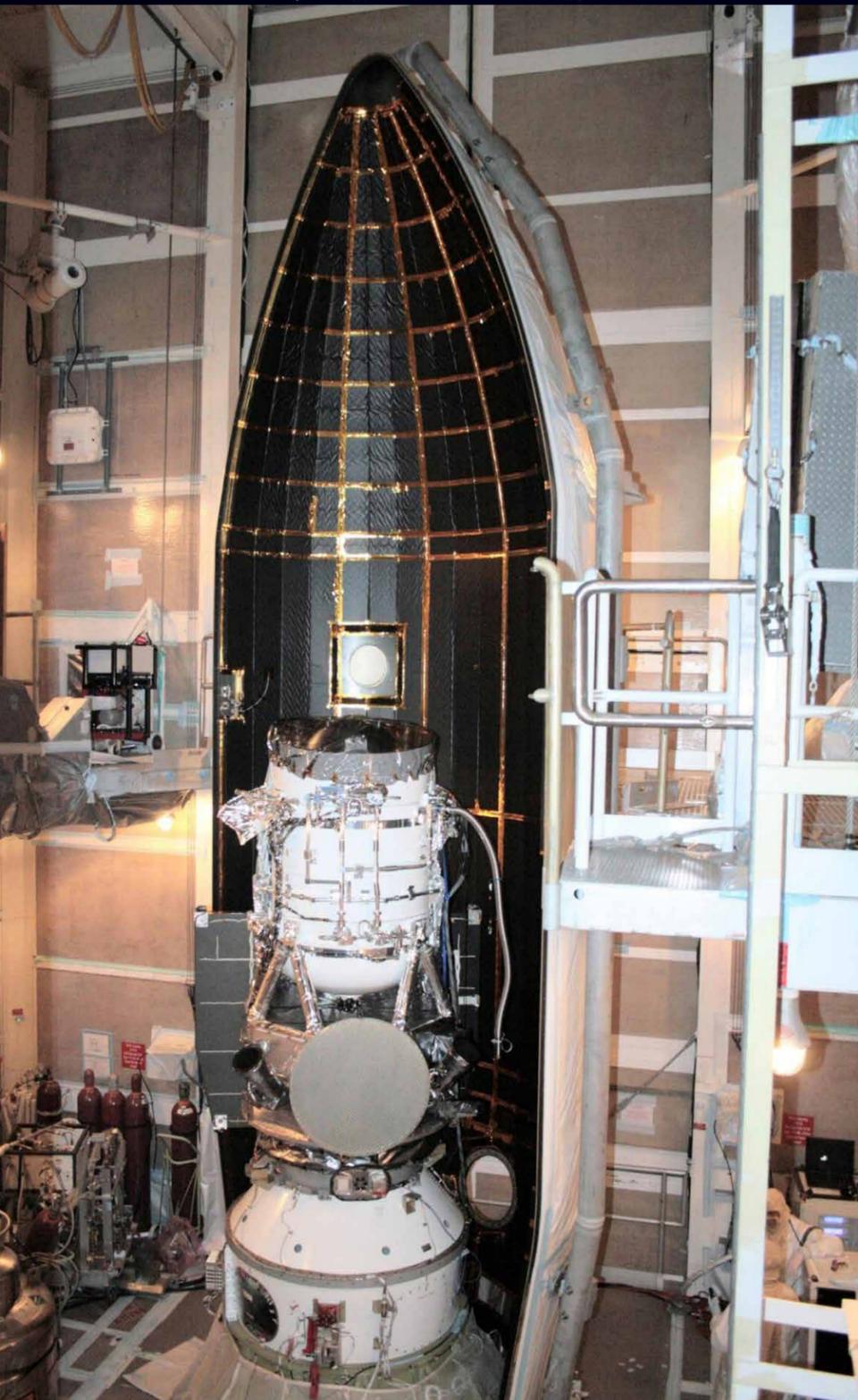
From 2009-2011, he was the LSP certification manager for new rockets, including the SpaceX Falcon 9. In early 2011, he made the move to LSP launch director.

"My first mission was the **Gravity Recovery and Interior Laboratory (GRAIL)**, which launched Sept. 11, 2011, aboard the last Delta II rocket to fly from the Cape."

His memorable missions include **IRIS**, his first Pegasus mission as launch director, **Jason-3**, the first NASA LSP launch on a SpaceX Falcon 9, and the recent ICESat-2.



The United Launch Alliance Delta IV Heavy rocket launches NASA's Parker Solar Probe to touch the Sun, on Aug. 12, 2018 at 3:31 a.m. EDT from Launch Complex 37 at Cape Canaveral Air Force Station in Florida. Parker Solar Probe is humanity's first-ever mission into a part of the Sun's atmosphere called the corona. Here it will directly explore solar processes that are key to understanding and forecasting space weather events that can impact life on Earth. Photo credit: NASA/Bill Ingalls



The first half of the Delta II payload fairing is secured around NASA's Wide-field Infrared Survey Explorer (WISE) is underway in the White Room at Space Launch Complex 2 on Nov. 25, 2009, at Vandenberg Air Force Base in California. WISE launched aboard the Delta II on Dec. 24, 2009 at (insert time). WISE was Chuck Dovale's last mission as NASA launch director. Photo credit: NASA/WAFB

"I look forward to LSP's future in working alongside the commercial providers to bring newer rockets, both small and large, into the NASA catalog of available launch services," Dunn said. "LSP's expertise and flexibility will allow us to bring new rockets online and maximize mission assurance for our customers."

Bobbi Gnan was at Kennedy during the creation of LSP. She is chief of the LSP Business Office and has been in that position for 15 years. Prior to that she worked in the payloads program control office.

"It was an exciting time, but also a chaotic time when the contracts were transferred to Kennedy," Gnan said. "We were melding three teams together and we had to come up to full speed in a short amount of time."

That's because the new program's first mission was **Deep Space 1**, which launched Oct. 24, 1998, on a Delta II from Space Launch Complex 17 at Cape Canaveral Air Force Station. To help LSP prepare for the transfer of work, Gnan traveled to Goddard in early 1998 to understand the budgets and launch service contracts prior to standing up the program at Kennedy.

"The challenge was that we had a small percent of management of the entire program's responsibility prior to 1998," Dovale said. "Then we inherited the rest of the program with no idea of how to organize it and with little to no personnel to accomplish that giant task."

Some of the workforce came to Kennedy from Glenn and Goddard. Two of them, still with the program, are **Darren Bedell**, a launch services development and risk manager, from Goddard; and Mike Carney, chief, Flight Analysis Division, from Glenn (formerly Lewis Research Center).

Carney supported the Launch Vehicle Project Office at Glenn, which performed a similar role as LSP today, but only for the Atlas/Centaur and Titan III and IV launch vehicles. He supported the nuclear launch approval process for the Cassini mission. He worked flight design for several missions, including **Geostationary Operational**



NASA Launch Director Tim Dunn speaks to members of the news media and social media participants during a prelaunch mission briefing for NASA's Ice, Cloud and Land Elevation Satellite-2 (ICESat-2) on Sept. 13, 2018, at the agency's Kennedy Space Center in Florida. ICESat-2 launched aboard a United Launch Alliance Delta II, the rocket's final mission, on Sept. 15, 2018, at 9:02 a.m. EDT (6:02 a.m. PDT), from Space Launch Complex 2 at Vandenberg Air Force Base in California. ICESat-2 will measure the changing height of Earth's ice. Photo Credit: NASA/Kim Shiflett

Environmental Satellite (GOES-I), and the **Solar and Heliospheric Observatory (SOHO)**.

"The first two years were very challenging for several reasons," Carney said. "It was a difficult period, but also very exciting and rewarding." Two of Carney's most memorable missions are **Pluto New Horizons** and **Parker Solar Probe**.

"LSP is a great place to work," Carney said. "I would certainly like to see that continue, and for LSP to be involved in interesting science missions that challenge the young folks that will eventually be taking on technical and management leadership roles within the program and the agency."

Bedell, who is now the program technical integration manager, worked in Goddard's resident office in Huntington Beach, California, where the Delta II was managed. He describes the first few months in LSP as managed chaos.

"We launched seven missions in our first 12 months, and another four in the next 12 months," Bedell said. "While the launch operations piece was well known by most of the workforce, very few knew about the mission integration or vehicle analysis and hardware qualification."

Bedell said there were no processes that came with the program. "We had to make it up as we went," he said.

Bedell's most memorable missions include the **Mars Reconnaissance Orbiter**, which launched on the first Atlas V. "Also, the **Mars Climate Orbiter**, **Mars Lander** and **Stardust**, these are what I call the 'Planetary 3-peat,'" Bedell said.

"We have done some great things, we have made some

mistakes, and some of what we do will have to change over time," Bedell said. "But if we remember why, then our future leaders will be able to evolve our service to meet our customers' needs and the ever-changing landscape of new vehicles."

Looking ahead, Dovale said that LSP is in the planning stages for 50 to 60 missions, including providing advisory services to NASA's James Webb Space Telescope and the **Commercial Crew Program**.

"We are a big part of the future," he said. "This shows how flexible LSP has become."

"In 2021 and 2022 we will have many missions, many launching from Vandenberg," Dovale said. "And we'll be on-ramping several new launch vehicles with different configurations, including Blue Origin's New Glenn Rocket, and ULA's next-generation Vulcan, as well as SpaceX's Big Falcon Rocket."

"The future looks bright for LSP," Baez said.

"LSP is special because of the people," Dunn said. "The LSP team is composed of amazing people with a variety of government and commercial backgrounds and experience who possess world-class knowledge of what it takes to successfully integrate and launch rockets. That's what makes this program special."



Water Recovery

Teams complete Underway Recovery Test-7 in Pacific Ocean

BY LINDA HERRIDGE

NASA and the U.S. Navy completed the seventh in a series of tests to verify and validate procedures and hardware that will be used to recover the Orion spacecraft after it splashes down in the Pacific Ocean following deep space exploration missions.

After traveling through space at 25,000 miles per hour, the Orion spacecraft will slow to 300 mph after it passes through the Earth's atmosphere. The spacecraft then slows down to 20 mph before it safely splashes down in the Pacific Ocean. That's when **Exploration Ground Systems** (EGS), managed at Kennedy Space Center in Florida, comes in.

"We have an amazing team of people," said Melissa Jones, Launch and Recovery director. In addition to NASA and the Navy, the team also includes Lockheed Martin, the Orion prime contractor; EGS contractor Jacobs, and the U.S. Air Force's 45th Space Wing Detachment 3.

During this test, which took place in late October and early November, the team was stationed on a U.S. Navy ship off the coast of California. They released a test version of Orion in various sea states, in day and night time, and then retrieved it and secured it on a structure called the **Orion Recovery Cradle Assembly** (ORCA) in the flooded well deck of the ship.

"Every recovery test allows the team to gather important data used to improve recovery procedures and hardware," Jones said. "The primary objective of this test was to prove the recovery equipment works as expected, and if it doesn't, they have time to fix it before actual splashdown in a couple of years."

"Every recovery test allows the team to gather important data used to improve recovery procedures and hardware."

Melissa Jones
NASA Launch and Recovery Director

The USS John P. Murtha and a test version of the Orion capsule are in view at sunset on Nov. 1, 2018, during Underway Recovery Test-7 in the Pacific Ocean. Photo credit: NASA/Tony Gray



A test version of the Orion capsule is guided onto its cradle in the flooded well deck of the USS John P. Murtha on Nov. 3, 2018, during Underway Recovery Test-7. Photo credit: NASA/Kim Shifflett

During the **sixth** test in January 2018, a couple of the tending lines snapped during Orion retrieval. Analysis afterward revealed that the attachment hardware on some of the tending lines, called tow pin inserts, did not perform as expected. New hardware was designed by Kennedy's Engineering team, and a ball bearing was added to each tow cleat so they can pivot and handle the directional forces during Orion retrieval.

"The concept was fairly easy, but implementation was a huge challenge because the hardware interface didn't allow us much room to fit anything else," said Jeremy Parr, lead design engineer for Landing and Recovery. "The new design has been through several extensive design reviews and testing. We were excited to test it on this test."

Teams also evaluated the crew module recovery equipment. This includes the inflatable stabilization collar that U.S. Navy divers will place around Orion at the water line, which also serves as a work area for divers. An inflatable covered life raft, called the "front porch," was

attached to Orion. It is large enough to serve as an emergency life raft for astronauts. Divers also attached another collar, called a Pony Collar, around Orion about three feet above the water line. The collar will be used for tending line attachment for recovery and serves as a secondary recovery method in contingency situations.

There are two more recovery tests planned for this series. Prior to each test, the Navy dive teams train and perform additional preparation activities at the **Neutral Buoyancy Laboratory (NBL)** at the agency's Johnson Space Center in Houston. The NBL is a large pool where astronauts train for spacewalks and engineers refine procedures.

"I look forward to seeing the months of hard work and planning be executed," said Slade Peters, assistant NASA recovery director.

Exploration Mission-1 will be an uncrewed flight test of the Space Launch System rocket and Orion, and the first in a series of increasingly complex missions. NASA is leading the **next steps** of human exploration into deep space where astronauts will build and begin testing systems near the Moon needed for lunar surface missions and exploration to other destinations farther from Earth, including Mars.



NASA Recovery Team members watch as a test version of the Orion capsule is pulled into the flooded well deck of the USS John P. Murtha, during Underway Recovery Test-7 on Oct. 30, 2018. Photo credit: NASA/Tony Gray

NASA's Recovery Team, along with the U.S. Navy, practice recovering a test version of the Orion capsule as part of Underway Recovery Test-7 (URT-7) on Oct. 31, 2018, in the Pacific Ocean. URT-7 is one in a series of tests that the Exploration Ground Systems Recovery Team, along with the U.S. Navy, are conducting to verify and validate procedures and hardware that will be used to recover the Orion spacecraft after it splashes down in the Pacific Ocean following deep space exploration missions. Orion will have emergency abort capability, sustain the crew during space travel and provide safe re-entry from deep space return velocities. Photo credit: NASA/Jamie Peer



Watch aerial drone footage of the recovery test at sunset at <https://go.nasa.gov/2JMYo9a>.

Wave trackers aid NASA with Orion recovery

BY AMANDA GRIFFIN

When NASA astronauts aboard the **Orion** crew capsule splash down in the Pacific Ocean after a trip beyond the Moon, their journey isn't over just yet. As the capsule bobs up and down in the ocean waves, the astronauts will experience gravity for the first time in weeks after their 25,000-mile-per-hour journey in space while they await the recovery team.

To ensure the astronauts have the smoothest ride possible from the splashdown site to the recovery ship, NASA's **Landing and Recovery Team** has enlisted the help of a small consulting firm named Applied Physical Sciences (APS). The company studies marine hydrodynamics, or the movement of water in the ocean, and is charged with helping NASA and the U.S. Navy chart the best course to minimize wave impact to the capsule – and the crew.

According to APS scientist Bill Milewski, the company started developing a system to measure and forecast waves back in 2012 for the U.S. Navy's Office of Naval Research. Back then, the Navy was looking for a system that did just that and account for corresponding motions between two ships sailing side by side. Using this data, sailors could safely use a ramp to drive vehicles between the two vessels to transfer materials from one ship to the other.

Fast forward a few years. NASA started looking for someone who could do wave analysis to help with operations to recover Orion, which will weigh about 22,000 pounds at splashdown, or about five times the weight of an SUV. The recovery team was looking to minimize waves as it secures the Orion capsule to attaching lines and pulls it into the well deck of a U.S. Navy ship. The ship has a gate that lowers so the well deck can open to the ocean, allowing water to flow in and fill it like a swimming pool.

The ocean's wave conditions are present in the well deck, too. Milewski and his team have been tasked with modelling that wave action and recommending course headings that will minimize waves inside the well deck, allowing a smoother recovery of the capsule and crew.

"We can even tell the team when to pull the module across the stern gate door to reduce damage to the ship and crew module," Milewski said.

The APS system could help reduce the possibility of damaging the Orion capsule or injuring the astronauts during the recovery

process. While the well deck is flooded, Orion is guided onto a cradle that will hold it in place. Then, once the well deck is emptied of water, the NASA Recovery Team can approach the capsule and reach the astronauts waiting inside.

During the **previous recovery test**, the APS team used wave data received from modified marine navigation radars temporarily attached to the USS Anchorage to predict the ship's roll, pitch and motion. Those motions, in turn, are used to forecast the well deck conditions.

The APS team currently is onboard a U.S. Navy ship off the coast of California, alongside the NASA Recovery Team for the **seventh recovery test** in this series, where they hope to hone their skills even more with simulated recovery operations. NASA's team will recover the crew module from a large area in the Pacific, and the APS team aims to provide the local wave conditions and forecast trends – anywhere in the recovery area, in real-time – to help ensure smooth sailing for future astronauts onboard Orion.



Benjamin Connell, a principal scientist with Applied Physical Sciences, monitors wave movement inside the well deck of a U.S. Navy ship during Underway Recovery Test-7 (URT-7) on Oct. 30, 2018. Photo credit: NASA/Kim Shiflett



Dragon Set to Deliver Supplies to International Space Station

A SpaceX Falcon 9 rocket lifts off from Space Launch Complex 40 at Cape Canaveral Air Force Station in Florida on April 2, 2018, carrying the 14th commercial resupply mission to the International Space Station. Photo credit: NASA/Tony Gray, Tim Powers, Tim Terry

COMMERCIAL RESUPPLY SERVICES MISSION: SpaceX CRS-16

LAUNCH: 1:38 p.m. EST, Tuesday, Dec. 4, 2018

LIFT OFF: Space Launch Complex 40 at Cape Canaveral Air Force Station in Florida

LAUNCH VEHICLE: SpaceX Falcon 9, 230 feet tall

SPACECRAFT: Dragon, 20 feet high, 12 feet in diameter

PAYLOAD: Dragon will deliver supplies and payloads, including materials to directly support dozens of the science and research investigations that will occur during the space station's Expeditions 57 and 58.

RETURN TO EARTH: After about one month attached to the space station, Dragon will return with results of earlier experiments, splashing down in the Pacific Ocean off the coast of Baja California.

PAYLOADS ON BOARD: Includes the Global Ecosystem Dynamics Investigation lidar, or GEDI, as an external payload.

For countdown coverage, NASA's launch blog, and more information about the mission, visit:

<https://www.nasa.gov/spacex>

A flow test of the Ignition Overpressure Protection and Sound Suppression water deluge system was completed at Launch Pad 39B at NASA's Kennedy Space Center on Oct. 15, 2018. At peak flow, the water reached about 100 feet in the air above the pad surface. It flowed at high speed from a holding tank through new and modified piping and valves, the flame trench, flame deflector nozzles and mobile launcher interface risers. The testing is part of Exploration Ground System's preparation for the new Space Launch System rocket. Modifications were made to the pad after a previous wet flow test, increasing the performance of the system. During the launch of Exploration Mission-1 and subsequent missions, this water deluge system will release about 450,000 gallons of water across the mobile launcher and Flame Deflector to reduce the extreme heat and energy generated by the rocket during ignition and liftoff. Photo credit: NASA/Kim Shiflett



NASA's Kennedy Space Center Innovators' Launchpad:

Drew Smith



Please explain your job in a single sentence.

I conduct research and do technology development for the advancement of **resource utilization** on the **Moon** and **Mars**.

What do you find most exciting about your job as a robotics engineer for NASA's Kennedy Space Center's Granular Mechanics and Regolith Operations Laboratory?

As a robotics engineer doing technology development, I enjoy having the freedom to be innovative and creative to design, build and test new technologies that could help with the exploration of the Moon and Mars.

What is a typical day like for you?

I start my day checking emails from the day before to answer questions or to do any needed administration activities. Then I begin working on whatever phase of a project I am on. This could be requirement documentation or generation, working in CAD on designing something for the project, fabricating parts, building up hardware, testing the hardware, or documenting the results of the test.

Was the work you did your first month at NASA anything like your current work?

No, I was hired into NASA as an **institutional safety** engineer, reviewing facility drawings and lab test procedures.

What is your educational background and why did you choose to study those areas?

I have an educational background in mechanical engineering. I choose to study this because I have always been interested in how machines work and operate. I was good at math and science in high school and this led me to pursue a degree in engineering.

How do the era and place in which you grew up shape how you approach your work?

I grew up on the Space Coast near Kennedy. I witnessed many **shuttle** and rocket launches. This was a huge inspiration to pursue an area in STEM (science, technology, engineering and mathematics).

What motivated you to want to work for NASA?

Growing up in the area where we launched the shuttle and seeing all the cool things going on at the space center was motivation to one day work for NASA and be a part of something that great.

Why does conducting research and developing new technology matter to you?

Because if we do not push the limits of current technologies then we will never advance the future possibilities of exploring other planets and moons within our solar system.

How do you think your NASA research or the agency as a whole benefits people on Earth?

NASA as a whole benefits the people on Earth with the technology we have to develop in order to be successful off Earth. Off Earth technologies have to be lighter weight and more efficient, and therefore most of these same materials and designs can be used here to improve performances in processes and produce higher yields.

Do you have any advice for people trying to foster innovation in the workplace?

To be innovative, you have to remove most — if not all — of the structure of a normal engineering design cycle; let the people come up with ideas and let them try their ideas in a quick iterative manner to see if the idea is feasible or not. This will allow people to “think outside the box” and let their creativity come out.

RECYCLING IN SPACE

Waste handling in a microgravity environment challenge

BY LEEJAY LOCKHART

NASA, in partnership with NineSigma, is seeking new ideas to facilitate recycling in space, through a crowdsourcing challenge as part of the **NASA Tournament Lab (NTL)**. The Recycling in Space Challenge is an opportunity for the public to submit proposals for components capable of storing and transferring trash to a thermal processing unit.

Participants will be able to submit entries through Wednesday, Jan. 16, at 5 p.m. EST. NASA plans to award \$10,000 to the first-place winner, and two \$2,500 second prizes. Successful entrants also may have the opportunity for future collaboration with the agency. NASA will announce winners for the Recycling in Space Challenge in March 2019.

Long-duration human space exploration missions to the Moon and Mars need solutions for managing trash and other waste generated by the crew. **NASA's Advanced Exploration Systems** logistics reduction project is developing technologies to mitigate issues with waste. Four astronauts can generate 2,500 kilograms of waste during a yearlong mission. Trash takes up space and presents a safety risk to the crew from biological and physical hazards. Current waste disposal methods on the **International Space Station** rely on astronauts manually processing trash by placing it into bags then loading it onto a designated vehicle for short term storage, which depending on the craft, returns the trash to Earth or burns up in the atmosphere. This disposal method will not be available for missions beyond low-Earth orbit.

Recycling trash is one method for mitigating these issues, as well as potentially transforming waste into a source of supplies for the mission. Astronauts can process small pieces of trash in a high-temperature reactor, which breaks the waste down into water, oxygen, and other gases which the crew can use or vent as needed. Besides the gases, the remainder of the waste is greatly reduced in size, and no longer biologically active.

“Along with a commitment to explore and pioneer, comes a commitment to use the resources at our disposal fully, efficiently

and responsibly,” said Anne Meier, lead research engineer at NASA’s Kennedy Space Center. “Recycling in space and repurposing all or as much of the mass that we launch up to space is key for sustainable long-duration space travel. Waste conversion and volume reduction will free up volume for more science, more exploration, and is the heart of closing the loop on human spaceflight, and logistics reduction and reutilization.”

To harness the recycling potential of the reactor, this challenge is seeking proposals for a unit that can function in microgravity with a receptacle component for depositing various types of waste into the unit and a feeder component capable of transferring the waste into the reactor through a small opening. Without these components, the crew would have to spend time processing trash and manually inserting it into the reactor instead of working on other higher priority tasks. By employing crowdsourcing, which has proven effective in previous challenges, it increases the likelihood of finding an innovative solution. Crowdsourcing allows NASA to harness a surge of creativity from external sources and augment ideas generated by the agency’s workforce.

The Recycling in Space challenge compliments a similar initiative at the agency to increase innovation headed by the NASA’s Center of Excellence for Collaborative Innovation and its **NASA@WORK** team. By using a new platform that enables employees across NASA to collaborate and share ideas on challenges posted to NASA@WORK, participants have already started proposing solutions for the inaugural challenge of developing an astronaut-friendly waste receptacle design.

NASA also is pursuing other methods of handling trash during deep space missions including reaching out to industry through the Next Space Technologies for Exploration Partnerships **solicitation**

for a prototype Trash Compaction and Processing System. Awards for the first phase of the public private partnership went to Sierra Nevada Corporation and UTC Aerospace Systems to develop systems that can reduce trash volume. They will have 18 months to develop and test their designs, before NASA conducts a preliminary design review (PDR). There will be a second phase focused on procurement after the PDR.

Since 2011, the NTL has used a variety of open innovation platforms to engage crowdsourcing communities in challenges to create the most innovative, efficient and optimal solutions for specific, real-world challenges faced by NASA and the federal government.

NineSigma North America Inc. helps organizations in the public, private and nonprofit sectors find new solutions, knowledge and partners to accelerate innovation, addressing problems of a global magnitude through its Grand Challenge innovation programs.

For more information about the challenge, and details on how to apply, visit:

https://9sig.co/NASA_RISC

For more information about the NASA Tournament Lab, visit:

www.nasa.gov/coeci/ntl

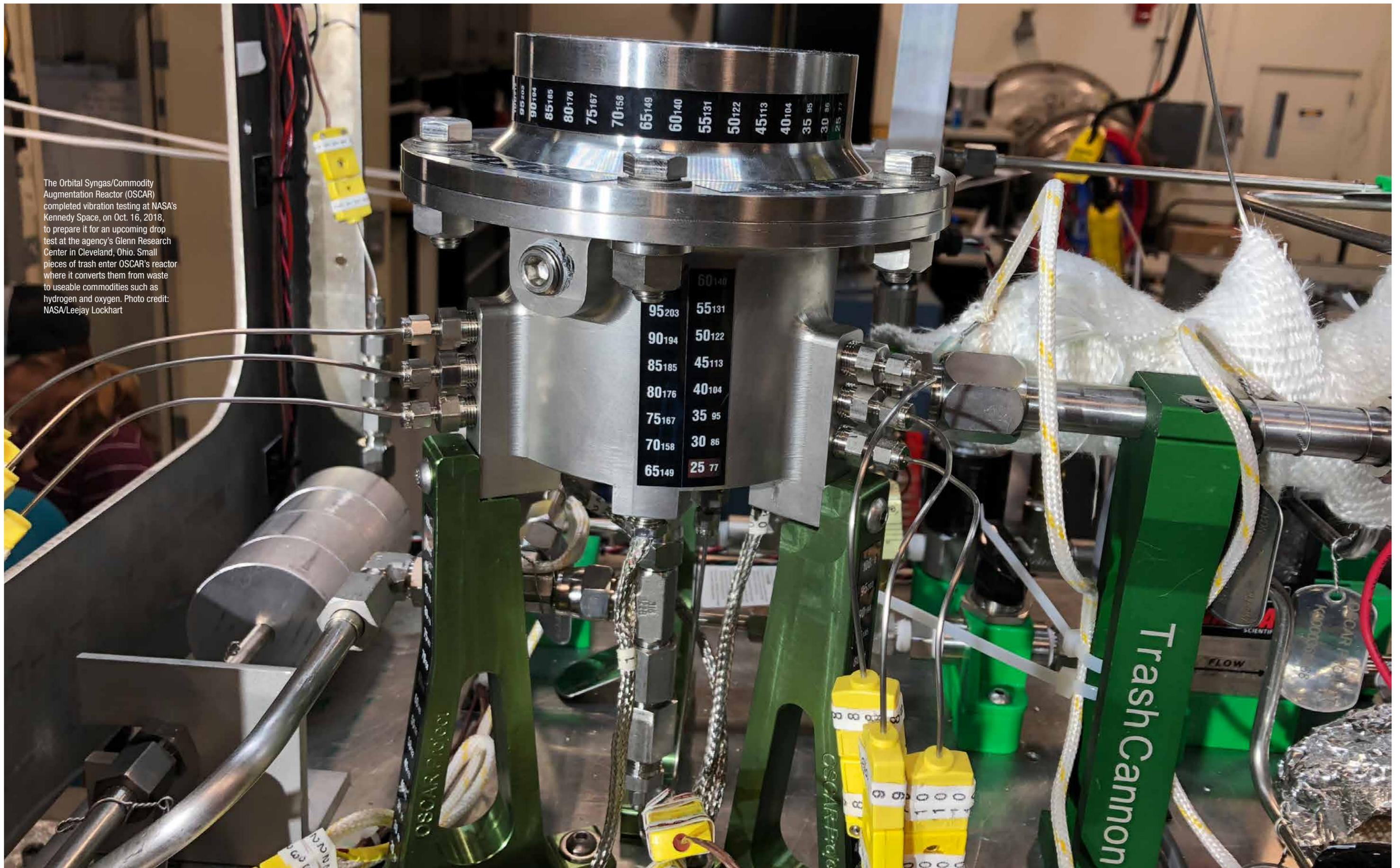


Commander Barry Wilmore floats through the Zvezda Service Module with a full Jettison Stowage Bag. Image credit: NASA



The European Space Agency’s fourth Automated Transfer Vehicle (ATV-4), also known as the “Albert Einstein,” begins its relative separation from the International Space Station during the Expedition 37 mission. The ATV-4 undocked from the aft port of the Zvezda Service Module at 4:55 a.m. (EDT) Oct. 28, 2013. The ATV, filled with trash and unneeded items, was scheduled to be sent into Earth’s atmosphere for a planned destructive re-entry over an uninhabited area of the south Pacific Ocean on Nov. 2. Photo credit: NASA

The Orbital Syngas/Commodity Augmentation Reactor (OSCAR) completed vibration testing at NASA's Kennedy Space, on Oct. 16, 2018, to prepare it for an upcoming drop test at the agency's Glenn Research Center in Cleveland, Ohio. Small pieces of trash enter OSCAR's reactor where it converts them from waste to useable commodities such as hydrogen and oxygen. Photo credit: NASA/Leejay Lockhart



95203	55131
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85185	45113
80176	40104
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Trash Cannon

OSCAR-Prod
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BUILDING ON SAFETY

Commercial Crew teams practice triage and medical evacuation

BY JENNIFER WOLFINGER

NASA and the Department of Defense Human Space Flight Support (HSFS) Office have a long history in preparing for human spaceflight missions. As [NASA's Commercial Crew Program](#) prepares to begin launching astronauts once again from American soil, it is vital teams prepare for launch day operations, including possible but unlikely emergency scenarios, and simulations are key to getting teams as ready as possible.

Teams from NASA, HSFS and SpaceX conducted a joint medical triage and medical evacuation (medevac) training exercise Oct. 25, 2018, at NASA's Kennedy Space Center in Florida. This is the second of two emergency medical services simulations to be performed before commercial crew flight tests, which are scheduled for 2019. The [first exercise](#) was conducted at Space Launch Complex 41 and integrated teams from NASA, Boeing and United Launch Alliance.

"In the business of human spaceflight, we go to great lengths to design away or to control all the known hazards," said Steve Payne, NASA simulation test director and CCP launch integrator. "However, when the unexpected happens, we must be ready to respond. We develop and practice our procedures to handle the worst possible scenarios on launch day, but we hope we never have to use them. NASA is working closely with both our commercial partners and the Department of Defense to do everything possible to keep our flight crews and ground teams safe."

For the exercise, teams practiced a worst-case scenario, pad emergency and subsequent hypergolic fuel leak. Starting at the base of the egress system at Launch Complex 39A, volunteer ground crews evacuated the pad perimeter using three [Mine Resistant Ambush Protected, or MRAP](#), vehicles. Three helicopters, emergency services, and the triage team met the evacuated crews at triage site 8, between Launch Pads 39A and B.

As part of this exercise, evacuated personnel underwent a toxic vapor check. Kennedy Fire/Rescue teams treated the crews as if contamination were detected and performed decontamination measures. Following the medical evaluations, the simulated patients were stabilized and prepared for transport. Selected patients were evacuated to several area hospitals in order to validate all emergency procedures.

This simulation is a recent example of how safety is being built into systems, processes and procedures. These simulations are designed to exercise various components of emergency procedures, as well as triage and medevac response during the unlikely event of an emergency during launch operations. It is standard practice to conduct these exercises, and was regularly done during the Space Shuttle Program.



A simulated patient is stabilized and prepared for transport during a joint medical triage and medical evacuation training exercise conducted by NASA, the Department of Defense Human Space Flight Support Office and SpaceX on Oct. 25, 2018, at NASA's Kennedy Space Center in Florida. Photo credit: NASA/Kim Shifflett



Teams from NASA, the Department of Defense Human Space Flight Support and SpaceX conducted a joint medical triage and medical evacuation (medevac) training exercise Oct. 25, 2018, at NASA's Kennedy Space Center in Florida. As NASA's Commercial Crew Program prepares to begin launching astronauts once again from American soil, teams are sharpening their launch day operations procedures, including responses during the unlikely event of an emergency. Photo credit: NASA/Kim Shifflett



Commercial Crew: Explained

Click on the titles to view videos about the Commercial Crew Program and recent accomplishments.



What Is Commercial Crew?

NASA's Commercial Crew Program is poised to return America's capability to launch astronauts from our nation's soil to the International Space Station.

Commercial Crew: Meet the Flight Test Crews

On Aug. 3, 2018, NASA Administrator Jim Bridenstine announced to the world the first astronauts to fly commercial spacecraft from Boeing and SpaceX, as part of NASA's Commercial Crew Program. Meet the astronauts who will be the first to launch from American soil since 2011.



Commercial Crew: The Spacecraft

Look inside Boeing's Starliner and SpaceX's Crew Dragon, the commercial spacecraft that will fly astronauts from the U.S. to the International Space Station for the first time since 2011.

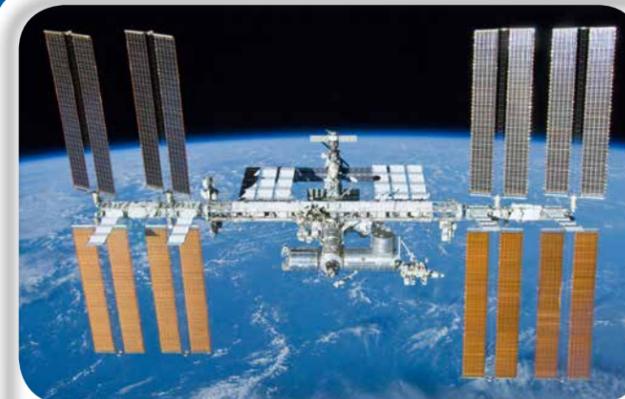
Commercial Crew: The Flight Tests

Learn about the first flights of Boeing's Starliner and SpaceX's Crew Dragon with and without astronauts on board, and what they will accomplish for NASA and its commercial partners.



Commercial Crew: Astronaut Flight Prep

From trying on spacesuits to preparing for potential emergencies, see how astronauts are getting ready to fly on the test flights and first missions of Boeing's Starliner and SpaceX's Crew Dragon.



Commercial Crew: Supporting Critical Research

Boeing and SpaceX are getting ready to launch astronauts from U.S. soil, but getting off the ground is just the beginning. Once they arrive at the International Space Station, astronauts will be working on research to improve life on Earth, and help us send humans into deep space—farther than ever before.

Commercial Crew: Dawn of the New Space Age

Will commercial space look more like the airline industry one day? The business case for humans in space is bigger than just NASA, and commercial crew is paving a path to the new space age.



Message in a Bottle

Kennedy ecologists find 'love from Barbara in a bottle'

BY ANNA HEINEY

When a team of Kennedy Space Center ecology specialists ventured out to the Florida spaceport's shoreline for a routine site survey, they expected to check on the progress of an ongoing dune restoration project. They didn't expect to find a compilation of poignant and charming writings.

Don Dankert first spotted the olive-green glass bottle jutting out of a shallow ditch just inland from the dune. It was May 2, 2018, and the area had recently been cleared of thick vegetation, leaving the bottle exposed. Surprised to have made such a discovery in the first place, Dankert retrieved and opened it, pulling out the neatly typed packet inside.

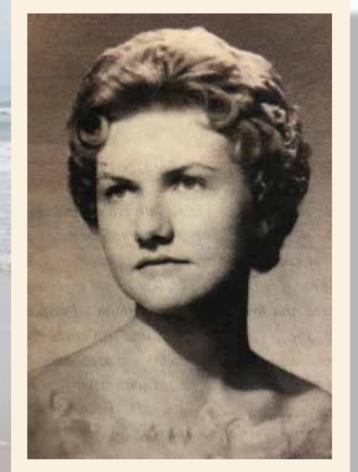
"You expect a single page, but it was five pages, front and back," said Dankert, NASA technical lead for environmental planning in the center's Environmental Management branch. "We were all reading excerpts, standing right there on the beach."

"Dearest Barbara," the first letter began. The writer, Victoria, addresses her sister Barbara directly, reminiscing about their sister, brother, parents, husbands and experiences they'd shared growing up. "My letter will take on its own pulse as I want to say the things I was not able to say at your bedside. . ."

After the first letter to Barbara was a second, written after she passed away in September 2012, describing the beautiful, smart and funny woman whom her siblings had always admired. Then, a copy of Barbara's obituary. There were photos of Barbara, and several pages of her favorite witty "Barbara-isms."

Also included was a letter from Victoria to the person who would someday find and open the bottle.

"It is the desire of Barbara's sisters to honor and share this amazing woman with



A printed photo of Barbara is included among other photos and stories contained in the message found in a bottle. Photo credit: NASA/AI Feinberg

the mystery of whomever should come upon 'Love from Barbara in a bottle,' the letter read. "Barbara enjoyed life, and her funny side kept us laughing with the timing of these 'isms.'"

Victoria also included a phone number. Reached at her home in Mississippi, she was pleased and relieved to learn the bottle had surfaced.

"You don't know if it will be broken at sea; you wonder whether it will ever be found," she said.

After Barbara's passing, Victoria explained, the family had enlisted the help of the captain of a fishing charter that sailed out of Daytona Beach, Florida, about 50 miles north of the spaceport. He'd released the bottle in the Gulf Stream in March 2015. Dankert believes a passing hurricane probably carried it all the way over the dune to the place where it was finally discovered. The bottle and enclosed papers were all in good condition.

After the Kennedy team read the message that day at the beach, they brought it back to share with the rest of their organization.

"We shared it widely within our branch, with the disclaimer that it's emotional," Dankert said. "But it was well-received around here. Now everybody feels like we know Barbara, and a few of us still use the 'Barbara-isms.'"

Victoria and her surviving sister, Annis, are happy to know they accomplished their goal of honoring Barbara by sharing her warmth and wit.

"She loved life, and was just a beautiful woman, physically and in spirit," Victoria said. "She was an amazing role model."

Sisters Annis, left, and Victoria, right, along with Victoria's husband Dean, center, pause for a photo on Daytona Beach in March 2015. Dean holds the bottle containing the message honoring Barbara, sister to Annis and Victoria, prior to the bottle's release in the ocean. The bottle was found at NASA's Kennedy Space Center in Florida in May 2018. Photo provided by the family.



Kennedy Space Center ecology team members hold pages of a message they found in a bottle during a site survey of dune along the Atlantic shoreline. From left to right, Don Dankert, NASA technical lead for Environmental Planning, Environmental Management Branch; and Integrated Mission Support Services wildlife ecologists Becky Bolt, Stephanie Weiss and Mark Mercadante. Photo credit: NASA/Don Dankert

The rolled-up message was visible through the olive-green glass bottle, still partially covered by beach sand and plant matter, when it was found in a ditch on the inland side of the dune. Photo credit: NASA/Don Dankert

VETERANS DAY 2018

Veterans bring important skills to NASA's mission

BY ANNA HEINEY

The workforce at NASA's Kennedy Space Center in Florida focuses its energy and talents on advancing America's premier multi-user spaceport and all of its launches, programs and initiatives. For the U.S. military veterans within this team, supporting the space program is a continuation of their service to the nation.

There are currently 350 veterans employed at Kennedy as NASA civil servants and interns. They come from diverse backgrounds and have previously served in a wide variety of roles, but a dedication to the mission at hand remains a guiding – and uniting – force.



Photo courtesy of Stephanie Simms

"The overall mission and working together as a team – it's very similar to being in the military. It's something greater than yourself," said Stephanie Simms, an engineering technical integrator with ELVIS3 contractor Saalex Solutions, supporting Engineering and the Commercial Crew Program. Simms served as an intelligence analyst during her 20 years in the U.S. Air Force, and deployed in support of Operations Iraqi Freedom and Enduring Freedom.

The path from the military to the multi-user spaceport is as varied and individual as those who serve.



Photo courtesy of Austin Langton

For Austin Langton, space was in his blood from an early age. "When I was growing up, I wanted to be a rocket scientist like my grandfather," said Langton, a NASA aerospace technologist in automation and robotic systems. His grandfather, Richard Langton, an aeronautical engineer, moved his family from England to the U.S. to work for various contractors as a thermodynamics engineer on the Skylab program and as a mechanical engineer supporting the space shuttle and other spacecraft. Austin Langton served in the U.S. Marine Corps from 2010 to 2014. When he spotted an opening at Kennedy, he applied and was selected. He began serving in his current role in July 2018.

For others, their military experience steered them to the spaceport.

John "Mike" Womack's decades in the U.S. Air Force, first as an F-15 aircraft mechanic and later as a flight engineer on the HH-3E Jolly Green Giant helicopter at Patrick Air Force Base, led to his career at Kennedy. Womack joined the U.S. Air Force in 1979; in 1988, he left active duty and took a job at Kennedy, working for contractor Lockheed as an aircraft inspector on the shuttle program. He went on to work for NASA as a quality assurance specialist, also on the shuttle program, while serving in the Air Force Reserve.

Photo courtesy of John "Mike" Womack



He retired from the Reserve in 2002 after a 23-year military career, and in 2006, he moved into his current role as a NASA spaceport integration services specialist.

"Long story short, if I was not working at NASA, then I was working for the Air Force Reserve in support of NASA and Combat Search and Rescue Units," Womack said. He cited his military background as an aircraft mechanic and aircrew member, along with having earned his airframe and power plant license from the Federal Aviation Administration, as primary factors in his hiring by NASA.

Don Crouse, an engineering technician working for Jacobs on the TOSC contract supporting launch vehicle technical operations, served six years in the U.S. Navy before going to work in IT for Honeywell Information Systems. A friend encouraged him to apply at Kennedy, and once he was laid off from Honeywell, he did just that. He was hired by Lockheed in June 1990 to work in the communications and tracking stations in the shuttle orbiter processing facilities.

"I was reluctant, feeling that employment here would put me in 'way over my head,'" Crouse remembered. "Once I was laid off, I applied and was hired for my service in the Navy and my computer background. The lab was a completely new ballgame for me in that it dealt with radio frequency transmissions, telemetry data and radar. I became a quick learner."



Photo courtesy of Don Crouse



Photo courtesy of John "Mike" Womack

service. I do not feel I would be where I am today without my military experience," Crouse said.

For Simms, her experience as an analyst has a direct influence on how she handles her role at Kennedy.

"As an intelligence analyst, I had to do a lot of presentations, have insight, look for gaps in information and analysis, and ask and answer questions," she explained. "The tempo of certification has a lot of similarities to the operations tempo of the military. Changes are dynamic, and you have to adjust and adapt, the same way we do here."

Conquering the physical, mental, emotional and spiritual challenges of serving in the military also provides a dose of perspective that translates well to the challenges and aspirations required to succeed in the space program.

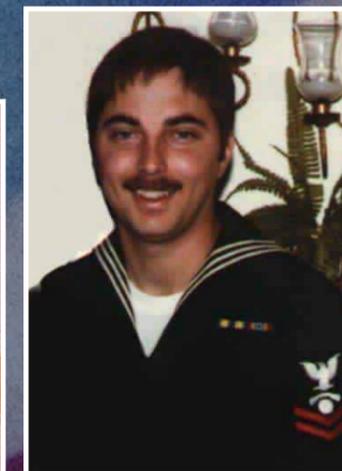


Photo courtesy of Don Crouse

Every day, Kennedy's veterans draw on their military experience and apply it in their current roles, lending strength and skill to a variety of space exploration programs and projects.

"I learned to deal with schedules, people, and equipment repair and replacement in order to meet the Navy's demand to return my ship back to active

"I learned a lot about myself, most importantly that the limits we place on ourselves as humans only exist in our minds," Langton said. "My experiences have given me the belief that anything is possible."

A DAAWG in the Fight

Group campaigns for disability awareness

BY JIM CAWLEY

For more than a quarter-century, Kennedy Space Center's Disability Awareness and Action Working Group (DAAWG) has been a determined advocate for employees with disabilities. The group has contributed significantly to the improvement of facility accommodations at the Florida spaceport, while continuing to increase awareness and education.

On Wednesday, Oct. 17, DAAWG's sustained accomplishments were honored in a special tribute, as the group was presented with the Moving Forward Award at **Brevard Achievement Center's** second annual E2A (Employ, Empower: Achieve) community awards event at the Hilton Melbourne Rialto Place in Melbourne, Florida. The award recognizes individuals or organizations that have made extraordinary efforts to assist people with disabilities in gaining new skills or improving access to employment opportunities.

The announcement caught DAAWG members off guard. "Shocked is not even the right word. When I got the email, I

could not believe it," said Nicole Delvesco, a system accountant in the Office of the Chief Financial Officer. Delvesco co-chairs the group along with Annie Williams, an environmental protection specialist with Spaceport Integration and Services.

"We were surprised... and super excited to be recognized," DAAWG Executive Advisor and Kennedy Chief Financial Officer **Susan Kroskey** said. "We especially like the name of the award. We believe we are always moving forward and looking for new ways to understand, educate and explore disabilities."

Brevard Achievement Center (BAC) is celebrating 50 years spent helping people with disabilities achieve personal and professional success. The nonprofit organization's president and CEO, Amar Patel, praised DAAWG for its accomplishments in elevating the importance of inclusion and disability in the workforce.

"DAAWG is representing so many people in Brevard County," Patel said. "It is because of their programming, their focus on disability employment awareness. It has been a real powerful message — and we want to recognize that."

Kennedy employs about 100 people through BAC's custodial contract, which has been active at the center since 2008. Patel believes this valuable working relationship thrives, in part, due to DAAWG's steadfast advocacy.

"There is that conscious forward thought — I think that's amazing," Patel said. "It shows NASA and Kennedy Space Center want to create an inclusive environment and want to have people with disabilities as part of their vision."

DAAWG, which is in its 26th year at Kennedy, is particularly engaged in raising awareness this time of year. October is **National Disability Employment Awareness Month (NDEAM)**, bringing with it a new theme and new events. This year's national theme is "America's Workforce: Empowering All."

In recognition of NDEAM 2018, DAAWG sponsored an informational fair titled "Talent Has No Boundaries." The event featured 20 vendors, showcasing resources and services available to Kennedy employees and family members. DAAWG also sponsored Disability Mentoring Day for area students and job seekers with disabilities in November.



Kennedy Space Center's Disability Awareness and Action Working Group (DAAWG) received the Moving Forward Award at Brevard Achievement Center's E2A (Employ, Empower: Achieve) community awards event at the Hilton Melbourne Rialto Place in Melbourne, Florida, on Oct. 17, 2018. From left, Eddie Wroblinski, disability program manager with Kennedy's Office of Diversity and Equal Opportunity (AJ); Kelvin Manning, Kennedy's associate director, technical; Jessica Conner, an equal employment specialist with AJ; Nicole Delvesco, a system accountant in Kennedy's Office of the Chief Financial Officer and DAAWG co-chair; Susan McGrath with Brevard Achievement Center; Susan Kroskey, Kennedy's Chief Financial Officer and DAAWG Executive Advisor; Rob Grant, AJ manager; Annie Williams, environmental protection specialist with Kennedy's Spaceport Integration and Services and DAAWG co-chair; and Brevard Achievement Center's Chris Nunley and James LaRubio. Photo credit: NASA/Kim Shiflett

Last year, DAAWG partnered with another employee resource group on center — Kennedy Networking Opportunities for Women (KNOW) — to host Dr. Temple Grandin as a keynote speaker. Grandin, an internationally famous spokesperson on autism, wowed a standing room-only crowd for the NDEAM event. Other notable past speakers include Aaron Scheidies, a visually impaired world class triathlete and U.S. Paralympian in 2016, and Marc Buoniconti, son of NFL Hall of Famer Nick Buoniconti (Marc was paralyzed in 1985 during a college football game).

Kroskey, Delvesco and Williams, who have more than 50 years combined experience with DAAWG, have been a part of planning these events and many more. Lunch and learns, creative mentoring activities and other talented speakers and events are examples of past and ongoing efforts to spread awareness of disability-related issues.

"Passion takes on a whole new definition when it comes to

DAAWG, and our experience and love for working with DAAWG at Kennedy," Kroskey said.

Delvesco has been DAAWG's co-chair for 24 years. During that time, she witnessed firsthand the group's core goals move from facility issues to education about the different disabilities, and the possibilities for people with disabilities. As a result, DAAWG is addressing fewer and fewer issues related to accommodations because these are now ingrained in Kennedy's culture.

"I have seen that transition," Delvesco said, "and that makes me very proud because I know we did our jobs."

DAAWG currently comprises 65 people, representing organizations throughout the center. Although decision-making is limited to civil servants, contractors are important contributors to the group. Membership is open to all.

"Not everybody who is a DAAWG member has a disability," Williams said. "There are people who are just passionate about helping others and getting the information out."



Brevard Achievement Center (BAC) President and CEO Amar Patel, right, talks with Kennedy Space Center Chief Financial Officer Susan Kroskey and Kennedy Associate Director, Technical Kelvin Manning during BAC's E2A (Employ, Empower: Achieve) community awards event at the Hilton Melbourne Rialto Place in Melbourne, Florida, on Oct. 17, 2018. Kennedy's Disability Awareness and Action Working Group (DAAWG) was presented with the Moving Forward Award at the event. Photo credit: NASA/Kim Shiflett

Partnering Up

NASA Business Opportunities Expo 2018 yields mentor-protégé agreement

BY LINDA HERRIDGE

NASA's Business Opportunities Expo 2018 was held Oct. 23, at Cruise Terminal 6 at Port Canaveral in Florida. As in the past, the expo drew hundreds of attendees to this annual event that featured more than 200 vendors from a variety of product and service areas, including computer technology, engineering and communications, construction and safety.

"This is always a huge event. We are very proud that Kennedy is helping to host it again this year," said Bob Cabana, Kennedy Space Center director.

Now in its 28th year, the annual expo is facilitated by Kennedy Space Center's **Small Business Programs Office** and Prime Contractor Board in conjunction with the U.S. Air Force 45th Space Wing and Canaveral Port Authority. Expo participants include Office of Small Business Programs representatives from each NASA center, and Kennedy prime contractors, including Lockheed Martin Space, Northrop Grumman, SpaceX and The Boeing Company.

"This expo has been held at the port since 1990, and has now become the largest event within NASA," said Joyce McDowell, Small Business specialist at Kennedy. "It has become the hub bringing together a vast array of businesses, an information session and networking opportunities."

During the expo, a.i. solutions Inc., a contractor at Kennedy on the Expendable Launch Vehicle Integration Support 3 contract (ELVIS 3), and Red Canyon Software of Denver, Colorado, held a signing ceremony for a new **Mentor-Protégé Agreement**.

NASA's Mentor-Protégé Program encourages NASA prime contractors to help eligible protégés,

NASA Kennedy Space Center Director Bob Cabana, standing, shakes hands with Barry Hamilton, CEO and Founder of Red Canyon Software Inc., during the signing of a Mentor-Protégé Agreement on Oct. 23, 2018, at the NASA Business Opportunities Expo 2018 inside Cruise Terminal 6 at Port Canaveral in Florida. Seated, from left are Amber Allen, program analyst in the Launch Services Program; Steve Owens, deputy program manager with a.i. solutions Inc., a contractor at Kennedy; and Glenn Delgado, associate administrator, NASA Office of Small Business Programs. a.i. solutions will serve as the mentor to protégé Red Canyon Software. Photo credit: NASA/Kim Shiflett



Attendees talk with representatives from a variety of business and government agencies during NASA's Business Opportunities Expo 2018, on Oct. 23, inside Cruise Terminal 6 at Port Canaveral in Florida. Photo credit: NASA/Kim Shiflett

increasing their capabilities to perform on NASA contracts and subcontracts.

"NASA is one of three agencies that has retained its Mentor-Protégé Program," said Glenn Delgado, associate administrator for NASA's Office of Small Business Programs. "This program provides mentors to small contractors to help grow them into larger companies."

"We are so proud to have them on the mentor-protégé team," said Amber Allen, a program analyst for the Launch Services Program and the Contracting Officer's Representative for the ELVIS 3 contract.

"This agreement allows us to establish ourselves as a company for NASA that can help to continue to grow the capabilities of small business," said Steve Owen, ELVIS 3 deputy program manager for a.i. solutions. "It creates a greater landscape for businesses to be able to serve NASA."

Red Canyon Software currently is a subcontractor to a.i. solutions and provides a critical role in their engineering area for the

Launch Services Program.

"They are a great fit for us. We're looking forward to helping Red Canyon Software develop and expand their capabilities for growing their business," Owens said.

"I'm on cloud 9. It's a dream come true," said Barry Hamilton, CEO and founder of Red Canyon Software. "It's an opportunity to grow as a team and a company and is a plus for NASA."

Hamilton's company has a background in flight software. One of his lead subject matter experts is a lead for Orion's launch abort system (LAS) and worked on the LAS for Exploration Flight Test-1.

Hamilton said the company will open an office in the **HUBZone** in Titusville, Florida. The federal "HUBZone" program is designed to promote job growth, capital investment and economic development for small businesses in economically challenged communities.

"Our mission is to help small businesses achieve their business goals by bringing some of the brightest minds and best resources from around the nation together," McDowell said.

Thankful

Kennedy Space Center Workers Share What Makes Them Thankful

The holidays are right around the corner. Soon, many of us will be reflecting on what we are thankful for. Some of Kennedy Space Center's engineers share what they are thankful for this holiday season.



"I'm thankful for the support of my fiancée as we work hard to develop new technologies."

Chris Watts
Software Developer



"I'm thankful for having the opportunity to support the construction of the world's most powerful rocket."

Corey Dike
Software Engineer



"I'm thankful for the opportunity to be a part of the next generation of space exploration."

Delvin VanNorman
Software Engineer



"I'm thankful for all of the progress we are making within the Exploration Ground Systems Program as we march forward towards Exploration Mission-1."

Julie Peacock
C3 Systems Integration



"I'm thankful for being a part of the team that is going to get Americans back into space."

Oscar Brooks
Chief, Software Engineering Branch



"I'm thankful for my fiancée's motivation and support while we worked long hours to complete the 5.0 software release."

William Denis
Software Engineer

A wild turkey strikes a regal pose in the underbrush at NASA's Kennedy Space Center. The center shares a boundary with the Merritt Island National Wildlife Refuge. The refuge encompasses 140,000 acres that are a habitat for more than 331 species of birds, 31 mammals, 117 fish, and 65 amphibians and reptiles. The marshes and open water of the refuge provide wintering areas for 23 species of migratory waterfowl, as well as a year-round home for great blue herons, great egrets, wood storks, cormorants, brown pelicans and other species of marsh and shore birds. Photo credit: NASA/Bill White





Our Refuge

NASA'S KENNEDY SPACE CENTER
NATIONAL WILDLIFE REFUGE

EASTERN INDIGO SNAKE

BY REBECCA BOLT (IMSS)

Even people who claim to hate snakes are often enamored of the beautiful, docile eastern indigo snake. In this edition of the “Our Refuge” Q&A series, we discover what makes the indigo so special and why its future is anything but secure.

How big can eastern indigo snakes grow?

Eastern indigos are the longest snake in the U.S., often reaching 7 feet with a record of 8 ½ feet. Males are typically larger than females and can weigh up to 11 pounds. Hatchling indigo snakes fresh from the egg are 1 ½ to 2 feet long and as big around as a large thumb.

What do they eat?

“Variety” is the best word to describe the eastern indigo snake’s diet. A research paper published in 2010 documented 48 different species of prey. Almost half of the records were other species of snakes, including venomous rattlesnakes. Other commonly eaten animals are frogs, juvenile gopher tortoises and rodents.

How can they eat venomous snakes and not be harmed?

Several different kinds of North American snakes (ratsnakes, kingsnakes and the indigo) appear to be immune or at least resistant to rattlesnake venom. Why this is true is unknown, but perhaps it is because rattlesnake venom impacts the blood of warm-blooded animals and may not be as effective on cold-blooded snakes.

In what kinds of habitats can eastern indigos be found?

The types of habitats that indigos will use are as varied as their diet. These include uplands such as scrub, scrubby flatwoods and coastal dunes, as well as moist areas, such as hammocks and marshes. They are even found in suburban situations, making use of ditches and undeveloped areas in neighborhoods and golf courses.

How large of an area does an indigo use?

Radio-tracking studies of eastern indigo snakes in east central Florida found that male indigo home ranges were between 161 and 741 acres, and females’ were between 49 and 371 acres. One male in Georgia used 3,781 acres! That’s a big area for an animal crawling around on its belly!

Are indigo snakes legally protected?

Yes. They were federally listed as a Threatened species under the Endangered Species Act in 1978.

What are the threats to eastern indigo snakes?

From radio-tracking data, we know that individual snakes are very susceptible to road mortality and to being intentionally killed by people. (Yes, some people do believe that the only good snake is a dead snake, federally protected or not.) At a population level, habitat destruction and fragmentation are the greatest problems. Because the indigo is a large predator, they must have room to hunt. When their home range is

fragmented by roads, buildings and other infrastructure, it becomes very easy for them to get into trouble. It has been scientifically shown that the indigos living in suburban situations have much lower survival rates than those living in large protected places. Fragmentation also makes it difficult for them to find mates, and without successful reproduction, the species cannot persist.

Why are indigos typically less aggressive than many other snakes?

Probably because they are so large and don’t have very many natural predators. Indigos will bite if they feel threatened, but calm down quickly. Their non-aggressive nature was a problem before they were legally protected; they were often captured and kept as pets, removing them from the reproductive population.

Is there anything that I can do to help eastern indigo snakes persist into the future?

Yes! The first thing you can do is educate yourself so you can educate others. A good place to start is with the [Florida Fish and Wildlife Conservation Commission](#) website, which has information, fact sheets and links to several other good resources. Another suggestion of something you can do is support efforts to conserve and manage



An indigo snake approaches a burrow at Merritt Island National Wildlife Refuge. Photo credit: Courtesy of KEMCON/Becky Bolt

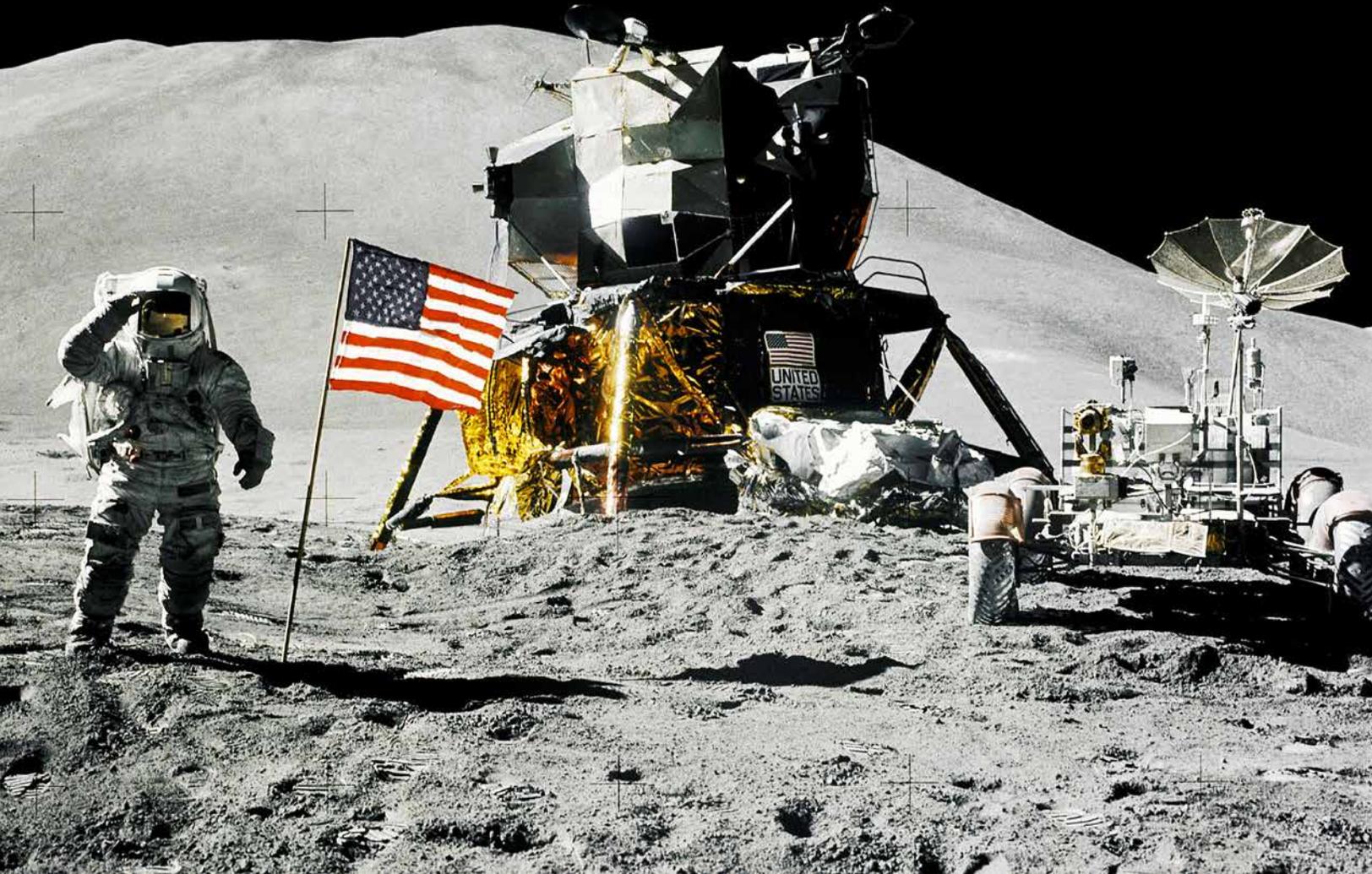


An indigo snake hatchling is held by a wildlife specialist. Hatchlings fresh from the egg are 1.5 to 2 feet long and as big around as a large thumb. Photo credit: Courtesy of KEMCON/Becky Bolt

large parcels of natural habitat, especially those parcels that create corridors between existing protected areas. If the eastern indigo is to survive as a species, it must have access to undeveloped expanses of habitat to find food and mates. This also is true for several large mammals such as Florida panthers and bears, and large predatory birds such as hawks and owls. Habitat conservation and management is crucial for much of our native wildlife.

NASA salutes military veterans

Photo credit:
NASA/David Scott



U.S. Air Force Col. Jim Irwin, Apollo 15 lunar module pilot, gives a military salute while standing beside the deployed United States flag on Aug. 1, 1971. Irwin and U.S. Air Force Col. David Scott, mission commander, landed July 30, 1971 at the Hadley-Apennine site on the Moon. Nov. 11 is Veterans Day, observed to honor everyone who served and are serving in the United States armed forces. Many of those include NASA astronauts. Originally established as Armistice Day, the holiday marked the end of World War I which concluded on that date in 1918 -- 100 years ago.

NASA is working to return astronauts to the Moon to test technologies and techniques for the next giant leaps – challenging missions to Mars and other destinations in deep space. For more information about NASA's plan for the future, visit:

Moon to Mars Exploration Campaign

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