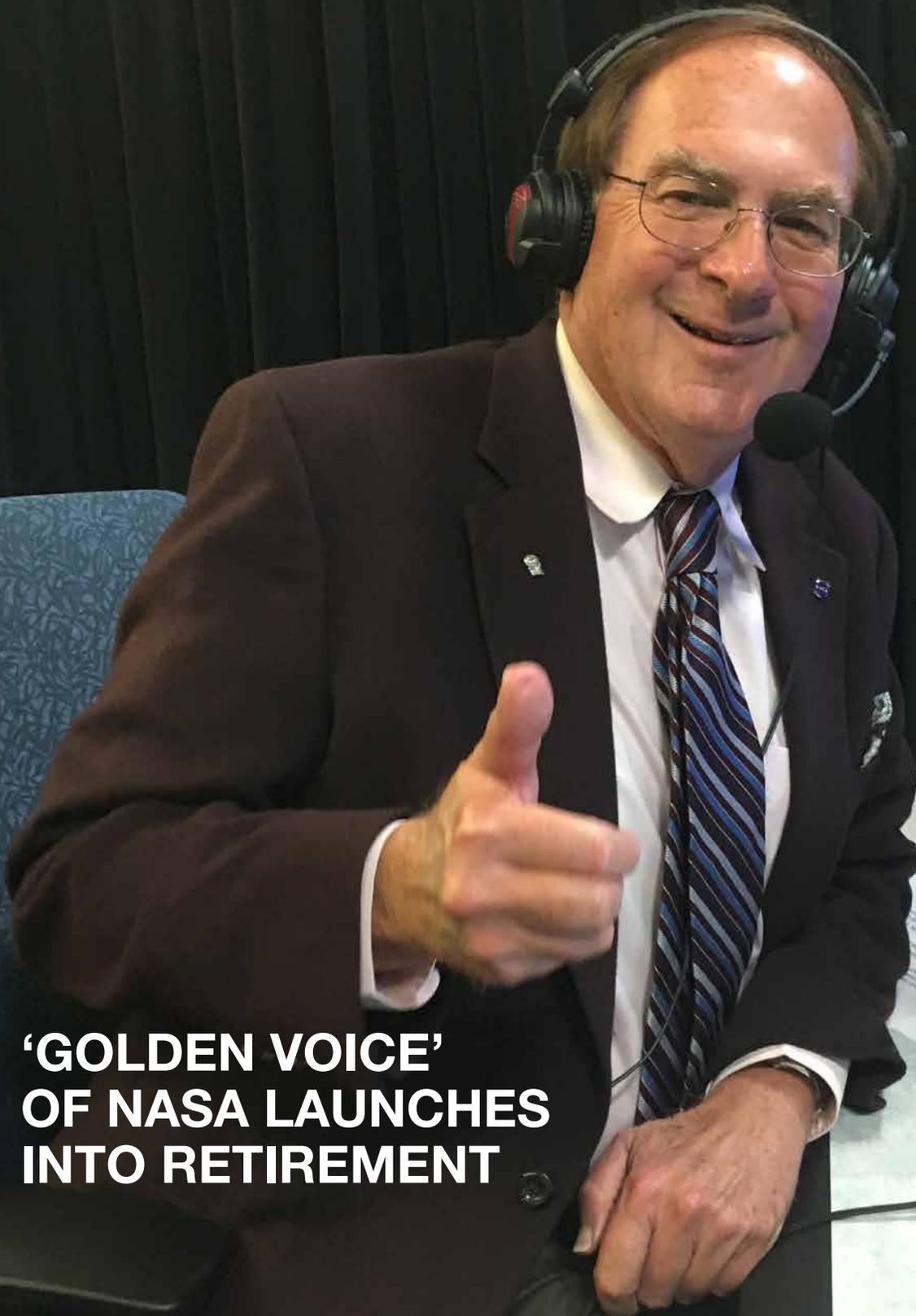




KENNEDY SPACE CENTER'S
SPACEPORT
m a g a z i n e



**'GOLDEN VOICE'
OF NASA LAUNCHES
INTO RETIREMENT**

KENNEDY SPACE CENTER'S SPACEPORT MAGAZINE CONTENTS

- 4.....Veteran launch commentator George Diller retires
- 8.....SpaceX CRS-11 mission launches, heads to space station
- 12.....Students create hardware on a 'HUNCH'
- 14.....Electromagnets offer tantalizing options for satellites
- 16.....Final brick installed in Launch Complex 39B flame trench
- 22.....Engineer's design aids Orion recovery, earns award
- 24.....Engineering Kennedy's transformation a total team effort
- 32.....Foale, Ochoa inducted into Astronaut Hall of Fame
- 36.....Intern gets by with a little help from a friend
- 38.....2017 Hurricane season begins
- 40.....Brevard's top scholars visit Kennedy Space Center

Cover: NASA Public Affairs Officer George Diller moderates a news conference at Kennedy Space Center. Diller is stepping away from the microphone after 37 years at Kennedy Space Center. He has been seated at the commentator console for countless countdowns and launches as a NASA Public Affairs specialist. Photo credit: NASA

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NASA'S LAUNCH SCHEDULE

Date: July
Mission: Expedition 52 Launch
Description: Expedition 52/53 crew members Randy Bresnik of NASA, Paolo Nespoli of ESA (European Space Agency) and Sergey Ryazanskiy of the Russian space agency Roscosmos launch to the International Space Station.
<https://go.nasa.gov/2oJzivW>

Date: Aug. 3
Mission: Tracking and Data Relay Satellite M (TDRS-M)
Description: Orbiting 22,300 miles above Earth, the TDRS spacecraft provide near-constant communication links between the ground and orbiting satellites, such as Hubble, and the International Space Station. TDRS-M will launch from NASA's Kennedy Space Center in Cape Canaveral, Florida, on an Atlas V rocket.
<http://go.nasa.gov/2l8Hysg>

Date: Sept. 13
Mission: Expedition 53 Launch
Description: NASA astronauts Joe Acaba and Mark Vande Hei and cosmonaut Alexander Misurkin of the Russian space agency Roscosmos will launch to the space station aboard the Soyuz MS-06 spacecraft from the Baikonur Cosmodrome in Kazakhstan.
<https://go.nasa.gov/2rRChR>

Date: Nov. 14
Mission: ICON (Ionospheric Connection Explorer)
Description: The Ionospheric Connection Explorer will study the frontier of space: the dynamic zone high in our atmosphere where Earth weather and space weather meet. ICON will launch from Kwajalein Atoll aboard an Orbital ATK Pegasus.
<https://www.nasa.gov/icon>

Want to see a launch?
 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. Call the KSC Visitor Complex at **(321) 449-4444** for information on purchasing tickets.

National Aeronautics and Space Administration



KENNEDY

SPACE CENTER

CARLY HELTON

My path to Kennedy Space Center was not direct. However, I definitely feel it is part of my life's destined road to travel.

I am a technical support specialist and information analyst. I make sure commercial and government customers' needs are met by providing technical support for the SpecsIntact application.

With Lompoc, California, as my hometown, Vandenberg Air Force Base (VAFB) essentially was my backyard. I was mesmerized with the sheer magnitude of the launch vehicles making their magnificent flights into the sky, watching, captivated, until they vanished. My imagination would run wild thinking of how they were made, what they were carrying, and where they were going.

On Sept. 29, 2013, in awe, I watched when SpaceX's F9 took its maiden flight. And, as life's road would have it, within the family-like environment that is SpaceX, I would come to meet the man who I now proudly call husband, Travis.

One day, I found myself applying for a position with Abacus Technologies. Once I was offered the job, I called my aunt. She reminded me of something I had said to her when I was younger: "One of these days I'm going to be at Kennedy Space Center and I'm going to work for NASA."

It has definitely been a journey to get where I am — every skill set I have gathered has prepared me for this moment in time. The memories of rockets, space and exploration as a child lit a fire within me . . . and it remains.





GEORGE DILLER

The VOICE

of NASA

Veteran launch commentator George Diller retires

BY ANNA HEINEY

A familiar voice will be absent from the NASA Television airwaves as veteran launch commentator George Diller launches into retirement at the end of May.

Diller is stepping away from the microphone after nearly four decades at Kennedy Space Center. His unique blend of expertise, accessibility and humor has made him a favorite among journalists and colleagues alike during his 37-year tenure at the spaceport. He's been seated at the commentator console for countless countdowns and launches as a NASA Public Affairs specialist.

"It was always neat to hear his voice, knowing his shuttle heritage and hearing that for virtually half my life. To know that this is that guy, next to you, interviewing you for a particular launch, was really cool," said Omar Baez, a NASA launch manager in the agency's Launch Services Program based at Kennedy.

As the Public Affairs team's lead for the expendable launch vehicle fleet, Diller has covered the vast majority of the agency's planetary, astrophysics and Earth-resources missions, including probes launched to asteroids and comets, the moon, Mars, Jupiter, Saturn, Mercury and Pluto. He worked closely with the LSP team, which manages the processing and launch of these unpiloted scientific and planetary spacecraft.

Commentary duty rotated through the specialists in the office. As the roster changed over the years, Diller remained, becoming the agency's longest-serving commentator and helping to train others. He was frequently heard during space shuttle countdowns and was the lead for the launch of the Hubble Space Telescope in 1990, as well as all five shuttle flights to repair and maintain the orbiting observatory.

It was his voice viewers heard when they tuned in for liftoff of STS-114, the shuttle's return to flight in

2005, and when the storied program completed its final mission, STS-135, in 2011.

"All three engines up and burning," Diller called as shuttle Atlantis' trio of main engines ignited. "Two, one, zero and liftoff — the final liftoff of Atlantis. On the shoulders of the space shuttle, America will continue the dream."

Diller got his start in radio at a young age. Calm



George Diller interviews former Kennedy Director of Public Affairs Hugh Harris during prelaunch activities before liftoff of space shuttle Atlantis on its STS-135 mission. Photo credit: NASA/Kim Shifflett

under pressure, his voice never wavered, regardless of whether the countdown or launch went according to plan. His smooth, matter-of-fact delivery made him famous within the industry and among space enthusiasts who knew him by voice.

Amanda Mitskevich, director of LSP, recalls attending her first NASA Social, with a select group of the agency's social media followers in the audience.

"We walked in and George walked up to the front," Mitskevich said. "He said one word, and the entire audience of all these tweeters jumped up and started taking pictures. 'That's George Diller!' He was a total rock star."



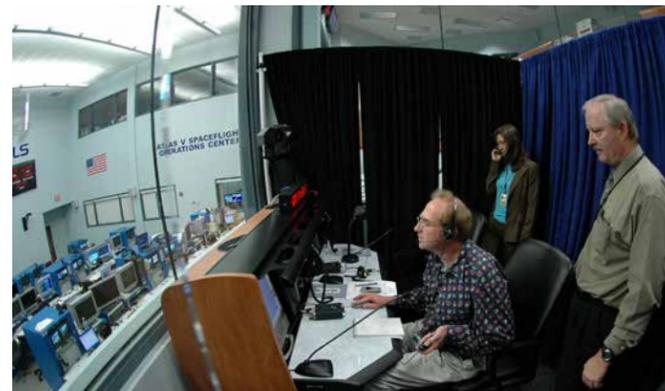
NASA Commentator and Public Affairs Officer George Diller provides live launch coverage for NASA TV from his console in Firing Room 4 of the Launch Control Center during the countdown for space shuttle Atlantis' STS-135 mission. Photo credit: NASA/Kim Shifflett



NASA Public Affairs Officer George Diller moderates a news conference at Kennedy Space Center. Photo credit: NASA

He made a point of working as closely as possible with each spacecraft's payload team in order to thoroughly understand the hardware, instruments and objectives of the mission -- all so he could share this information in a clear and interesting way to the news media and, ultimately, to the TV audience on launch day. His willingness to share information, not just among members of the news media but also with members of his own team, who came to rely on his status updates and in-depth knowledge of spacecraft and rockets making their way to the launch pad.

Spacecraft and launches are not Diller's only areas of expertise. As the liaison to the Kennedy weather office, he kept his colleagues and the public informed about potential weather impacts to



In the communications room above the Atlas V Spaceflight Operations Center on Cape Canaveral Air Force Station, George Diller rehearses for the upcoming launch of the New Horizons spacecraft. Behind him are Tiffany Nail, with the Launch Services Program at Kennedy Space Center, and Bob Summerville, a Lockheed Martin console system software engineer. Photo credit: NASA

launches or center assets, even staying at Kennedy through hurricanes as a member of the center's Rideout Team. He also was Kennedy Public Affairs' resident expert on the NASA Railroad, which was used during the Apollo and Shuttle Programs.

"It really was very clear, very fast, that George was one of those guys who really knew what he was doing," CBS News space correspondent Bill Harwood said. "He made a real effort to understand these missions. George put an enormous amount of time into this, and that was the key to his success."

Diller's professional calm on television masks a friendly, funny personality off the air. His unexpected one-liners are renowned, and he is well-regarded as an invaluable, yet approachable resource for newcomers to the NASA News Center.

"When you're new to the press site, it's overwhelming," veteran space journalist Jim Banke explained. "There's so much to learn, so

many people to meet — figuring out who to call, who to ask.

He knew his stuff. He still knows his stuff."

As Diller embarks on a new chapter, he leaves a well-built legacy of professionalism and enthusiasm. His love of space exploration and his appreciation of the technology and human talent required to achieve it helped explain to audiences worldwide that the effort to expand the human presence in space is always worthwhile.

"He wanted to tell that story, and he made it easier for us to tell that story," Banke said.

During NASA Television's post-launch interview after the successful liftoff of Orbital ATK CRS-7 on April 18, Kennedy Space Center Director Bob Cabana turned the tables and interviewed Diller, surprising the veteran commentator as his final turn at the microphone drew to a close.

"George didn't know I was going to recognize him today, but I could not let this opportunity pass," Cabana said. "You've just done an outstanding job, and we're really, really going to miss hearing your golden voice on console during launch."

Diller, a Florida native, has plans to relocate to the northeast now that his life is not governed by the ups and downs of a launch schedule. But after so many years on the job, it's a part of him, he told Cabana.

"I'm sure when I'm retired and up in the mountains somewhere, and there's a launch going, it'll be hard not to tune it in, on satellite



The STS-114 crew gathers at the slidewire basket landing area at Launch Complex 39B for a media question-and-answer session moderated by George Diller, at left. Photo credit: NASA

radio or something, to see it," Diller replied.

"You can take the boy out of the launch, but you can't take the launch out of the boy."

REGULAR RESUPPLY

SpaceX CRS-11 mission launches cargo toward International Space Station

BY BOB GRANATH

A SpaceX Falcon 9 rocket lifts off from Launch Complex 39A at Kennedy Space Center, the company's 11th commercial resupply services mission to the International Space Station. Liftoff was at 5:07 p.m. EDT June 3 from the historic launch site now operated by SpaceX under a property agreement with NASA. The Dragon spacecraft will deliver 6,000 pounds of supplies, such as the Neutron star Interior Composition Explorer, or NICER, designed to study the extraordinary physics of these stars, providing insights into their nature and behavior. Photo credit: NASA/Tony Gray

A resupply mission to the International Space Station roared into orbit at 5:07 p.m. EDT on June 3, from Launch Complex 39A at Kennedy Space Center. The eleventh commercial resupply services flight for SpaceX is the sixth SpaceX rocket to take off from the historic pad, further emphasizing the center's role as a premier, multi-user spaceport.

About 10 minutes after launch the Dragon spacecraft separated from Falcon 9 and solar arrays successfully deployed following separation from the second stage.



A Falcon 9 rocket is raised into position for liftoff at the Kennedy Space Center's Launch Complex 39A on June 1. A launch attempt June 1 was postponed due to thunderstorms and lightning near Kennedy. Photo credit: NASA/Glenn Benson

A launch attempt on June 1 was postponed due to thunderstorms and lightning near Kennedy.

The Earth-orbiting laboratory brings together science, technology and human innovation, demonstrating new technologies and research breakthroughs not possible on Earth. A resupply line of uncrewed spacecraft keeps this work going, supporting efforts to enable human and robotic exploration of destinations well beyond low-Earth orbit.

The company's 230-foot-tall Falcon 9 rocket boosted a 20-foot high, 12-foot-diameter Dragon capsule filled with supplies and experiments. The payload includes important materials to support more than 250 science and research investigations taking place during Expeditions 52 and 53.

After the Dragon arrived at the space station June 5, U.S. astronauts Peggy Whitson and Jack Fischer grappled Dragon using the station's 57-foot-long robotic arm. Ground commands were sent from mission control for the station's arm to rotate and install the Dragon capsule to the station's Harmony module.

The Expedition 51 crew will unpack the Dragon and begin working with the experiments that include the following:

SEEDLING GROWTH-3

A joint project of NASA and the European Space Agency (ESA), the Seedling Growth-3 experiment is being flown for the third time. Once onboard the space station, seeds will be placed in the European Modular Cultivation System, or EMCS, where they

will be hydrated and exposed to varying conditions of light and gravity. The EMCS is an ESA research facility aboard the space station dedicated to studying plant biology in a microgravity environment. The resulting seedlings will be either frozen or chemically fixed and returned to Earth for post-flight analysis. Seedling Growth-3 is designed to help scientists gain a better understanding of the basic mechanisms of light and gravity-sensing in plants. The results could aid in improving the long-term sustainability of agricultural production both on Earth and extended-duration spaceflights.

ADVANCED COLLOIDS EXPERIMENT-TEMPERATURE-6

Colloids are microscopic particles suspended in a liquid found in products ranging from milk to fabric softener. Consumer products often use colloidal gels to distribute specialized ingredients such as droplets that soften fabrics. But the gels must serve two opposite purposes. They must disperse the active ingredient so it can work, yet maintain an even distribution so the product does not spoil. The Advanced Colloids Experiment-Temperature-6, or ACE-T-6, is designed to study the microscopic behavior of colloids in gels and creams, providing new insight into fundamental interactions that can improve product shelf life.

ADVANCED COMBUSTION VIA MICROGRAVITY EXPERIMENTS

The Advanced Combustion via Microgravity Experiments, or ACME, is a set of five independent studies of gaseous flames being conducted aboard the space station. ACME's goals are to improve fuel efficiency and reduced pollutants in practical combustion on Earth. It also is expected to aid in spacecraft fire prevention through innovative research focused on materials flammability.

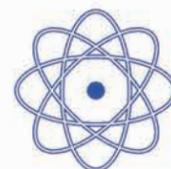
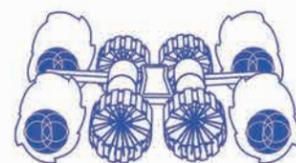
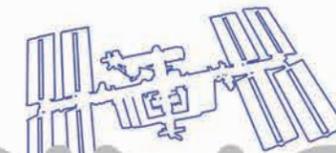
NANORACKS

NanoRacks of Houston again will provide commercial hardware and services supporting several experiments flown to the U.S. National Laboratory aboard the space station. The company provides low-cost services, many supporting opportunities for students in middle and high schools to develop investigations to be conducted in the microgravity environment of the station. Such programs provide young scholars with hands-on experience in disciplines of science, technology, engineering and mathematics, or STEM. The goal is to encourage these students to pursue careers in fields that support NASA research.

The Dragon capsule will spend approximately one month attached to the space station, remaining until early July. The spacecraft then will return to Earth with results of earlier experiments, splashing down in the Pacific Ocean off the coast of Baja California.

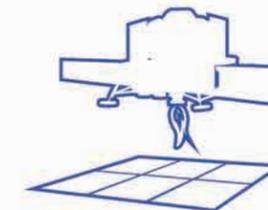
The space station has been occupied continuously since November 2000. In that time, more than 200 people from around the world and a variety of international and commercial spacecraft have visited the orbiting laboratory. The space station remains the springboard to NASA's next great leap in exploration, including future missions to Mars.

ALWAYS EXPLORING



“You are never too old to set another goal or to dream a new dream”

– C. S. Lewis



Dr. Ye Zhang
Project Scientist



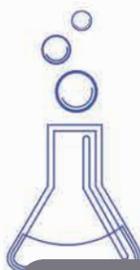
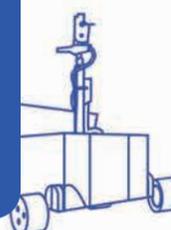
Exploration Research and Technology Programs

I am currently the project scientist responsible for establishing alternative research platforms for microgravity research in the Life Sciences office at Kennedy Space Center. Using analogs to simulate microgravity and space radiation on the ground is challenging but useful for space research and spaceflight-related risk assessment. I also collaborate on projects using the Veggie system to enable growth of various crops in space. Working on plants is fun and is a new endeavor in comparison to my previous experience in human research. Our ultimate goal is to enable continuous production of fresh vegetables and fruits on the

International Space Station and during long-term, deep-space missions.

My NASA dream started in my late thirties and I believe it is never too late to dream a new dream. I am very thankful for my friendly co-workers and great mentors here in Exploration Research and Technology Programs. The coolest part of my job is to take on every challenge with my colleagues and to watch the rocket launch, knowing that our science payloads are onboard.

When I'm not at work, I enjoy playing with my kids, reading and traveling.



To learn more about Dr. Ye Zhang, go to <https://youtu.be/pUBZPIg5nj0>

ON A HUNCH

Students Create for Space

BY AMANDA GRIFFIN

Hundreds of high school students have a “hunch” their hardware prototypes have the potential to succeed in space.

High school students United with NASA to Create Hardware, or HUNCH, began 14 years ago and now includes post-secondary students in colleges, trade schools, and apprenticeship programs, as well as some middle schools. HUNCH first came to Kennedy Space Center in 2014 after a NASA engineer came across an article about the program.

“This program got my attention because it focuses on high school students in career and technical education curriculum,” said Lisa Passarelli, project manager/mechanical engineer at the Florida spaceport. “It brings a real project, something NASA needs and intends to use, into the classroom.”

Once she learned of HUNCH, Passarelli spent months learning the ins and outs of the program that encourages interest in the STEM disciplines by providing real-world, hands-on projects that the students develop or fabricate themselves. Products developed by HUNCH students cover a wide range of disciplines, including culinary, soft-goods/textiles, design and prototyping, hardware fabrication and communications.

During the past three years, Kennedy mentors have worked with Palm Bay Magnet High School in Palm Bay, Space Coast Machinist Apprenticeship Program in Melbourne, Space Coast Jr./Sr. High in Cocoa, Lake Mary High School in Lake Mary, and Valencia College Advanced Manufacturing Training Center in Kissimmee. Students have worked on a wide variety of design and prototype projects: a mouse container for zero gravity, food preservation, a restraint for

use in the International Space Station’s cupola module, even a toilet paper dispenser. Machining students have fabricated Single Stowage Locker components which are classified by NASA as Class 1E flight hardware, meaning they go to space. Build-to-print soft goods or textile projects include sleeping bag liners that will be used in space, and jettison stowage bags that may be used for astronaut training.

In mid-May, Passarelli and her fellow mentors recognized more than 250 students who participated in HUNCH during the current school year. For Passarelli, the highlight of the year was during the actual award ceremony.

“One student asked to come up front and address the crowd to share how much he learned working on these projects,” she said. “One of the teachers spoke about how meaningful it was to have an event like this that recognizes students in trade disciplines. He noted that events of this magnitude rarely include Advanced Manufacturing students, and he was grateful that he and his students were part of the NASA HUNCH Program at Kennedy. I also had several parents come up to me after the event to say thanks, and share how their child is now excited about engineering or manufacturing.”

The HUNCH Program to date has flown more than 160 items made by high school students to the International Space Station. One easy-to-spot item is the galley table where the astronauts gather to eat. This galley table was designed and fabricated by HUNCH students. Additionally, NASA has utilized many of the other delivered output from these student projects for astronaut training, communications and outreach, prototyping, and display purposes.



Above: Kennedy Space Center's Engineering Director Pat Simpkins signs a locker that will go to the International Space Station. Photo credit: NASA

Below: Students from Space Coast Jr./Sr. High talk to guests at the award ceremony about their toilet paper dispenser design. Photo credit: NASA



SIMPLE SOLUTION

Electromagnets offer tantalizing options for satellites

BY STEVEN SICELOFF

A group of NASA physicists at Kennedy Space Center may have uncovered an intriguing option for controlling a fleet of satellites or stopping an older satellite from tumbling out of control.

The research centers on electromagnetics and considers how simple devices might offer solutions to problems that have eluded engineers. For example, oscillating magnetic fields on adjacent spacecraft can be used to push and pull against each other and may prove a better steering mechanism in orbit than small thrusters that consume — and eventually exhaust — fuel. It also may present methods to make a series of small spacecraft perform as well or better than a single large spacecraft.

“Maybe instead of flying one big telescope, you fly a bunch of mirrors in formation and they form the telescope,” said NASA’s Stan Starr, one of the researchers. “You could have the same number of mirrors and spread them out to collect more light, or bring them together tightly to look at a specific area. You could change shape to refine the focus. The mirror of the telescope would be fully adaptable.”

The findings could even lead to a spacecraft that lands on an asteroid without bouncing off it. Using magnetic forces, a spacecraft could simply connect to the asteroid similar to the way a magnet sticks to a refrigerator.

Delving into principles of electromagnetism first published in the 19th century, Starr, and Kennedy scientists Bob Youngquist, Ph.D., and Mark Nurge, Ph.D., explained that magnetic fields offer new opportunities in spaceflight because they can move themselves or other spacecraft without using fuel. On Earth, strong gravity and friction dwarf magnetic forces. But in orbit, relatively small magnetic forces over sufficient time can slow the spin of an object as big as a satellite.

“This ability to generate very weak forces is not very useful on the ground, but in orbit, long-term application of small forces can accumulate and that’s where you can have a realm where these things are very applicable,” Youngquist said. “There are other options, but this is a good one. This is a very promising area.”

Some of the key work was performed early on by a German physicist named Heinrich Hertz, for whom the unit of frequency was named.

“It turns out that Hertz was the guy who addressed that in the 1880s,” Youngquist said. “Most of it is archaic, done before modern calculus, so it’s kind of like translating from another language when you read Hertz’ work.”

Joined by other researchers, including Mason Peck, NASA’s former chief technologist, the trio of Kennedy researchers dug into landmark studies from the 19th century for the principles they set out to build upon.

After theorizing methods to control a fleet of satellites using magnetic waves, the team now is working on the formulas needed to

“This ability to generate very weak forces is not very useful on the ground, but in orbit, long-term application of small forces can accumulate and that’s where you can have a realm where these things are very applicable. There are other options, but this is a good one. This is a very promising area.”

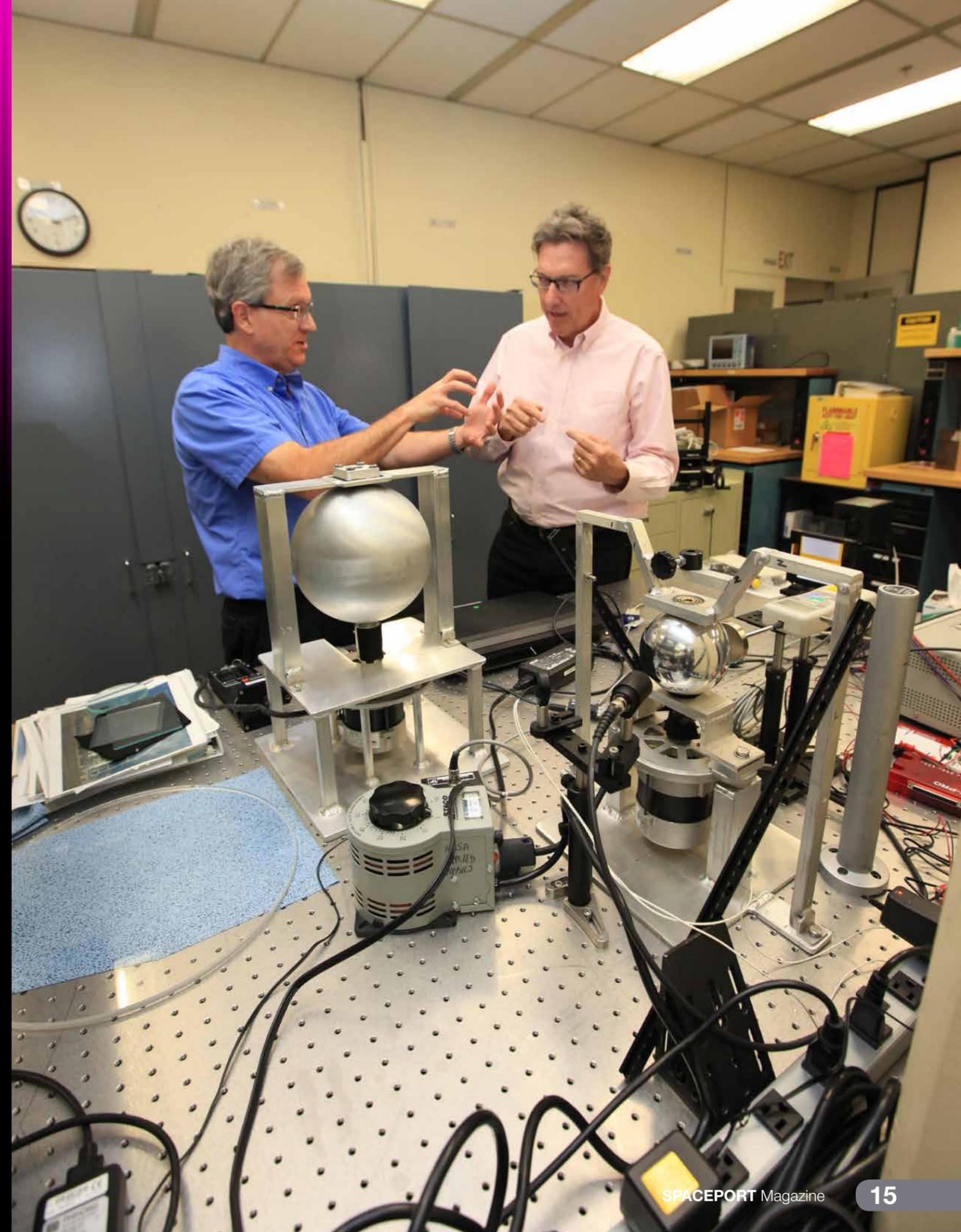
— Bob Youngquist
NASA Scientist

stop defunct satellites from tumbling so they can be refurbished or refueled in orbit and returned to service. There may be a possibility of designing spacecraft that can use magnets to deorbit satellites to prevent the buildup of debris in space.

Until now, this technology has not been explored for spaceflight, largely because magnets can be quite heavy. However, innovations in power sources and other advances can lighten the mass so modern rockets can lift a workable spacecraft equipped with electromagnets. This is good news since space debris has become a concern with more and more satellites being launched into space every year.

Their work was recently featured on the cover of the American Journal of Physics, an achievement compared to making the cover of Rolling Stone magazine.

The research was funded through NASA’s Space Technology Mission Directorate Center Innovation Fund program which stimulates and encourages creativity and innovation within NASA centers.



Opposite: Physicists Bob Youngquist, left, and Stan Starr work with hollow and solid metal spheres in a laboratory at Kennedy Space Center where they are helping formulate principles of magnetic forces to see how they might be applied to spaceflight. Photo credit: NASA/Kim Shiflett

UPGRADE COMPLETE

Final brick installed in Launch Complex 39B flame trench for NASA's Space Launch System

BY LINDA HERRIDGE

Intense heat and fire will fill the north side of the flame trench beneath the pad when NASA's Space Launch System (SLS) rocket and Orion spacecraft lift off from Launch Complex 39B at Kennedy

A view of the north side of the flame trench at Launch Complex 39B at Kennedy Space Center. Photo credit: NASA/Leif Heimbold



Jimmy Saylor, a mason with Reintjes Services, a subcontractor to JP Donovan, installs the final brick on the north side of the flame trench wall at Launch Complex 39B at Kennedy Space Center. Photo credit: NASA/Leif Heimbold

Space Center. A project to upgrade the walls of the flame trench to withstand these conditions recently was completed.

All of the new heat-resistant bricks now are in place in the flame trench below the surface of the pad. Construction workers installed the final brick May 9, completing about a year's worth of work on the walls on the north side of the flame trench to support the launch of the (SLS) rocket and Orion spacecraft on deep-space missions, including the Journey to Mars.

About 96,000 heat-resistant bricks, in three different sizes, now are secured to the walls using bonding mortar in combination with adhesive anchors. The flame trench will be able to withstand temperatures of up to 2,000 degrees Fahrenheit at launch from the rocket's engines and solid rocket boosters.

"The flame trench has withstood so many historical launches, and we are giving it new life to withstand many more," said Regina Spellman, the launch pad senior project manager with the Ground Systems Development and Operations Program.

The north side of the flame trench is about 571 feet long, 58 feet wide and 42 feet high.

A new flame deflector soon will be installed that will safely contain and deflect the plume exhaust from the massive rocket to the north during launch. Two side flame deflectors, repurposed from space shuttle launches, will be refurbished and reinstalled at pad level on either side of the flame trench to help reduce damage to the pad and SLS rocket.



An aerial view of Launch Complex 39B at Kennedy Space Center. Photo credit: NASA/Kim Shiflett



Ron Horvath

Program Analyst, Ground Systems Development and Operations Program



KENNEDY SPACE CENTER
Exploration Begins Here

My name is Ron Horvath. I am a program analyst in the Ground Systems Development and Operations Program (GSDO) at Kennedy Space Center.

I am the lead program analyst in the GSDO Business Office for the Command, Control and Communications (C3) Division. My main responsibilities include managing budgets, schedule and risk for the division. As an analyst, I support GSDO with planning the annual and multiyear budget activities for C3.

The part of my job that I like most is having the opportunity to see the tremendous progress that has been achieved by GSDO and be a part of history with the successful launch of NASA's Orion spacecraft aboard the Space Launch System from Kennedy Space Center.

I first started working at Kennedy in February 2001, with United Space Alliance (USA). Initially, I was hired as a project analyst but transitioned to the USA business office as a business analyst. I eventually moved into a position with software quality. After more than 10 years with USA, I was hired by SAIC as a support contractor in the business office. In October 2011, I was hired by NASA as a civil servant supporting the GSDO Program Business Office, taking on the role that I currently perform.

I have been very blessed to achieve Employee of the Quarter in March 2015 and received a Space Flight Awareness Team Award in July 2015 for my contribution to and support of the C3 projects. I

most recently earned the Early Career Achievement Medal in August 2016.

Thinking back, I first became interested in space while growing up at the United States Military Academy at West Point. My Aunt Holly and Uncle Gary Turner worked for USA at the time. I thought their jobs were so amazing, to be able to work with the space shuttles and the astronauts. I became a teacher at Space Coast Middle School in Port St. John, Florida. During six summers between school years as a teacher, I worked at Kennedy and Cape Canaveral Air Force Station through a program called "Summer Intern Fellowship for Teachers" for four different companies doing five different jobs. I learned different aspects of the space program. The work during those summers set the stage for achieving my goal to work at Kennedy.

I grew up in West Point, New York. I began my post-secondary education at the Florida Institute of Technology in Melbourne, Florida, studying civil engineering. I transferred and graduated from the University of Central Florida in 1995 with a bachelor's degree in secondary math education and a minor in mathematics. I returned and received a second bachelor's degree in engineering technology in 2006.

The advice I would give to students who are interested in a career similar to mine is to broaden your knowledge and be well-rounded. Be a good problem-solver. But most of all, be a great listener.

Ron Horvath
Program Analyst

Ground Systems Development & Operations Program

LLAMA WINNER

Engineer's design aids Orion recovery, earns Innovation Award

BY LINDA HERRIDGE

What is a LLAMA? It's a Line Load Attenuation Mechanism Assembly, designed by Jeremy Parr, a mechanical design engineer in the Engineering Directorate at Kennedy Space Center. He designed the LLAMA to help U.S. Navy line handlers retrieve the Orion crew module after it splashes down in the Pacific Ocean.

Parr is the lead design engineer for Orion Landing and Recovery, which is coordinated and led by the Ground Systems Development and Operations Program. Parr's design recently earned him second place in the agency's third Innovation Awards competition.

"The LLAMA concept came to me after watching the sailors fighting to control the Orion test capsule during Underway Recovery Test 1 in open water in February 2014," Parr said.

The standard Navy line tending practice is to wrap their lines around the ship's T-bits, or large solid columns with a crossbar that resemble the letter "t," located near the stern, so that the sailors can control big loads with only a few people. This works for most operations they do since the hardware they handle is usually big and slower moving in the seas. But the crew module is a different beast when floating in the water than anyone on the recovery team expected, Parr said. Orion is easily pushed around by wind and waves.

"I came up with a design that helps the Navy line handlers to safely maintain high tension in the tending lines during recovery of Orion into the well deck of a ship. It also regulates the amount of tension in the lines to ensure equal loading on the vehicle."

The LLAMAs are mounted on the ship's T-bits, and the mechanisms provide all tending line control of the crew module once it enters the well deck and until it is secured on the recovery cradle pads.

"I am both excited and honored to be recognized for the LLAMA design," Parr said. "This has been a team effort for a few years now to get where we are today. We worked through development and testing until we completed our successful test during Underway Recovery Test 5 off the coast of San Diego in the fall of 2016."

The LLAMA-controlled tending lines are the baseline method for recovery of Orion after Exploration Mission-1 and all future missions.

Parr began working at Kennedy in 2007. Prior to that, he worked for SAIC at Johnson Space Center in Houston for four years.



Jeremy Parr, a mechanical design engineer in Kennedy Space Center's Engineering Directorate, monitors the Line Load Attenuation Mechanism Assembly, or LLAMA, on the U.S. Navy ship during Orion Underway Recovery Test 5 in the Pacific Ocean off the coast of California. Photo credit: NASA

FULL SUPPORT

Engineering Kennedy's transformation a total team effort

BY STEVEN SICELOFF



Mars

Kennedy Space Center has transformed from a government-focused center into a spaceport open to many different users with their own unique needs and goals. Making the transformation ultimately successful is now in the hands of spaceflight specialists at Kennedy including the center's corps of professional engineers.

Having historically solved a slew of launch system, spacecraft and ground support equipment issues, Kennedy's engineering team now supports private companies just starting out in space, offers guidance to established aerospace companies and designs and builds the massive ground machinery that will launch NASA's Space Launch System (SLS) rocket and Orion spacecraft.

"What we really bring to the table is extremely competent engineers who know how to pull together complex projects," said Scott Colloredo, deputy director of the center's Engineering Directorate.

Colloredo was instrumental in laying out an approach for the multi-user spaceport in the wake of the Space Shuttle Program's retirement. "We essentially re-architected the space center from shuttle to this multi-user spaceport. In Engineering, we're now executing what we set out to do and that's mainly through supporting the programs."

The directorate realigned its specialists so each program at the center would have a chief engineer and engineering team that specializes in the program's needs and is on-hand to help solve problems quickly.

The realignment set up four groups:

Technical Performance and Integration, which ties the directorate's program support together,

Commercial Systems, including NASA's Launch Services Program and Commercial Crew Program as well as other programs and commercial partners,

Exploration Systems and Operations, working with NASA's Ground Systems Development and Operations, which is setting up and operating ground support and related systems for SLS and Orion missions, and

Laboratories Development and Testing, which supports International Space Station and other research environments.

Each area requires different skills and flexibility, Colloredo said.

Commercial, for example, requires its teams to react to changes very quickly. Engineers are on the LSP teams to tackle questions that arise ahead of launches of some of the most complicated robotic probes ever built to operate far from Earth and out of reach of any repair crew.

The work ranges from an analysis of an unexpected condition to offering alternatives for components or processes to make sure mission and launch goals are met.

"If we simplify the decisions, flatten the structure of the organization and empower the employees to make their own decisions and managements, then we can keep up with the speed of changing program and commercial needs," Colloredo said.

In the Exploration Systems and Operations group, the engineering team is testing the machinery that will be installed on the mobile launcher for the first launch of the SLS rocket and Orion spacecraft.

The testing is underway at Kennedy's Launch Equipment Test Facility, a large area at the center designed to put hardware such as swing arms and umbilical connectors through stresses similar to those they will experience in a real liftoff.

"We're in the real deal now, the prototyping phase is over," Colloredo said. "We're dealing with the real hardware, it's got to work."

The testing comes at the same time as other engineers are working on modifications to the Vehicle Assembly Building, the mobile launcher and the launch pad at Launch Complex 39B. When issues come up, engineers are already on-site and can provide changes and answers within hours, Colloredo said.

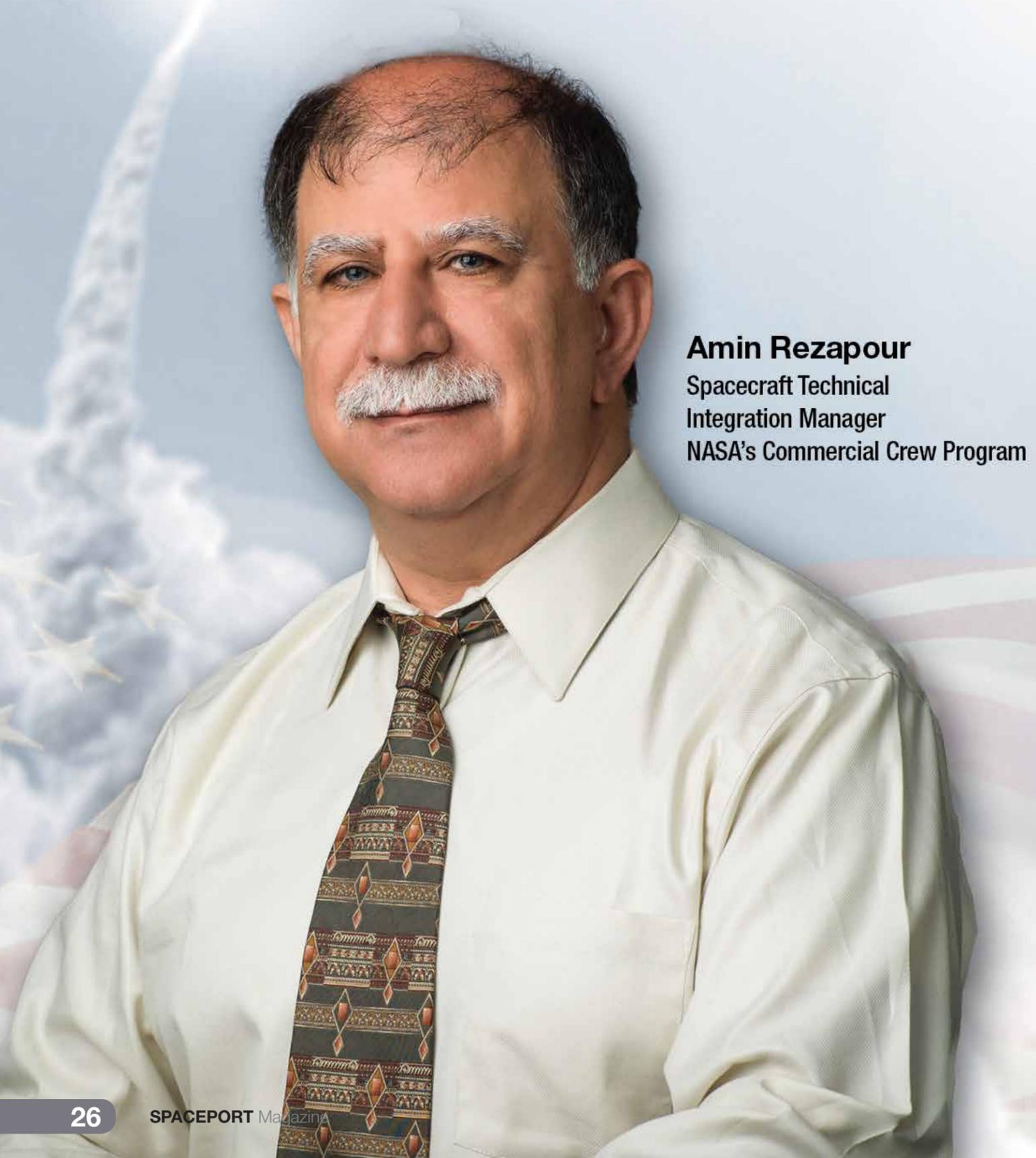
Kennedy's engineers are supporting multiple spaceflight efforts — Boeing and SpaceX for Commercial Crew Program, SLS and Orion, plus Blue Origin's emerging spaceflight system — along with the launches of NASA's satellites and uncrewed commercial cargo missions.

"We can't help but see how each one is doing and make sure they're all supported even though they're all different," Colloredo said. "We're building on the legacy of Mercury, Gemini, Apollo and shuttle. More kinds of missions will be launching from here, with only a short duration between them, going to different destinations. What could be better?"

A view from above shows a heavy-lift crane attached to the Interim Cryogenic Propulsion Stage Umbilical at the Launch Equipment Test Facility, or LETF, at Kennedy Space Center. Photo credit: NASA/Glenn Benson

I Will LAUNCH AMERICA

Restoring America's Human Launch Capability



Amin Rezapour
Spacecraft Technical
Integration Manager
NASA's Commercial Crew Program

I Will Launch America: Amin Rezapour

NASA is developing a new generation of spacecraft and launch systems that will enable research, technology and further exploration. As the agency looks deeper into the solar system with the Orion spacecraft and Space Launch System rocket, NASA's Commercial Crew Program is leading the nation's effort to turn over to American industry human space transportation to low-Earth orbit and the space station.

Amin Rezapour is NASA's spacecraft integration manager working with SpaceX, one of two private companies contracted to develop spacecraft systems and fly crew rotation missions for the agency. He ensures all of the subsystems in the spacecraft get evaluated and certified for human spaceflight.

"I am the single point of contact from the spacecraft program aspect of the Crew Dragon spacecraft with SpaceX, to ensure all of the integrated issues get resolved," said Rezapour.

Commercial crew contracts with Boeing and SpaceX are set up differently than other NASA programs. The difference is because the agency has a goal to foster a commercial market in low-Earth orbit, where the space station is located.

"This has never been done before," Rezapour said. "For the first time, we are relying on commercial companies to carry astronauts to the space station. And they are not NASA's contractors; they are our partners."

With this approach, NASA can use its human spaceflight expertise to enable two different American companies to take

astronauts to and from the station and thereby help maximize the research opportunities on the orbiting laboratory. Certifying the first privately built and owned human-rated space systems is a sensitive task.

For a spacecraft to be certified, the design has to meet stringent NASA standards. For Rezapour, this is a good fit as he is an electrical engineer with majors in computer science as well as robotic and control systems. After years of experience in communication and tracking systems on commercial vehicles, first with Boeing and then with NASA's Johnson Space Center, and working many years with NASA partners on cargo vehicles from requirement developments, design, test and operation, Rezapour knows what it takes to design, verify and operate successful spacecraft vehicles.

Starting on a new journey is not new to Rezapour. At 17, he moved to the United States during the Iran hostage crisis to attend college. He was the first of his family in America and had no one but himself to depend on. He attributes his success to a family motto that has followed him throughout his career: "If you want it bad enough, you have to put up with everything required to get it done."

Fortunately for Rezapour, his hard worked paid off and has brought him to the pinnacle of his career.

"People ask me, 'When are you going to retire?' You retire so you can do what you want. I'm doing that now. And the best part is I'm getting paid for it!"

SPECIAL SOIL

“We look at this asteroid simulant as an enabling technology. Now that it is available for sale, research teams across the country can use it to perform high-caliber ISRU research with directly comparable results.”



Mike Vinje
Leader of SBIR activities at Kennedy Space Center

The first shipment of asteroid simulant is ready for delivery to NASA. Photo courtesy of Deep Space Industries

This image, taken by NASA's Near Earth Asteroid Rendezvous mission in 2000, shows a close-up view of Eros, an asteroid with an orbit that takes it somewhat close to Earth. Photo credit: NASA/JHUAPL

Small business manufactures ‘Space Dirt’ for NASA research

BY MIKE VINJE

Deep Space Industries recently delivered 3.5 gallons of dirt to NASA. But this wasn't ordinary dirt; it was developed to simulate the material found on an asteroid or moon.

“The crushed rock found on celestial bodies is called regolith and we can make regolith simulants by using a special recipe of minerals mined on Earth,” said Rob Mueller, a senior technologist with Kennedy Space Center in Florida. “This will help researchers perform experiments and conduct equipment testing for potential mining of useful resources in space. Private industry is helping NASA in this effort.”

Deep Space Industries (DSI) proposed the development of an asteroid simulant in their response to NASA's Small Business Innovation Research (SBIR) program 2015 solicitation. As part of its plan, the company developed a range of asteroid simulants for government and commercial use, and its recent delivery to Kennedy Space Center marks the first batch ready for use by researchers across the nation.

To make the simulant, Deep Space Industries had to analyze the mineral composition of meteorites — the only material we have on Earth in significant amounts that originated on other planetary bodies (apart from the lunar rocks and regolith brought back during the Apollo program). Once they did this, they found rocks with similar content on Earth and milled them into powders. DSI then

mixed the powders in proper proportions to simulate the mineral composition of particular types of asteroids.

Deep Space Industries also worked with faculty and students at the University of Central Florida to test and verify the physical properties of the simulants they created.

“The NASA SBIR program is interested in helping industry grow into new research areas,” said Mike Vinje, who leads SBIR activities at Kennedy Space Center. “We look at this asteroid simulant from Deep Space Industries as a potentially enabling technology.” The practice of using resources found in a surrounding environment is called in-situ resource utilization, or ISRU. New ISRU technologies may help NASA convert materials found in space into usable supplies like fuel, oxidizer for fuel, water, air, building materials and even spare parts. If more materials gathered onsite can be used, then fewer materials need to be brought from Earth.

DSI will eventually produce several tons of five types of asteroid regolith simulants for NASA, universities and the space mining industry to use for ground testing of technologies. Planetary scientists and engineers at NASA will use the asteroid regolith simulants to design and develop space technologies for future space exploration missions in which local resources can be used instead of transporting resources from Earth. Some of the applications that may benefit from using high-fidelity regolith simulants to test

future space technologies include: excavation technologies; sample collection for resource prospecting; granular material handling in microgravity; thermal processing of regolith to extract volatiles like water and carbon dioxide; chemical processing of regolith to extract metals for 3-D printing of parts, oxygen for life support, and other materials; space suit development; and may even help NASA to study potential health effects of asteroid dust particles.

The group of companies capable of producing ISRU technology is small, but the customer base is growing. United Launch Alliance (ULA) recently announced long-term planning that includes the incorporation of ISRU-derived fuels for its Advanced Cryogenic Evolved Stage booster concept.

“If you are able to create an industry that is able to mine propellant from the moon or asteroids or other locations, we'd be willing to buy it,” said ULA Advanced Programs Manager Michael Holguin at the company's Human Spaceflight Update during the 2016 International Symposium for Personal and Commercial Spaceflight. “It would lower the cost of in-space transportation by an order of magnitude.”

“We have a long way to go in the ISRU field, and a lot of tough challenges that need to be solved along the way,” Vinje said. “However, we are planting seeds in industry — seeds that will help everyone make progress in this field, not just NASA.”

For more information about the Small Business Innovation Research program managed by NASA's Ames Research Center in California's Silicon Valley, visit <https://sbir.nasa.gov>.

On May 7, one of our spaceport partners, the U.S. Air Force, successfully landed their X-37B Orbital Test Vehicle at the Space Florida-operated Shuttle Landing Facility here at Kennedy Space Center. I am proud to congratulate the Air Force on their program accomplishment and welcome them as a member of the KSC multiuser spaceport family. What an outstanding use of a runway and processing facilities that once supported NASA's space shuttle and now support a new orbital vehicle.

This achievement is just one more example of how KSC is a vibrant spaceport full of activity. We continue to forge new relationships with commercial space industry and other partners to expand the spaceport. We enable organizations to achieve mission success through a comprehensive range of resources unmatched anywhere in the world. Having industry partners enables NASA to do what we do best, explore the unknown and forge the path to send humankind farther into deep space than we have ever been, including Mars.

— Bob Cabana,
Director, NASA's Kennedy Space Center



Photo credit: Air Force

DYNAMIC DUO

Foale, Ochoa inducted into Astronaut Hall of Fame

BY BOB GRANATH



"My first flight was STS-45 and Charlie Bolden was my first commander. Charlie has become my model on how to respect other people, how to listen to issues, and how to make decisions to resolve them. Truly, he is my model for leadership, fellowship and all the other things that go into making a team work."

Michael Foale
Hall of Fame Astronaut

"I'm honored to be recognized among generations of astronauts who were at the forefront of exploring our universe for the benefit of humankind. I hope to continue to inspire our nation's youth to pursue careers in science, technology, engineering and math so they, too, may reach for the stars."

Ellen Ochoa
Hall of Fame Astronaut

Space shuttle astronauts Michael Foale, left, and Ellen Ochoa, stand with their plaques after being inducted into the U.S. Astronaut Hall of Fame at NASA's Kennedy Space Center Visitor Complex. Photo credit: NASA/Kim Shiflett

Space shuttle astronauts Dr. Michael Foale and Dr. Ellen Ochoa recently joined an elite group of American space heroes with their induction into the U.S. Astronaut Hall of Fame. They were welcomed to the ranks of legendary pioneers such as John Glenn, Jim Lovell and Eileen Collins during a May 19 ceremony at the Kennedy Space Center Visitor Complex.

Since the Hall of Fame inducted the seven Mercury astronauts in 1990, these additions bring the number of enshrined space travelers to 95.

Kennedy's center director, Bob Cabana, himself a member of the Astronaut Hall of Fame, offered praise for the two new inductees.

"To Ellen and Michael, my sincerest congratulations on this recognition," he said. "It's most well deserved. This is an exciting time here on the space coast. Kennedy has established itself as a true multi-user spaceport and NASA is once again preparing to explore beyond our home planet."



Michael Foale performs a spacewalk to service the Hubble Space Telescope during the STS-103 mission of the space shuttle Discovery in December 1999. Photo Credit: NASA

Foale's road to becoming an astronaut began when he moved from his home in Great Britain to Houston in 1982 to work in space shuttle navigation with McDonnell Douglas. The next year, he joined NASA as a payload officer in the Mission Control Center. Foale was selected as an astronaut in 1987.

Foale expressed appreciation to former

NASA Administrator and fellow Hall of Fame member Charlie Bolden for his introduction.

"My first flight was STS-45 and Charlie Bolden was my first commander," he said. "Charlie has become my model on how to respect other people, how to listen to issues, and how to make decisions to resolve them. Truly, he is my model for leadership, fellowship and all the other things that go into making a team work."

Foale was born in Louth, England, but raised in Cambridge. Although he carries dual citizenship in both the U.S. and Great Britain, the stars and stripes have always been displayed on his flight suit.

Working toward his ambition to fly in space, Foale attended the University of Cambridge, Queens' College, earning a bachelor's degree in physics and natural sciences and graduating in 1978 with first-class honors. He completed his doctorate in laboratory astrophysics at Cambridge in 1982.

As a NASA astronaut, Foale flew to space five times aboard the space shuttle. One mission included a 145-day stay in 1997 aboard the Russian space station Mir. In 2003, he launched to the International Space Station for his sixth flight as part of the Soyuz TMA-3 crew.

During those flights, Foale participated in spacewalks to inspect Mir, service the Hubble Space Telescope and perform work outside the International Space Station.

Foale retired from NASA in 2013 to pursue his dream of developing an electric aircraft as part of his passion for green aviation and hoping to reduce the cost of flying by 90 percent.

Ochoa began her journey to space in 1988 as an engineer at NASA's Ames Research Center in California. She led a group working on optical systems for automated space exploration. She moved to the agency's Johnson Space Center in Houston during 1990, having been selected as an astronaut. A veteran of four space shuttle missions, Ochoa now is center director at Johnson.

"I'm honored to be recognized among generations of astronauts who were at the

forefront of exploring our universe for the benefit of humankind," she said. "I hope to continue to inspire our nation's youth to pursue careers in science, technology, engineering and math so they, too, may reach for the stars."

When Ochoa was growing up in La Mesa, California, she was fascinated by the Apollo astronauts as they launched to the moon. Her personal interests focused on science and engineering, leading her to San Diego State University. She majored in physics, earning highest honors and graduating Phi Beta Kappa. Ochoa applied



Aboard the Spacehab module in the space shuttle Discovery's cargo bay, Ellen Ochoa coordinates the transfer of hardware to the International Space Station during STS-96 during May and June 1999. Photo credit: NASA

for the astronaut program while completing her doctorate in electrical engineering at Stanford University.

With Foale as a crewmate, Ochoa's first space shuttle mission was STS-56 in April 1993. On that flight she became the first Hispanic woman in space.

Ochoa went on to fly three more shuttle missions, including flights to service the Hubble Space Telescope and assemble the International Space Station.

After STS-110 in 2002, Ochoa moved into management, serving as deputy director of Flight Crew Operations and, five years later, deputy center director at Johnson. On Jan. 1, 2013, Ochoa moved into her current position when she was named director of the Johnson Space Center.



A female wild pig digs for food in the woods at Kennedy Space Center. The center shares a boundary with the Merritt Island National Wildlife Refuge. The refuge is home to more than 65 amphibian and reptile species, along with 330 native and migratory bird species, 25 mammal and 117 fish species. Photo credit: NASA/Bill White

CANINE COMPADRE

Intern gets by with a little help from a friend

BY LEAH CHESHIER



Nova's name is derived from the phenomena of an exploding star: a supernova. Photo courtesy of Elijah Spiro

Every night, countless children across the world gaze up at the night sky and imagine what it must be like among the stars. Some even dare to dream as big and bright as those stars, dreaming of traveling beyond Earth's atmosphere and into outer space. Elijah Spiro was one of those children, realizing a career could stem from his passion for space exploration. But not all dreams come true.

Elijah was devastated when his goal of becoming an astronaut reached an untimely and unfortunate end. He was diagnosed with Type 1 diabetes, a condition leaving him ineligible to someday join the Astronaut Corps. However, Elijah knew he could still make invaluable contributions to spaceflight without actually going on one, and he found a way to do just that.

In fall 2016, Elijah was selected as an intern at Kennedy Space Center. Though he said temporary goodbyes to many friends at Amherst College in Massachusetts, Elijah was bringing "man's best friend" with him. Elijah's pup, Nova, wasn't just joining for a good time: he was also on his way to work alongside his owner at NASA.

While Elijah was contributing to important projects, Nova had significant work to do, too. Nova is a Service Animal trained to recognize high and low blood sugar levels, exactly what he does for his owner, allowing Elijah to focus solely on his project. The pair has been inseparable for four years now, with Nova saving Elijah's life more than a few times. The pup was welcomed into the NASA family, and according to Elijah's mentor, Jamie Szafran, essentially became the interns' mascot!

While Nova can't help Elijah study, he does provide excellent company for his hardworking owner, a double major in computer

science and astronomy. Elijah put those studies to the test during his internship in the software engineering branch at Kennedy Space Center in Florida. This branch writes code that launches rockets and ensures all conditions are safe prior to launch. Elijah focuses mostly on developing automated testing procedures that emulate human code testing. When running Elijah's code, the computer moves the mouse pointer and types on its own, saving software engineers copious amounts of time and resources.

One thing Elijah loves most about his project is that it takes him into Firing Room 3 every day. "It's been amazing to stand and work in the same room that's responsible for executing famous NASA endeavors, such as multiple shuttle launches," he said. "I'm learning to appreciate how every little part comes together to create the big picture that the public is exposed to, and just how much work goes in to each launch." Elijah has also enjoyed simply being in the NASA environment, frequently admiring the Vehicle Assembly Building and rockets mounted on the launch pads.

Because of his internship, Elijah learned how to incorporate feedback from his mentor and other technical experts into his work. He now recognizes how important each person's job is when working on a large project, with each small piece coming together to ultimately create something amazing.

Elijah believes the automation skills and technical frameworks he has been exposed to will advance him beyond his competition when applying for future jobs, but he already knows where he wants to be: NASA. "I want to develop code that will benefit humanity, and I believe that I'm in the right place to do that."

And while Elijah worked to advance space exploration, Nova was in the right place too — by his owner's side.



By Elijah's side for four years, Nova continued that streak by sharing an office with the interns at Kennedy Space Center. Photo courtesy of Elijah Spiro



Hurricane Season Begins

Last October, Hurricane Matthew brushed the beaches of Brevard County in Florida, including the shoreline of NASA's Kennedy Space Center. Were it not for a last minute turn to the northeast, Kennedy would have received catastrophic damage from storm surge and high winds.

The center received some isolated roof damage and the chiller plant was totally destroyed. Kennedy has not fully recovered, having to rent portable chillers for several months. Although the storm surge was less than expected, the beach erosion was extreme. Sand dunes are among the most important structures that protect Kennedy's spaceport infrastructure.

June 1 marks the start of another hurricane season at Kennedy. The Atlantic hurricane season is a time when most tropical cyclones are expected to develop across the northern Atlantic Ocean. It extends through Nov. 30. Kennedy Space Center's Environmental Management Branch, in conjunction with the Merritt Island National Wildlife Refuge, works to plan and protect Kennedy's environment and unique spaceflight assets from severe weather such as hurricanes.



SENIORS VISIT

Brevard's top scholars visit Kennedy Space Center

BY FRANK GONZALES

About 40 high school seniors saw firsthand how NASA's Kennedy Space Center might be the perfect place for them to work in the future during Brevard Top Scholars Day.

Kennedy's Office of Education Projects and Youth Engagement coordinated the May 5 event that featured a special behind-the-scenes tour of Kennedy, including prototype shops, cryogenic labs and facilities such as the Vehicle Assembly Building and the Launch Control Center firing rooms.

The day began with Kelvin Manning, Kennedy associate director, addressing the students regarding NASA's and Kennedy's roles and missions.

"We truly enjoy sharing our vision of a multi-user spaceport with you seniors," Manning said. "You've got a lot to look forward to. We hope someday your journey will bring you back to Kennedy Space Center."

Thomas Sturman, a senior at Edgewood Jr./Sr. High School on Merritt Island, Florida, said he hopes to earn a mechanical engineering degree at the University of Central Florida before finding a job at Kennedy.



About 40 Brevard County high school seniors take in the enormity of the Vehicle Assembly Building during Brevard Top Scholars Day on May 5. Kennedy's Office of Education coordinated the event that featured a special behind-the-scenes tour of Kennedy, including prototype shops, cryogenic labs and the Launch Control Center firing rooms. Photo credit: NASA/Cory Huston



Kennedy Space Center Associate Director Kelvin Manning addresses about 40 Brevard County high school seniors regarding NASA's and Kennedy's roles and missions during Brevard Top Scholars Day at Kennedy Space Center on May 5. Kennedy's Office of Education coordinated the event that featured a special behind-the-scenes tour of Kennedy, including prototype shops, cryogenic labs and facilities such as the Vehicle Assembly Building and the Launch Control Center firing rooms. Photo credit: NASA/Cory Huston

"I've been hoping to someday work here all my life," Sturman said. "It's nice to meet the people I hope to someday be working with."

Kennedy's Deputy Director for Education Projects and Youth Engagement, Lesley Fletcher, welcomed the students to the center and congratulated them on their achievements.

"I'm sure you have made many sacrifices along the way and your hard work will always reap the benefits," Fletcher said. "Continuing to make smart decisions and being a team player will benefit you the rest of your journey."



About 40 Brevard County high school seniors attended Brevard Top Scholars Day at Kennedy Space Center on May 5. Kennedy's Office of Education coordinated the event that featured a special behind-the-scenes tour of Kennedy, including prototype shops, cryogenic labs and facilities such as the Vehicle Assembly Building and the Launch Control Center firing rooms. Photo credit: NASA/Cory Huston

Dillon Mickel, a senior from Merritt Island High in Florida, said he really liked the day's experience.

"I felt very humbled and honored to be able to represent my school at such a wonderful event full of great students and mentors," Mickel said. "I was able to learn more about space travel, as well as what Kennedy has to offer. It was a wonderful event."

NASA engineers and scientists joined the breakfast to have one-on-one conversations with the students about their education, careers, and what they are working on now.

Jin Na Jones, a senior from Satellite High in Satellite Beach, Florida, is pursuing a career in cosmetics. Jones hopes to earn a chemical engineering degree from the University of Central Florida.

"This visit definitely has broadened my horizons," Jones said. "I'm just a girl who wants to contribute to the world all that I can. This place is just so inspiring."

The soon-to-be graduates of high academic standing were selected for their excellence in studies, responsible conduct, courtesy and respect towards teachers and fellow students, and representing their school in an exemplary manner in and out the classroom.

Samantha Cavallaro, a senior from Satellite High, plans to pursue degrees in animal biology and psychology from the University of South Florida.

"I'd love to be able to work with the animals around Kennedy," Cavallaro said. "I feel very fortunate to have been chosen. I am very inspired by the potential careers that involve animals that exist here."

At the end of the day, each student received a certificate acknowledging his or her attendance at the event.



Our Refuge

NASA'S KENNEDY SPACE CENTER NATIONAL WILDLIFE REFUGE

Since August of 1963, Kennedy Space Center has coexisted with Merritt Island's National Wildlife Refuge. Just south of Launch Pad 39A, manatees graze protected in a sanctuary in the northern end of the Banana River. Between May and September, thousands of endangered sea turtles come ashore on this barrier island in the dark of night to lay their eggs. Merritt Island's strategic location along the Atlantic Flyway provides a resting and feeding place for thousands of ducks, wading birds, shorebirds and songbirds. Diverse habitats that include brackish marshes, salt water estuaries, hardwood hammocks and upland scrub provide homes to an amazing diversity of more than 500 species of fish and wildlife, including many that are protected under the Endangered Species Act. Today, these 220 square miles are managed by the Department of the Interior as a national wildlife refuge and national seashore with the exception of about 10 square miles dedicated to the launch, landing and processing facilities that support the space program. In this Q&A installment about responsibilities of Kennedy's Ecological Program, we provide information on sea turtles and their significance to Kennedy's ecosystem. Included are facts about basic sea turtle biology, federal protection, and what we can do to ensure their continued survival. Remember, it is all of our responsibility to leave this planet in better shape for future generations than we found it.

Q: Are there sea turtles at Kennedy?

Yes, we have sea turtles that live in the Indian River and Banana River, and adult sea turtles that migrate here to nest on our beach.

Q: When are sea turtles nesting on Kennedy's beach?

Leatherback turtles sometimes can lay their eggs as early as March. Loggerheads tend to begin laying their eggs in late April/early May. Green turtles usually begin laying their eggs in late June and can lay as late as October or November.

Q: How many eggs do sea turtles lay?

It can vary by individual turtle and there are differences between the three species that typically nest here (Leatherback, Loggerhead, and Green turtle), but generally it's 100-130 eggs.

Q: How long does it take for the eggs to hatch?

Sea turtle eggs, like chicken eggs, will incubate faster at warmer temperatures. Here in central Florida, it takes 55-60 days for a nest to hatch.

Q: Do the mother turtles come back to care for their babies when they hatch (like alligators)?

No, sea turtles lay their eggs anywhere from 20 inches to 5 feet below the sand (depending on the species). They do a very good job of disguising where the eggs are when they cover them, but they do not return to the nest. In fact, they likely will lay another clutch of eggs on the same beach within a couple of weeks.

Q: Are sea turtles protected?

Yes, all species of sea turtles are protected under the Federal Endangered Species Act of 1973. They also are protected by state law.

Q: What time of day do sea turtles lay their eggs and when do the nests hatch?

Most sea turtles come up on the beach after dark to lay their eggs. It's cooler during the night, and they are less likely to overheat. Hatchlings also emerge from their nests at night, although occasionally, hatchlings will leave the nest at sunrise or dusk. Coming out at night is best because of the cooler temperatures and there are fewer predators, like birds, that would try to eat them.



Newly hatched loggerhead turtles trek across the sand toward the Atlantic Ocean at NASA's Kennedy Space Center in Florida, which shares boundaries with the Merritt Island National Wildlife Refuge. Courtesy of IHA/Karen Holloway-Adkins

Q: Why do I see signs and bumper stickers that say "Turn off lights for sea turtles"?

Sea turtles use the light of the moon and stars to navigate. Artificial lighting from street lights, buildings, and flashlights on the beach can mislead nesting and hatching turtles. They head toward the artificial lights away from the ocean and risk danger of being eaten by predators like raccoons and foxes. They also risk wasting precious energy wandering around that they need to get them far out to sea.

Q: How long do sea turtles live?

That's a tough one. It's not completely known, but there is evidence that sea turtles may live more than 50 years.

Q: What do sea turtles eat?

That depends on the species: leatherbacks tend to eat jellyfish; loggerheads will eat clams, oysters and horseshoe crabs; and green turtles mostly graze on seagrass and macroalgae.



NASA'S ICEBRIDGE WRAPS UP 2017 ARCTIC CAMPAIGN WITH SOUTHERN GREENLAND FLIGHT.

A fjord in southern Greenland, as seen during Operation IceBridge's last flight of the 2017 Arctic campaign, on May 12, 2017. This final full science flight, ICESat-2 South, was designed along the ground tracks of NASA's upcoming Ice, Cloud, and land Elevation Satellite-2 (ICESat-2), to fill in a gap in altimetry coverage of central southern Greenland. Supporting ICESat-2, which is scheduled to launch in 2018, is one of the primary goals for Operation IceBridge. But the large volumes of data on Arctic sea and land ice that IceBridge has collected during its nine years of operations there have also enabled scientific discoveries ranging from the first map showing what parts of the bottom of the massive Greenland Ice Sheet are thawed, to improvements in snowfall accumulation models for all of Greenland. IceBridge has produced unprecedented three-dimensional views of Arctic and Antarctic ice sheets, providing scientists with valuable data on how polar ice is changing in a warming world. Photo credit: NASA/John Sonntag

National Aeronautics and Space Administration

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