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National Aeronautics and
Space Administration

KENNEDY SPACE CENTER'S

SPACEPORT magazine

GOING UP

CubeSats among 7,600 pounds of cargo delivered to space station on Orbital ATK's CRS-7 mission

Aeronautics Research | Mars | Technology | Earth Right Now | ISS | Solar System & Beyond

KENNEDY SPACE CENTER'S

SPACEPORT MAGAZINE

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Cover: The Orbital ATK Cygnus pressurized cargo module is carried atop the United Launch Alliance Atlas V rocket from Space Launch Complex 41 at Cape Canaveral Air Force Station in Florida. Orbital ATK's seventh commercial resupply services mission, CRS-7, delivered 7,600 pounds of supplies, equipment and scientific research materials to the International Space Station. Photo credit: NASA/ Tony Gray and Sandra Joseph

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KSC BLOG

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NASA'S LAUNCH SCHEDULE

Date: April 20
Mission: Expedition 51 Launch
Description: Expedition 51/52 crew members NASA astronaut Jack Fischer and cosmonaut Fyodor Yurchikhin of the Russian space agency Roscosmos launch to the International Space Station. Yurchikhin will be the Expedition 52 commander.
http://go.nasa.gov/2gMfdmx

Date: June 1
Mission: SpaceX CRS-11 Cargo Mission to International Space Station
Description: An uncrewed SpaceX Dragon spacecraft, carrying crew supplies and station hardware, will lift off on a Falcon 9 rocket from Launch Complex 39A at Kennedy Space Center.

Date: No Earlier Than June
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

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

Want to see a launch?
All expendable vehicles launched in Central Florida begin their journeys on the launch pads of Cape Canaveral Air Force Station, next door to Kennedy Space Center. 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.

I am KENNEDY SPACE CENTER

MARK PETRUZZELLO

I am a field operations manager with CORE Engineering & Construction Inc. (CORE), working as a contractor at Kennedy Space Center. My responsibilities include serving as the field operations manager for environmental assessment and remediation projects and site superintendent for construction projects across Kennedy and Cape Canaveral Air Force Station, or CCAFS.

I love my job because every day is different, exciting and challenging. It's really cool that I work at facilities that other people pay to tour. I work for a HUBZone small business, based in Central Florida, specializing in environmental and construction services for the federal government. I get to lead complex and diverse environmental assessment and remediation efforts arising from activities associated with NASA's historical human spaceflight initiatives, including the Mercury, Gemini and Apollo programs at Kennedy and CCAFS. I also serve as a site superintendent for demolition of aging launch complexes and new construction to revitalize the aging infrastructure across Kennedy and CCAFS.

I have been interested in the space program for as long as I can remember. I was born in Baltimore, Maryland, and have lived my whole life along the Space Coast watching the growth and changes in the space program. I live in Cocoa, Florida, raising my son Alex, who is a football player at Cocoa High. I also have a daughter, Vanessa, who is in law school at the University of Maryland.

As a space coast native, I am proud of what I do to help support NASA's future space missions.

ELANA XVII

CubeSats touching new heights in space research

BY STEVEN SICELOFF

Part of the scientific cargo packed inside an Orbital ATK Cygnus spacecraft recently launched to the International Space Station is a trio of tiny spacecraft that soon will fly on their own in orbit to look at different aspects of space-based science.

With one examining Earth's cloud layer, another looking at the cosmic background radiation from the birth of the universe and one evaluating battery storage capacities in space, the three satellites make up NASA's ELaNa XVII mission, short for Educational Launch of Nanosatellites. The CubeSat Launch Initiative offers launch opportunities for CubeSats proposed and built by teams of engineers and researchers from U.S. educational institutions, nonprofits and NASA centers. NASA evaluates each proposal, selects some to fly and then schedules them for a trip into space on an ELaNa mission.

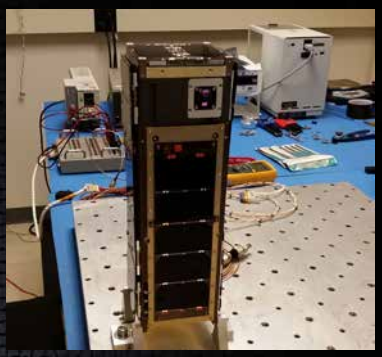
Built to operate on their own and communicate with Earth despite being only a few inches across, the CubeSats are the latest examples from a scientific movement that has seen satellites shrink dramatically to conduct research for far less money while still returning high-quality results.

"The community and industry is growing by leaps and bounds," said NASA's Scott Higginbotham, mission manager for ELaNa XVII. "It is amazing what you can do with in a small package at a relatively low price and folks are truly embracing the concept."

With blue sky for a background, the Orbital ATK Cygnus pressurized cargo module is carried atop the United Launch Alliance Atlas V rocket from Space Launch Complex 41 at Cape Canaveral Air Force Station in Florida on April 18. Photo credit: NASA/Tony Gray and Sandra Joseph

THE THREE ELANA XVII SATELLITES ARE:

ICECUBE – The mission is to demonstrate the technology of a submillimeter-wave radiometer for future cloud ice sensing. This technology will enable cloud ice measurements to be taken in the intermediate altitudes (5 km – 15 km), where no measurements currently exist. It will perform first-of-a-kind measurements of ice particles embedded within clouds. These measurements will advance atmospheric monitoring technology and also fill in critical gaps in understanding how cloud ice affects the weather and how cloud formations process atmospheric radiation.



CXBN-2 – Short for Cosmic X-Ray Background NanoSat-2, the mission will increase the precision of measurements of the Cosmic X-Ray Background in order to constrain models that attempt to explain the relative contribution of proposed sources lending insight into the underlying physics of the early universe. The mission addresses a fundamental science question that is central to our understanding of the structure, origin, and evolution of the universe, by potentially lending insight into high-energy background radiation and the evolution of galaxies.

CSUNSAT1 - Short for California State University Northridge Sat1, the primary mission of CSUNSat1 is to test an innovative low-temperature-capable energy storage system in space. The success of this energy storage system will enable future missions, especially those in deep space, to do more science while requiring less energy, mass and volume.

The three satellites flew into orbit inside a small canister tailored to the needs of CubeSats. Astronauts on the station will pull the canister out of the Cygnus and position it at the airlock of the Japanese Experiment Module. Once moved to the outside of the station, the small robotic arm on the Japanese module will point the canister out into space and each spacecraft will be pushed out into its own separate flight path to conduct its mission.

Part of lining up CubeSat missions is evaluating which ones are ready to go when the main payload is ready. Mission planners also work to get as many CubeSats into space with each launch as they can, Higginbotham said.

"We try to match the readiness date and orbital parameter desires of our CubeSats with the vehicles going to those orbits," Higginbotham said. "We are also always looking for efficient ways to effectively 'bundle' CubeSats together because we often get a volume discount."

Launch companies are making more room on their launchers for these tiny spacecraft as the interest in them grows. Some companies, such as those contracted under NASA's Venture Class Launch Services, are building launch vehicles solely for CubeSats and small spacecraft. Those launchers can be sent to many different orbits and are designed to carry dozens of CubeSats into space at a time.

Right now, Higginbotham and his NASA teams are processing eight more ELaNa missions that are in different stages of preparation for their own launches.

"There's never a dull moment around here," Higginbotham said.

Technicians package the Neutron star Interior Composition Explorer, or NICER, payload April 6 inside the Space Station Processing Facility high bay at Kennedy Space Center. NICER will be delivered to the International Space Station aboard SpaceX's Dragon cargo module, on its eleventh commercial resupply services mission, CRS-11. Photo credit: NASA/Frank Michaux

SIGHTS SET ON SATURN

Cassini's Kennedy legacy began 20 years ago with arrival at launch site

BY STEVEN SICELOFF

NASA's Cassini spacecraft arrived at Kennedy Space Center 20 years ago to begin processing for launch on a mission that would see it deliver spectacular images and data from the ringed planet Saturn. As the massive spacecraft begins its final chapter, engineers at Kennedy took a look back to how their contributions to the mission began.

The processing and launch of NASA's Cassini spacecraft in 1997 gave engineers at Kennedy a chance to work with a flagship spacecraft, new rocket and demanding power source. The Cassini mission also showed Kennedy launch teams techniques and approaches that would continue to pay off years later when new spacecraft were launched on unique missions.

Before heading to Saturn to conduct unprecedented science in the orbit of the gas giant, the Cassini spacecraft made a comparatively short jaunt from the Jet Propulsion Laboratory in Pasadena, California, to Kennedy inside an Air Force C-17 transport aircraft. April 1997 saw the arrival of Cassini and its move to the Payload Hazardous Servicing Facility for assembly.

"I'm thinking, 'this is a very, very large spacecraft,' " said Omar Baez, who worked as a mechanical and propulsion systems engineer for the Titan IVB rocket that launched Cassini.

Standing about 22 feet tall and weighing almost three tons empty, the spacecraft was tested extensively during processing. The Huygens spacecraft, which was much smaller and laden with a wide assortment of instruments, was attached to the side of Cassini so it could separate and parachute to the surface of Saturn's moon Titan.

"This was a whole new level of complexity and interest that got my attention," said Ken Carr, one of the launch site integration managers for Cassini. "It's mind-boggling the technology required to pull that off. We're trying to accomplish pretty bold things and wondering whether we're going to be able to pull it off at the end of the day."

A great deal of attention was paid to Cassini's power source, too. Plutonium encased in a radioisotope thermoelectric generator, or RTG, has provided electricity to Cassini throughout its 20 years in space, to power everything from navigation systems to the cameras and instruments that look closer at Saturn than ever before.

Ahead of the launch, every step of the handling of the RTG was not only planned carefully, but rehearsed repeatedly, sometimes months before the spacecraft arrived in Florida.

"I had to route all the hazardous procedures, get them signed off on before the procedure was done and there were many procedures that had to be written," Carr said.

"When you're flying material like that, you have to team with a lot of people," Baez said. "I remember going to meetings and there were hundreds of people. Air Force, aerospace community, we had to deal with Glenn Research Center. There were tons of people at these meetings whereas now if we had similar meetings there would be 20 people. It was a big deal."

Launch took place Oct. 15, 1997, when the Air Force Titan IVB ignited to catapult the robotic Cassini spacecraft on a path that would carry it around the inner solar system to build up momentum and sling it out to Saturn.

"The last five minutes was complete silence in that control room," Baez said. "It was a very cloudy morning and I remember seeing that Titan IV just shoot through the clouds on the way to Saturn. Everybody breathed a sigh of relief. We were able to exhale and relish in it."

The spacecraft reached Saturn's orbit on June 30, 2004, and began a tour of Saturn and its moons that returned remarkable images and detailed readings of the planet and its signature rings. Huygens landed on Titan in January 2005 and transmitted images from its surface. It was the first time a spacecraft landed anywhere in the outer solar system.

"Before, what we got was grainy and now we were getting these detailed photos in color," Baez said. "It looked like somebody had drawn them. It just went from being two-dimensional to something real that you could almost grab."

Cassini has been broadcasting new photos and scientific readouts from Saturn's orbit in all the years since arriving. On April 26, it performed its first dive between Saturn and its innermost ring to reveal some of the secrets behind the captivating planet's unique appearance. The mission will end Sept. 15 when Cassini follows its trajectory into Saturn itself, so that it doesn't accidentally contaminate any of the moons around the planet.

Cassini's legacy will not end in September, however. Scientists still have data to pore over at multiple research facilities, including the mission's home at the Jet Propulsion Laboratory in Pasadena, California. In Florida, the launch teams for NASA's Launch Services Program continue to draw lessons from Cassini as they prep for new missions.

"One thing that comes to mind is teamwork," Carr said. "Here at NASA, we do teams well."

"Before, what we got was grainy and now we were getting these detailed photos in color. It looked like somebody had drawn them. It just went from being two-dimensional to something real that you could almost grab."

Omar Baez

Then-Mechanical and Propulsion Systems Engineer for the Titan IVB rocket that launched Cassini

Engineers process NASA's Cassini spacecraft at Kennedy Space Center ahead of its launch to Saturn Oct. 15, 1997. Photo credit: NASA

NASA's Cassini mission begins with an Air Force Titan IVB rocket lifting off Oct. 15, 1997, from Cape Canaveral, Florida, to place the spacecraft on a path that would send it to Saturn. Photo credit: NASA

APOLLO, SPACE SHUTTLE, BEYOND

NASA celebrates 50th anniversary of Launch Complex 39B, prepares for next mission

BY LINDA HERRIDGE

Mars

An aerial view of Launch Pad 39B looking east on July 22, 1966. Photo credit: NASA

Launch pads built on a swamp. A humble beginning for the two pads, A and B, at Launch Complex 39 at Kennedy Space Center. They originally were constructed in the 1960s to serve as a starting point for Apollo and our journey to the moon. Now, Launch Complex 39B will serve as the launch site for the agency's Space Launch System rocket and Orion spacecraft on deep-space missions, including the Journey to Mars.

Time flies, and NASA is celebrating the 50th anniversary of pad B, the launch site for one Apollo/Saturn V launch, three Skylab missions using the Saturn 1B rocket, one Apollo-Soyuz Test Project mission that also used a Saturn 1B, and 53 space shuttle launches.

Construction of the pad began in December 1964 and was completed in April 1967.

Drawings of the original pad B were completed by Giffels and Rosetti Inc. of Detroit in October 1964. Construction of the complex was completed by George A. Fuller Co. in Los Angeles. Design and construction supervisors were the Canaveral District of the U.S. Army Corps of Engineers.

To fill in and build up the area, hundreds of tons of sand was dredged from the Atlantic Ocean and pumped along a road to pad B. The behemoth structure of the pad required 68,000 cubic yards of concrete and 5,100 tons of reinforced steel.

The complex consisted of the launch pad, fuel and oxidizer facilities, environmental control system room, pad terminal connection room, camera stations, electrical equipment buildings, a water chiller facility, an emergency egress facility, and operations offices. The only major difference between pads A and B is that pad B sits seven feet higher (55 feet) above mean sea level.

The first launch from pad B was Apollo 10 on May 18, 1969. It also was the first real use of the pad's water deluge system, used to cool the flame deflector in the flame trench after rocket ignition.

"It was a good feeling to see that launch," said Gene McDilda, who was a propellant mechanic with NASA and worked prelaunch testing. He watched the launch from the west side of the Vehicle Assembly Building. He worked at Cape Canaveral Air Force Station and Kennedy for more than 40 years.

Pad B was used to launch three of the four missions of the Skylab program. The crewed missions were Skylab 2 on May 25, 1973; Skylab 3 on July 28, 1973; and Skylab 4 on Nov. 16, 1973. The crewed Apollo-Soyuz Test Project mission launched from pad B on July 15, 1975.

Work to modify the pad for the Space Shuttle Program began in 1979. In October 1980, a $6.7-million contract was awarded to W&J Construction Corp. of Cocoa, Florida, to install the ground support equipment within the pad B complex. The work included installation of pipes and cable to carry fuels, fluids and air to the Fixed Service Structure and the Rotating Service Structure on the surface of the pad.

Additional work at the pad was completed by Saver Mechanical Inc. of Jacksonville, Florida, and the Holloway Corp. of Titusville. Modifications to accommodate space shuttles were completed in late 1985.

The pad was officially activated by "Buz" Brown, who was the site manager for ground support equipment with Martin Marietta

The Apollo-Soyuz Test Project (ASTP) Saturn 1B launch vehicle thundered away from Kennedy Space Center's Launch Complex 39B on July 15, 1975, at 3:50 p.m. Aboard the Apollo Command Module were ASTP astronauts Thomas Stafford, Vance Brand and Donald Slayton. Photo credit: NASA

Pouring concrete at Launch Pad 39B on March 7, 1966. Photo credit: NASA

from 1980 to 1984.

The first space shuttle launch from pad B was Challenger, on STS-51L, on Jan. 28, 1986. Pad 39B became the principle launch pad for the first Return to Flight mission, lifting off Sept. 29, 1988.

Bruce Simmons, with ERC on the Test and Operations Support Contract, is the flow manager for pad B. Simmons has worked at Kennedy Space Center for 38 years, most of it at pads A and B. His father, Albert Simmons, was on the construction crew for both pads, so there is a family history and connection for Simmons.

"I watched from near the KSC Press Site as Discovery lifted off from pad B on the return to flight mission, STS-26," Simmons said. "It was one of the launch team's proudest moments." (Note: space shuttle launches did not always launch in numerical order.)

Pad B was the liftoff site for STS-31 (carrying the Hubble Space Telescope) on April 18, 1990, and STS-61 (Hubble's first servicing mission) on Dec. 1, 1993. The first flight of Endeavour, on STS-49, on May 7, 1992, and John Glenn's return to space, on STS-95, on Oct. 29, 1998, also began from pad B.

Steve Bulloch is the NASA Pad Daily Operations manager. He joined NASA at Kennedy Space Center in 1989. Before that he worked for the Department of Defense during space shuttle Challenger recovery.

Bullock accompanied about 10 shuttles on ferry flights back to Kennedy. His first ferry flight was Endeavour's transport from Palmdale to Kennedy. He worked offload and onload at Edwards Air Force Base in California, where 34 shuttle missions that originated from pad B glided to a stop.

"I worked in operations around the center," Bulloch said. "Then, in 1996, I began working in pad operations. When I had the opportunity to do some shuttle landing recovery work, I jumped at the chance."

Space shuttle Discovery's STS-116 mission was the final liftoff from pad B, on Dec. 8, 2006. Afterward, the pad was modified to handle the launch of NASA's Ares 1-X rocket on a test flight Oct.

ORIGINAL STATISTICS FOR LAUNCH COMPLEX B (SPACE SHUTTLE):

ELEVATION:
The surface hardstand is 53 feet above sea level.

FIXED SERVICE STRUCTURE:
402 feet high from ground level to tip of lightning mast.

SERVICE ARMS:
(From bottom to top) Centaur Rolling Beam, crew access arm, external tank hydrogen vent and inter-tank access arm, external tank gaseous oxygen vent arm.

SOUND SUPPRESSION WATER TANK:
290 feet tall, 300,000-gallon capacity. Empties in 30 seconds, beginning just prior to main engine ignition.

EMERGENCY SLIDEWIRE SYSTEM:
Five 1,200-foot wires, each with a two-person basket. The baskets traverse the distance from the fixed service structure to the ground in 22 seconds.

LIGHTNING MAST:
80 feet tall, fiberglass.

FLAME TRENCH:
450 feet long, 42 feet deep, 58 feet wide.

ROTATING SERVICE STRUCTURE:
130 feet high, 102 feet long, 50 feet wide. Rotates in 120 degree arc. Contains spacecraft White Room.

Space shuttle Discovery cleared Launch Pad 39B at 2:19 p.m. EST on Oct. 29, 1998, as it lifted off on mission STS-95. Making his second voyage into space after 36 years was payload specialist John H. Glenn Jr., then senator from Ohio. Other crew members were mission commander Curtis L. Brown Jr., pilot Steven W. Lindsay, payload specialist Chiaki Mukai, with the National Space Development Agency of Japan, mission specialist Stephen K. Robinson, mission specialist Pedro Duque of Spain, representing the European Space Agency, and mission specialist Scott E. Parazynski. Photo credit: NASA

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

28, 2009. New lightning towers were constructed and installed around the pad in 2009.

In 2011, after the final space shuttle mission, STS-135, launched from pad A, dismantling of the fixed service structure and rotating service structure began on pad B to create a clean pad capable of handling a variety of launch vehicles. Old wiring was removed. The hypergolic propellants and fluids were drained. The pipes that carried these commodities were opened and safed, and the pad was officially turned over to the United Space Alliance demolition team.

The orbiter access arm and gaseous oxygen arm were preserved and are now on display with space shuttle Atlantis at nearby Kennedy Space Center Visitor Complex.

As NASA prepares for the first flight of the Orion spacecraft atop the SLS rocket, modifications to pad B are underway. These include new communications and wiring system; replacement of the Environmental Control System; new heating, ventilation and air conditioning systems; and replacement of various water system pipes within the pad perimeter. Installation of new ignition overpressure/sound suppression bypass valves at the valve complex; reinforcement and replacement of the pad surface crawlerway; and refurbishment of the pad's cryogenic propellant storage spheres also are underway.

In the flame trench, construction workers have installed nearly all of the 100,000 heat-resistant bricks, in three different sizes, 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 of the rocket's engines and solid rocket boosters. A new flame deflector will divert the rocket's exhaust, pressure and heat to the north side of the flame trench.

Two side flame deflectors, repurposed from space shuttle launches, are being refurbished and will be reinstalled at pad level on either side of the flame trench to help reduce damage to the pad and the SLS rocket.

"We are now part of the multi-user spaceport," Bulloch said. "It's a big change from being the single user for so many years."

The area at and around the pad is now protected wetlands. NASA shares a boundary with the Merritt Island National Wildlife Refuge and conducts environmental studies periodically inside and outside the pad fence boundary.

"It's always been about being able to conduct highly technical operations without harming the environment," Bulloch said.

Launches from Launch Complex 39B

An aerial view of Launch Pad 39B at Kennedy Space Center. In view in the background is the Vehicle Assembly Building and the mobile launcher. Photo credit: NASA/Bill White

APOLLO

Apollo 10	Saturn V AS-505	May 18, 1969

SKYLAB

Skylab 2	Saturn 1B AS-206	May 25, 1973
Skylab 3	Saturn 1B AS-207	July 28, 1973
Skylab 4	Saturn 1B AS-208	Nov. 16, 1973

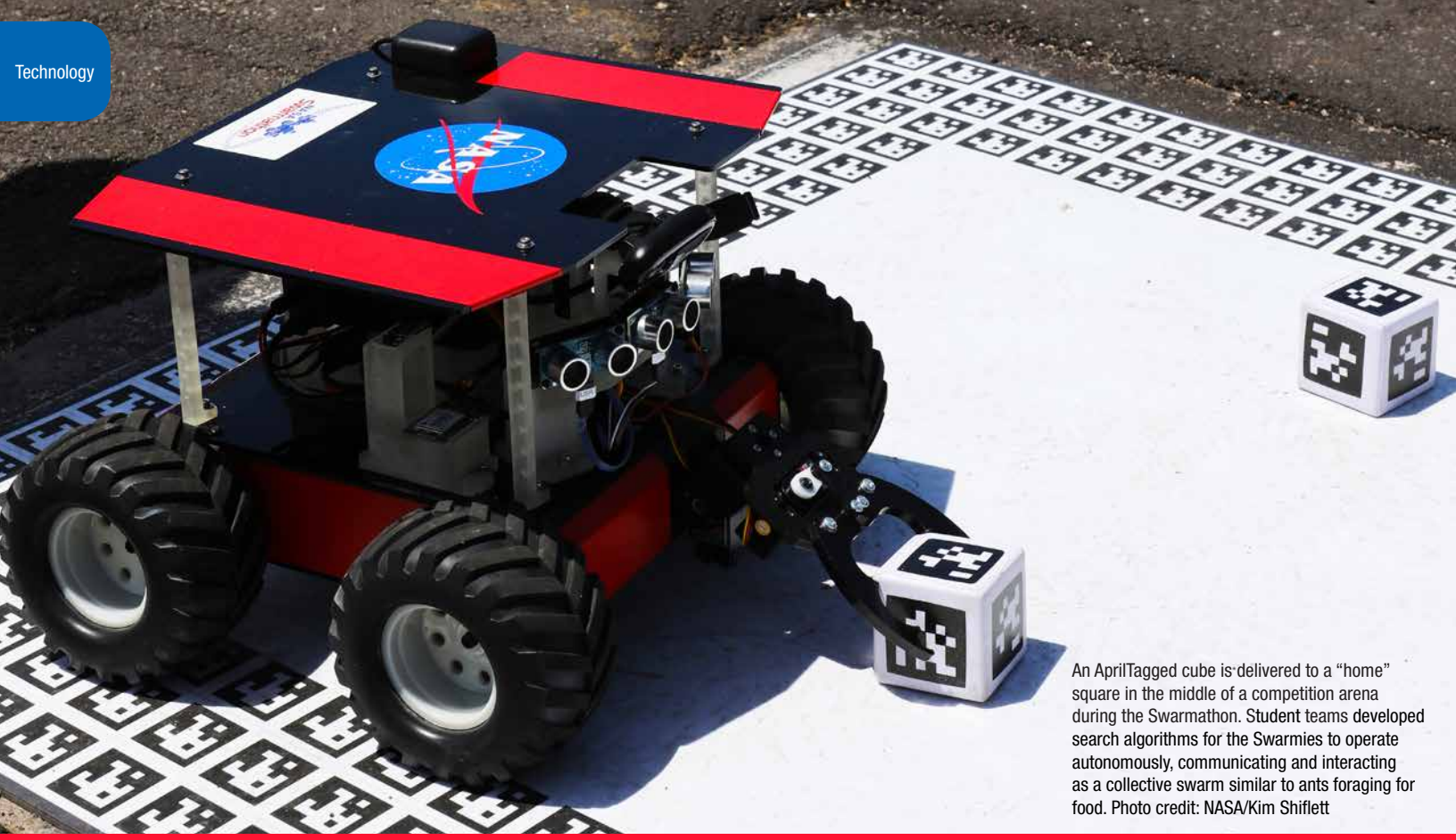
APOLLO-SOYUZ TEST PROJECT

ASTP	Saturn 1B AS-210	July 15, 1975

SPACE SHUTTLE

STS-51L	Challenger	Jan. 28, 1986
STS-26	Discovery*	Sept. 29, 1988
STS-27	Atlantis	Dec. 2, 1988
STS-29	Discovery	March 13, 1989
STS-30	Atlantis	May 4, 1989
STS-28	Columbia	Aug. 8, 1989
STS-34	Atlantis	Oct. 18, 1989
STS-33	Discovery	Nov. 22, 1989
STS-31	Discovery	April 24, 1990
STS-41	Discovery	Oct. 6, 1990
STS-35	Columbia	Dec. 2, 1990
STS-37	Atlantis	April 5, 1991
STS-40	Columbia	June 5, 1991
STS-49	Endeavour	May 7, 1992
STS-46	Atlantis	July 31, 1992
STS-47	Endeavour	Sept. 12, 1992
STS-52	Columbia	Oct. 22, 1992
STS-54	Endeavour	Jan. 13, 1993
STS-56	Discovery	April 8, 1993
STS-57	Endeavour	June 21, 1993
STS-51	Discovery	Sept. 12, 1993
STS-58	Columbia	Oct. 18, 1993
STS-61	Endeavour	Dec. 2, 1993
STS-62	Columbia	March 4, 1994
STS-64	Discovery	Sept. 9, 1994
STS-66	Atlantis	Nov. 3, 1994
STS-63	Discovery	Feb. 3, 1995
STS-70	Discovery	July 13, 1995
STS-73	Columbia	Oct. 20, 1995
STS-72	Endeavour	Jan. 11, 1996
STS-75	Columbia	Feb. 22, 1996
STS-76	Atlantis	March 22, 1996
STS-77	Endeavour	May 19, 1996
STS-78	Columbia	June 20, 1996
STS-80	Columbia	Nov. 19, 1996
STS-81	Atlantis	Jan. 12, 1997
STS-87	Columbia	Nov. 19, 1997
STS-90	Columbia	April 17, 1998
STS-95	Discovery	Oct. 29, 1998
STS-96	Discovery	May 27, 1999
STS-93	Columbia	July 23, 1999
STS-103	Discovery	Dec. 19, 1999
STS-106	Atlantis	Sept. 8, 2000
STS-97	Endeavour	Nov. 30, 2000
STS-102	Discovery	March 8, 2001
STS-104	Atlantis	July 12, 2001
STS-108	Endeavour	Dec. 5, 2001
STS-110	Atlantis	April 8, 2002
STS-112	Atlantis	Oct. 7, 2002
STS-114	Discovery*	July 26, 2005
STS-121	Discovery	July 4, 2006
STS-115	Atlantis	Aug. 9, 2006
STS-116	Discovery	Dec. 9, 2006

* Return to Flight



An AprilTagged cube is delivered to a "home" square in the middle of a competition arena during the Swarmathon. Student teams developed search algorithms for the Swarmies to operate autonomously, communicating and interacting as a collective swarm similar to ants foraging for food. Photo credit: NASA/Kim Shiflett

ALGORITHMIC ACTION

Students develop robotic code in first Swarmathon challenge

BY BOB GRANATH

Students from colleges and universities from across the nation recently participated in a robotic programming competition at Kennedy Space Center. Their research may lead to technology which will help astronauts find needed resources when exploring in deep space.

In the spaceport's second annual Swarmathon competition, aspiring engineers from 20 teams representing 22 minority-serving universities and community colleges were invited to develop software code to operate innovative robots called "Swarmies." The event took place April 18-20, 2017, at the Kennedy Space Center Visitor Complex. In addition to the event at Kennedy, 15 college teams participated in a virtual competition.

In her welcoming remarks, Kennedy's deputy center director, Janet Petro, pointed out to the students that their endeavors to develop robotic software code are more than an academic exercise.

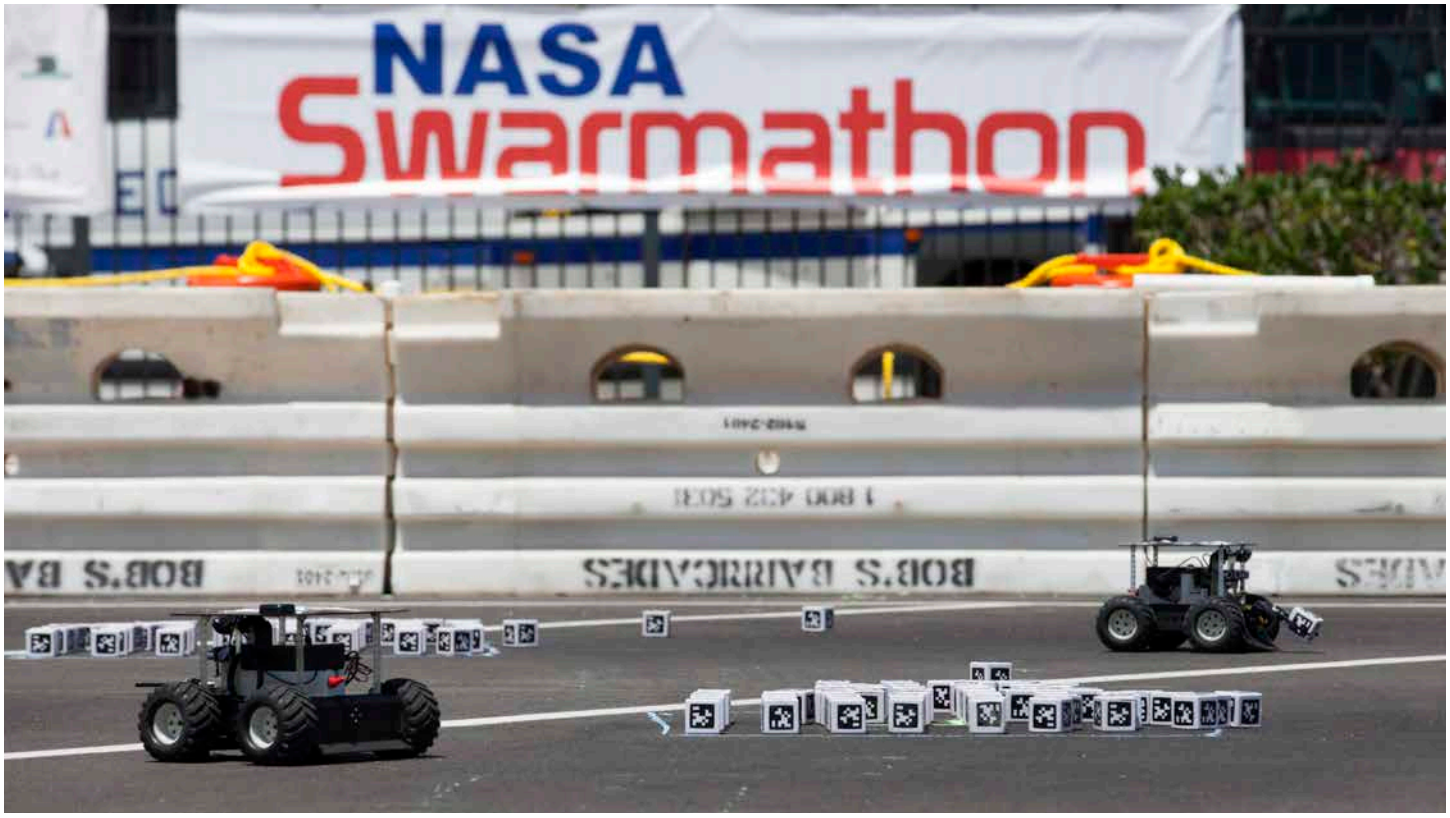
"All of the work that you have done – designing, coding, testing – will soon be put to the ultimate test," she said. "You should be extremely proud of your accomplishments. You have shown tenacity, problem-solving, teamwork and innovation – all qualities that NASA highly values."

Theresa Martinez, Minority University Research and Education Project (MUREP) Science, Technology, Engineering and Mathematics, or STEM, Engagement manager in Kennedy's Education Projects and Youth Engagement Office, noted that this year's Swarmathon got off to an exciting start.

"Right after we began, everyone watched the launch of an Atlas V," she said. "That was a great way to get underway."

During the first morning of the competition, the Orbital ATK

During the final round of the Swarmathon competition at the Kennedy Space Center Visitor Complex, students from Southwestern Indian Polytechnic Institute (SIPI) in Albuquerque, New Mexico, watch their robots as they look for cubes identified by their AprilTags, similar to a barcodes. The Swarmies were programed to deliver the cubes to a "home" square in the middle of a competition arena. SIPI captured first place in the competition winning a $5,000 cash prize. Photo credit: NASA/Kim Shiflett



In the spaceport's second annual Swarmathon, 20 teams representing 22 minority serving universities and community colleges were invited to develop software code to operate these innovative robots known as "Swarmies" to help find resources when astronauts explore distant locations, such as the moon or Mars. Photo credit: NASA/Kim Shiflett

CRS-7 resupply mission to the International Space Station lifted off atop a United Launch Alliance Atlas V.

Another exciting moment was the presentation of first-place awards to a team from Southwestern Indian Polytechnic Institute (SIPI) in Albuquerque, New Mexico. The students won this year's Swarmathon, capturing a $5,000 cash prize. First place in the virtual competition went to Montgomery College in Rockville, Maryland, awarded a $3,000 prize.

SIPI student Chrissy Martinez participated in last year's Swarmathon and expressed appreciation for the program.

"My experience with the Swarmathon team has been a great learning opportunity," she said. "I am proud to have been a part of it."

The small, four-wheeled Swarmies were designed through a collaboration between Kennedy's Swamp Works laboratory and the University of New Mexico. It is a technology that could revolutionize space exploration by more effectively and efficiently locating hidden resources while astronauts explore distant destinations.

"Computer scientists have not yet figured out how to program robots to interact autonomously with unanticipated events in the real world," said Dr. Melanie Moses, an associate professor of computer science at the University of New Mexico and principal investigator for the event.

To overcome those unknowns, researchers are developing Swarmies to focus not so much on the hardware, but the software. The Swarmathon is designed to help students improve their skills in robotics and computer science.

According to Kurt Leucht, a software team lead at Kennedy, astronauts who work and operate on Mars for the long term will have to rely on technology called in-situ resource utilization, or ISRU.

"The first thing we will need to do is locate the precious resources," he said. "One or two robots aren't going to be all that efficient in searching a large area."

As part of the NASA team testing Swarmies at the Florida spaceport, Leucht has built on the research conducted at the University of New Mexico operating on algorithms that tell the small robots to go out in different directions and randomly search an area for a particular material.

In the Swarmathon, robots searched walled arenas looking for "resources" in the form of small cubes with AprilTags, which are similar to bar codes.

"The challenge was much more difficult this year," Theresa Martinez said. "Instead of finding barcodes on the ground, this year the robots found AprilTag cubes and moved them to a 'home' square in the competition area."

Like Chrissy Martinez, Kristiana Rendón, a student at Pasadena City College in California, participated in the 2016 Swarmathon. She explained the value of the event which helped improve her skills in robotics, as well as in integrating hardware and software.

"We had several opportunities to interact with NASA experts in the computer field," she said. "They not only helped us with our Swarmie robots, but gave us insights on how we can develop more advanced robotics in the fields of aerospace and spaceflight."

And the winners are...

In the second annual Swarmathon competition at Kennedy Space Center, students were asked to develop computer code for the small robots called "Swarmies." A team from Southwestern Indian Polytechnic Institute (SIPI) in Albuquerque, New Mexico, captured first place and a $5,000 cash prize. SIPI team members, front row, from the left, are students Schulte Cooke, Emery Sutherland, Christian Martinez, Ty Shurley, and SIPI engineering professor Dr. Nader Vadiee who was the team's faculty advisor. Back row are Joeletta Patrick, Minority University Research and Education Project (MUREP) manager at NASA Headquarters, Theresa Martinez, MUREP Project Science, Technology, Engineering and Mathematics, Engagement manager at Kennedy, Kennedy Associate Director Kelvin Manning and Dr. Melanie Moses, associate professor of computer science at the University of New Mexico. Photo credit: University of New Mexico/ Kate Cunningham

The Kennedy Space Center Swarmathon competition included a virtual competition. A team from Montgomery College in Rockville, Maryland, came in first and was awarded a $3,000 cash prize. Kneeling, from the left, are students Huyen Vu, Rebekah Newby, Shayan Taslim, Suriya Iqbal, Michael Roa, Dr. David Kuijt, associate professor of computer science, and student Denis Tra Bi. Standing, from the left, are Montgomery student Denys Fedorchuk, Joeletta Patrick, Minority University Research and Education Project (MUREP) manager at NASA Headquarters, Theresa Martinez, MUREP Science, Technology, Engineering and Mathematics, Engagement manager at Kennedy, Kennedy Associate Director Kelvin Manning and Dr. Melanie Moses, associate professor of computer science at the University of New Mexico. Photo credit: University of New Mexico/ Kate Cunningham

National Aeronautics and
Space Administration

FACES OF GSDO

GROUND SYSTEMS DEVELOPMENT & OPERATIONS

KENNEDY SPACE CENTER
Exploration Begins Here

Regina Britton
Program Analyst Lead
Ground Systems Implementation Business Office

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SP-2017-03-332-KSC

Regina Britton

Program Analyst, Ground Systems Implementation Business Office

My name is Regina Britton. I am a program analyst in the Ground Systems Development and Operations Program at Kennedy Space Center.

My title is lead for the Ground Systems Implementation, GSI, Business Office.

My main responsibilities include managing the budget and schedule for the GSI Division of the GSDO Program.

The part of my job I like the most is being involved in so many parts of the GSDO Program. I have learned so much about the program as I plan and execute the budgets of the various elements of GSDO. I feel I have a first-hand seat to see all of the cool stuff going on.

I'm very proud of all that GSI has achieved in such a short amount of time. It is amazing to see so many things are complete or very near completion. It's exciting to think how close we are to being done with development and moving toward our first launch of the Space Launch System rocket with Orion.

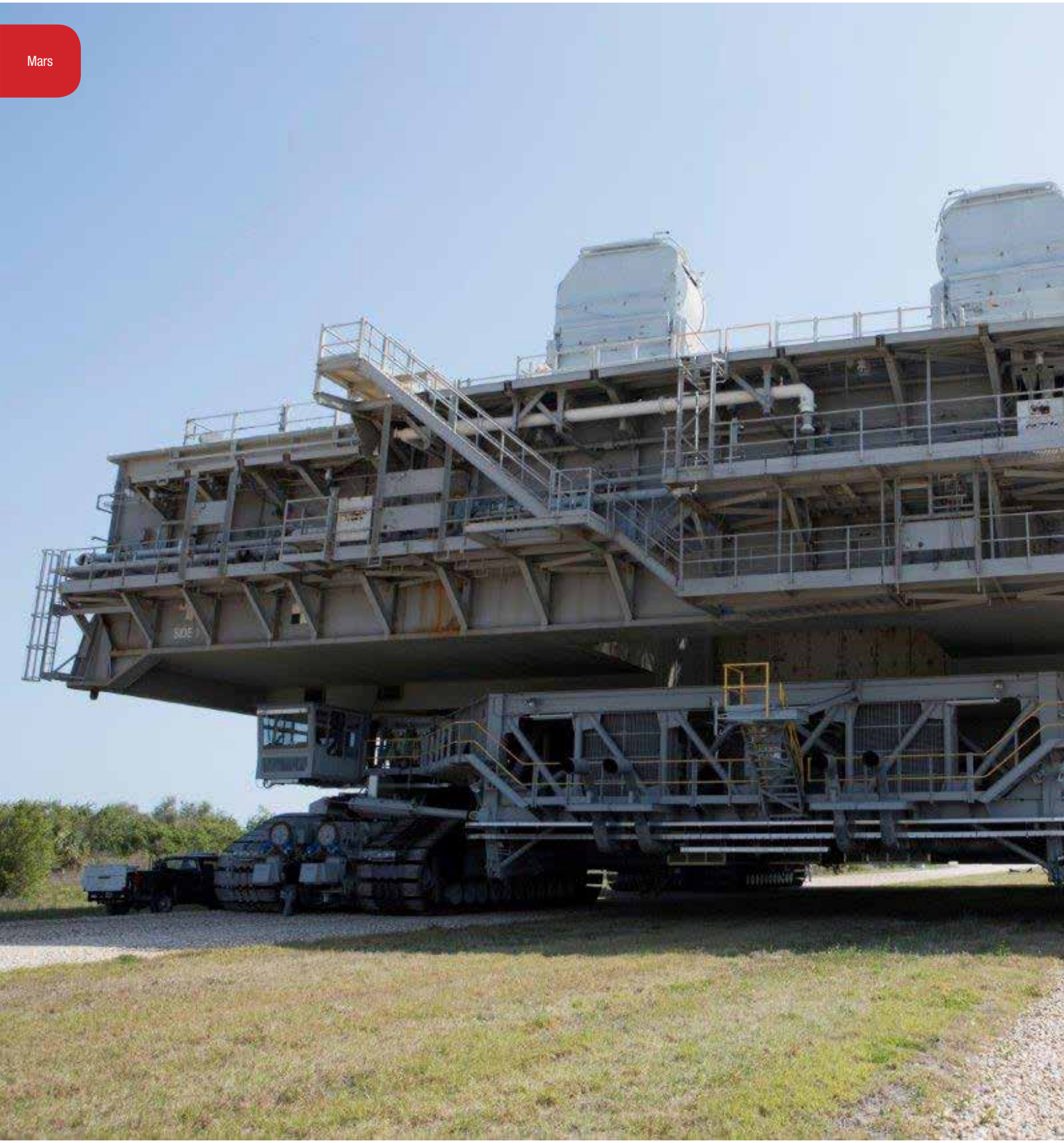
I started working at Kennedy Space Center in 1990 with McDonnell Douglas on the Payloads and Ground Operations Contract. I worked on that contract for 13.5 years. I transitioned to Analex on the Expendable Launch Vehicles Integrated Support contract. After working there for five years, I moved to Abacus Technology on the Information Management and Communication Support (IMCS) contract.

In 2011, 21 years into my career, I became a civil servant working for NASA. I came directly to the business office supporting GSDO. I feel I landed in the best place at Kennedy Space Center. I wouldn't want to be working anywhere else.

I first became interested in space when I was very young. I grew up around aviation all of my life. My family owned a small private airport. To my family, aviation and space was the coolest. To think I now work for NASA is beyond my belief and I feel so privileged.

My hometown is Milton, Florida. I earned a Bachelor of Science in business administration in 1982 from Troy University in Troy, Alabama.

The advice I would give to students interested in pursuing a career in a field similar to mine is that business administration is a wonderful area to study. It will open you up to a number of different career options, not limiting you to one thing. As a business analyst, you will find yourself at the heart of the organization, which is an exciting place to be.



NASA's upgraded crawler-transporter 2 (CT-2), carrying mobile launcher platform 1, moves slowly along the crawlerway March 22 at Kennedy Space Center. The crawler's upgrades and modifications were monitored and tested under loaded conditions during its travel to the crawlerway Pad A/B split and back to the crawler yard to confirm it is ready to support the load of the mobile launcher carrying the Space Launch System with Orion atop for the first test flight, Exploration Mission-1. The Ground Systems Development and Operations Program at Kennedy is managing upgrades to the crawler. Photo credit: NASA/Leif Heimbold

HEAVY LOAD

Crawler-transporter 2 takes test drive along crawlerway

BY LINDA HERRIDGE

NASA's crawler-transporter 2 (CT-2) took a test drive along the crawlerway March 22 at Kennedy Space Center to determine the structural dynamics and loading environments of the crawler's recent upgrades. The test was performed to ensure that the crawler is ready to support the first integrated flight of the agency's Orion spacecraft atop the Space Launch System.

The unloaded CT-2 rolled from the crawler yard along the crawlerway to the Pad A/B split for the first leg of the trip and traveled back to the mobile launcher platform park site near the Vehicle Assembly Building. For the loaded test, the crawler picked up Mobile Launch Platform 1 at the park site and returned to the Pad A/B split. Engineers took measurements during the entire trek using accelerometers, strain gauges and pressure transducers. The data collected will be used to validate the dynamic model of the integrated SLS.

CT-2 is the vehicle that will carry the SLS rocket and Orion spacecraft on the mobile launcher to Pad B for launch. The behemoth vehicle recently was upgraded to support the heavier load of the SLS atop the mobile launcher.

Upgrades to the crawler included installation of new generators, gear assemblies, jacking, equalizing and leveling (JEL) hydraulic cylinders, roller bearings and brakes. Other systems also were upgraded.

The Ground Systems Development and Operations Program is overseeing upgrades to facilities and ground support equipment necessary to support the launch and deep space missions, including the Journey to Mars.

FIRST NATIONS

Students launch high-powered K class rocket

BY AL FEINBERG

Members of the Northwest Indian College AISES (American Indian Science and Engineering Society) team from Bellingham, Washington, pose with their rocket prior to its successful launch. Photo credit: Al Feinberg

One recent bright Saturday morning, on an open, expansive piece of state-owned land in rural southeast Wisconsin, six students from Northwest Indian College (NWIC) waited to launch the high-powered K class rocket they've spent months designing and building back at school in Bellingham, Washington.

Matilda Brooks, an NWIC team member from the Yurok tribe in northern California, looked at the rocket on the launch pad about a hundred yards away and trusted in her team's engineering and preparation.

"I have a feeling we're gonna be doing pretty good today," Brooks said confidently.

Confidence-building is a big part of NASA's First Nations Launch (FNL), an annual, three-day gathering that's focused on Native Americans and is managed for NASA at the Kennedy Space Center. Hosted by the Wisconsin Space Grant Consortium at Carthage College in Kenosha, Wisconsin, it features technical workshops, design-sharing and is highlighted by a spirit of collaboration among the different teams, culminating at this multi-acre swath of fields and marshland within the Richard Bong Recreation Area in nearby Kansasville, Wisconsin.

FNL's primary goal is to encourage indigenous college students to pursue academic and professional opportunities in the STEM (Science, Technology, Engineering and Math) disciplines. (In this, its eight year, FNL had 15 teams from 14 tribal and other colleges and universities.) But, successfully designing, building and flying a rocket also can be a significant achievement in and of itself, something a young man or woman growing up on a reservation might not otherwise experience.

"In many cases, they have self-imposed restrictions . . . of what

expectations they can have and what they can do," says Rob Cannon of Kennedy's Education Projects and Youth Engagement division and FNL program manager for NASA. "This is just helping them open up their eyes and broaden their horizons."

This is the second year that Mark Abotossaway, a Boeing engineer in Seattle and FNL alum, has served as one of the competition's three judges. A member of the Ojibwe First Nation, he says First Nations Launch gave him the confidence to follow his dreams beyond his people's southern Ontario reservation.

"I want to be a role model," Abotossaway said. "I hope some of these students look up to me and say, 'Well Mark, he grew up on the reservation and he's an engineer in the big city, and maybe I can do the same thing.'"

But Abotossaway agrees that making it as an engineer "in the big city" is not every Native American student's measure of success. In fact, many FNL alumni leave the reservation to obtain degrees in any number of disciplines, then return so they can apply their newly acquired knowledge and skills to better the lives of their people.

"I think success is a personal definition of what you feel makes a difference in your life," says John Herrington, a Chickasaw who was the first tribally enrolled Native American in space. "'I feel good about what I've done for my family . . . for my community.' That type of thing."

A one-time Navy test pilot and mission specialist for STS-113 in 2002, Herrington has since acquired a doctorate in education to go along with his rock-star status among Native Americans, and regularly visits and inspires students in indigenous communities throughout the U.S. This was his first FNL and Herrington was impressed by the collaboration not only on, but also between each team.

"These kids work as a group… and you all feel good about that. Whether you're flying a shuttle or you're flying a squadron. You're working together to accomplish a goal and the feeling of satisfaction that comes from doing that, it's a great, great feeling."

On this sunny, final day of this year's FNL, the Northwest Indian College rocket performed well, reaching its planned apogee of about 3,500 feet, then using its drogue and main shoots to land safely among the tall grasses not far from the launch pad. In fact, all but one of the 14 teams succeeded in launching their rockets, some doing so twice.

As for NWIC's Matilda Brooks, a one-time TV actress and model only two terms away from her musical theatre degree, First Nations Launch now has her aiming for a different stardom.

"I want to be the first federally recognized Native American woman to fly in space."

NASA shuttle astronaut John Herrington, the first tribally enrolled Native American (Chickasaw) in space, poses for a picture with a young admirer and her mother. Photo credit: Al Feinberg

NASA shuttle astronaut John Herrington chats with a group of budding rocket scientists. Photo credit: Al Feinberg

Team members from Southwest Indian Polytechnic Institute pose with their rocket prior to its successful launch. Photo credit: Al Feinberg

MOON OR MARS

Lunar, Martian greenhouses designed to mimic those on Earth

At the University of Arizona's Controlled Environment Agriculture Center, an 18 foot long, 7 foot, 3 inch diameter lunar greenhouse chamber is equipped as a prototype bioregenerative life support system. Photo credit: University of Arizona

"The entire system of the lunar greenhouse does represent, in a small way, the biological systems that are here on Earth."

Dr. Gene Giacomelli
Director of the Controlled Environment Agriculture Center at the University of Arizona

Above: Through the design and construction of an innovative hydroponic plant growth chamber, the Prototype Lunar Greenhouse is designed to sustain a continuous vegetarian diet for astronauts on distant locations such as the moon or Mars. It employs plants and crop production designed to provide not only food, but air revitalization, water recycling and waste recycling. Photo credit: University of Arizona

BY BOB GRANATH

While astronauts have successfully grown plants and vegetables aboard the International Space Station, NASA scientists at the Kennedy Space Center are collaborating with a university team to develop long-term methods that could help sustain pioneers working in deep space.

Agency researchers believe while there are many challenges for human exploration beyond Earth, they are convinced there are solutions. According to Dr. Ray Wheeler, lead scientist in Kennedy Advanced Life Support Research, the Prototype Lunar/Mars Greenhouse project will support ongoing research in space to grow vegetables for food and cultivating plants to sustain life support systems.

"We're working with a team of scientists, engineers and small businesses at the University of Arizona to develop a closed-loop system," he said. "The approach uses plants to scrub carbon dioxide, while providing food and oxygen."

The prototype involves an inflatable, deployable greenhouse to support plant and crop production for nutrition, air revitalization, water recycling and waste recycling. The process is called a bioregenerative life support system.

Wheeler noted astronauts exhale carbon dioxide, which is then introduced into the greenhouse, and the plants then generate oxygen through photosynthesis. The water cycle begins with water that is brought along or found at the lunar or Martian landing site. Water is oxygenated, given nutrient salts, and it continuously flows across the root zone of the plants and returned to the storage system.

Back on Earth at the University of Arizona in Tucson, tests involving the Prototype Lunar Greenhouse have included determining what plants, seeds or other materials should be taken along to make the system work on the moon or Mars.

Learning what to take and what to gather on site will be crucial for living on distant locations. Using available resources located or grown on site is a practice is called in-situ resource utilization, or ISRU.

NASA scientists and engineers are developing systems to harness resources such as water that should be available in certain areas of the lunar or Martian surface to support missions lasting for months or years.

"We're mimicking what the plants would have if they were on Earth and make use of these processes for life support," said Dr. Gene Giacomelli, director of the Controlled Environment Agriculture Center at the University of Arizona. "The entire system of the lunar greenhouse does represent, in a small way, the biological systems that are here on Earth."

A professor in the University of Arizona's Agricultural and Biosystems Engineering Department, Giacomelli explains the next big step is to use additional lunar greenhouse units for specialized testing to ensure the system being developed will adequately support a crew of astronauts working on the moon or Mars.

"We will develop computer models to simulate what we're doing to automatically control the environment and provide a constant level of oxygen," he said.

Additionally, Dr. Roberto Furfaro at the University of Arizona is the principal investigator for the current phase of the project. He is a professor in the Systems and Industrial Engineering Department within the College of Engineering.

The prototypes now being developed are cylindrical -- 18 feet long and more than 8 feet in diameter and were built by Sadler Machine Company, one of the project partners.

To protect from radiation in space, the greenhouse units would likely be buried under surface soil or regolith thus requiring specialized lighting.

"We've been successful in using electric LED (light emitting diode) lighting to grow plants," Wheeler said. "We also have tested hybrids using both natural and artificial lighting."

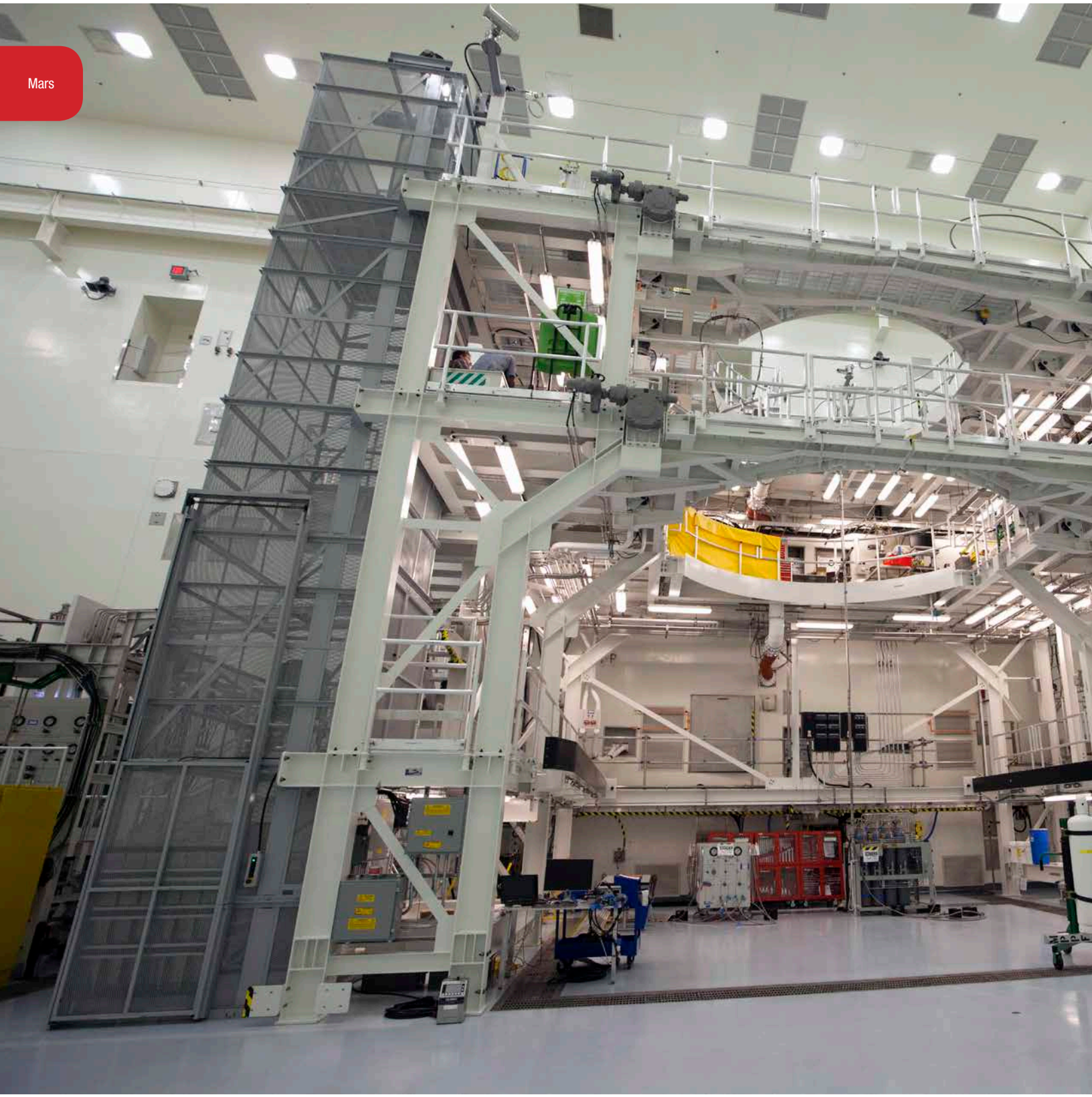
Solar light could be captured with light concentrators that track the sun and then convey the light to the chamber using fiber optic bundles.

While studies in working on the surface of other locations in the solar system take place on Earth, aboard the space station astronauts have been gaining experience in growing crops in space.

NASA's Veggie Plant Growth System was the first American-built, fresh-food growth experiment on the station. It helped continue research for the development of food production systems for long-duration exploration missions. This work is part of Kennedy's efforts in plant research and production of food for exploration missions as directed by Human Research Project and the Space Life Physical Science Division.

From Earth, Wheeler sees the greenhouse system as a way to take some native processes for sustaining life during exploration beyond Earth.

"I think it's interesting to consider that we're taking our terrestrial companions with us," he said. "While there may be ways to engineer around it in terms of stowage and resupply, it wouldn't be as sustainable. The greenhouses provide a more autonomous approach to long-term exploration on the moon, Mars and beyond."



Engineers and technicians completed verification and validation testing of several pneumatic systems inside and outside the Multi-Payload Processing Facility (MPPF) at Kennedy Space Center. In view is the service platform for Orion spacecraft processing. The MPPF will be used for offline processing and fueling of the Orion spacecraft and service module stack before launch. Orion also will be de-serviced in the MPPF after a mission. The Ground Systems Development and Operations Program (GSDO) is overseeing upgrades to the facility. The Engineering Directorate led the recent pneumatic tests. Photo credit: NASA/Kim Shiflett

Pneumatic systems tested in Multi-Purpose Payload Facility for Orion

BY LINDA HERRIDGE

Testing of systems critical to preparing Orion for its first flight atop NASA's Space Launch System rocket were successfully completed in the Multi-Payload Processing Facility (MPPF) at Kennedy Space Center.

The MPPF is the location where fuel and commodities will be provided for the Orion spacecraft prior to launch. Orion also will be defueled and prepared for its next mission in this facility.

Engineers and technicians completed a series of verification and validation tests of the pneumatic systems inside and outside the facility and confirmed they are ready to become operational, and that the systems meet requirements to support flight and ground systems that use pneumatic commodities.

"Completion of verification and validation testing of the pneumatic systems helps ensure that ground systems at Kennedy are ready to support Orion spacecraft processing," said Stephen Anthony, pneumatic design engineering lead in the Environmental and Life Support Systems branch in the center's Engineering Directorate.

Four pneumatic systems supply high pressure gases to various locations in the MPPF. These include gaseous nitrogen, gaseous helium and gaseous oxygen. They will be used to pressurize flight tanks on the Orion spacecraft. Another system, the breathing air system, provides an air source for personnel using Self-Contained Atmospheric Protection Ensembles, or SCAPE suits, which protect them during hazardous operations inside and outside the facility.

Leak tests of all of the pneumatic hardware installed inside and outside the MPPF were performed. Checkouts included verifying proper function of valves, regulators, pressure gauges and other components; verifying that the systems can be operated by command and control software; and performing flow tests of the systems to validate analysis and demonstrate that the systems meet requirements. A simulation of Orion flight tank fill operations also was performed.

"The pneumatic systems at the MPPF provide high pressure gases to many other ground and flight systems, making them vital to successful ground processing operations," Anthony said.

The vast majority of the testing was completed between August 2016 and January 2017. Additional testing is scheduled this spring.

A team of about 60 NASA and contractor workers supported the tests, including design, operations, systems and project engineers, mechanics, technicians, logistics, safety, quality, configuration management, and construction of facilities personnel.

Earth Day

Kennedy celebrates Earth Day 2017

BY FRANK GONZALES

The theme for the 48th Earth Day could have been "making space for nature" as Kennedy Space Center hosted about 40 exhibitors who shared information on renewable energy, electric cars and Florida-friendly landscaping.

The event kicked off at the Operations and Support Building II on April 20, then moved to the Kennedy Space Center Visitor Complex on April 21, allowing employees and visitors to learn and benefit from an array of available activities. Approximately 500 employees combined attended the events.

"Kennedy Space Center is dedicated to being really good stewards of the planet," said Jeanne Ryba of the center's Environmental Branch. "It was good to share our mission to better understand and protect our home planet. Everyone seemed to enjoy and appreciate the caliber of vendors."

The celebration was designed to spread awareness of our planet's needs and to share innovations that can contribute to sustainable living at work and at home.

Among the vendors was HomeBiogas who showed a biogas digester system that could convert any organic waste into clean cooking gas and high-quality liquid fertilizer for the garden.

"We are trying to get everyone to think more futuristically," said Rhiannon Roberts, an internship coordinator with the Patel College of Global Sustainability. "We eventually are shooting for galactic sustainability because that is where the future is at."

There also were natural conservation specialists showing ways to protect wildlife and Florida waters. Many employees took home plants that will help the environment.

Also included were representatives of the Merritt Island National Wildlife Refuge, Canaveral National Seashore, Brevard Zoo and General Motors. Other vendors shared Florida's expanded biking and hiking trails. Representatives from the Brevard Zoo showed the zoo's efforts to achieve sustainability, including a recycling program, enhanced sustainability signage within the zoo and assisting with special events to minimize waste.

At the visitor center, Jancy McPhee, director of NASA's Humans in Space art program, displayed art on a giant TV.

Earth Day in the United States, first celebrated April 22, 1970, is heralded nationally each April to promote environmental awareness and appreciation. For more than four decades, NASA has been using the vantage point of space to increase the understanding of Earth and safeguard the future while improving lives.

"We like to think every day is Earth Day at Kennedy Space Center," Ryba said. "We only have one Earth."

Approximately 500 Kennedy Space Center employees attended the 2017 Earth Day event at the Operations and Support Building II on April 20. Photo credit: Cory Huston

Kennedy Space Center hosted about 40 exhibitors who shared information on renewable energy, electric cars and Florida-friendly landscaping at the 2017 Earth Day event at the Operations and Support Building II on April 20. Photo credit: Cory Huston

One of 40 exhibitors shares information how the biogas digester system converts any organic waste into clean cooking gas and high-quality liquid fertilizer for gardens during the Earth Day 2017 event at Operations and Support Building II on April 20.

Earth Right Now

About 50 participants led by NASA Kennedy Space Center's Employee Resource Groups picked up about 20 bags of trash and other large debris along the center's shoreline before turtle-nesting season as a community service. Sea turtle-nesting season begins in about one month. Unlike what might be found along a public beach, all of the debris that litters Kennedy's restricted beaches washes ashore after being discarded at sea. Of the 72 miles of beach that form the eastern boundary of Brevard County, Florida, about six of those miles line Kennedy. Photo credit: Bill White

Picking Up

Workers unite to clean Kennedy's beach

BY FRANK GONZALES

About 50 employees picked up 20 bags of trash and large debris along the shoreline of NASA's Kennedy Space Center during a beach cleanup in preparation for the upcoming sea turtle-nesting season.

Led by the center's Employee Resource Groups, the participants met at the Beach House, worked about an hour and covered approximately two miles in their efforts. Of the 72 miles of beach that form the eastern boundary of Brevard County, about six of those miles line Kennedy.

Unlike what might be found along a public beach, all of the debris that litters Kennedy's restricted beaches washes ashore after being discarded at sea. So before the group started, Kennedy's Hazardous Materials team swept the beach to take care of any dangerous/suspicious items. They also stayed with the group through the entire cleanup on ATVs and responded quickly to potentially dangerous items the group found.

Along with cleaning the beach, the group's team-building effort included attracting a diverse group of Kennedy workers to come together and make a positive impact on Kennedy. With sea turtle-nesting season beginning in about a month, the group deemed the timing ideal. The beach looked completely transformed after the cleanup, said some of those taking part in the effort.

With Kennedy's shoreline being part of the top nesting area in the Western Hemisphere for loggerhead sea turtles, wildlife agencies consider it important to remove trash and debris along the coast whenever possible.

"We're hoping those sea turtles can have a safer nesting season with the newly clean beach," said Pri Thakrar, an engineer at Kennedy. "It was a beautiful day and we got a lot of positive feedback from the participants."

Thakrar, along with engineer and co-organizer Megan Yohpe, hope to make this a regular event.

TICKLED PINK

Comprised of students from Cocoa Beach, Rockledge, Viera and Space Coast high schools, the robotics group known as the "Pink Team," its mentors and support personnel celebrated a successful season near the Shuttle Landing Facility at NASA's Kennedy Space Center on April 5. Photo credit: Charles Babir

Engineers eager to help Kennedy robotics team

BY FRANK GONZALES

A robotics team that did not exist six months ago stormed back into competition this spring after a new group of engineering mentors at Kennedy Space Center in opted to work with high school students to build intricate machines capable of performing by remote control some of the same functions NASA asks its own robots to perform.

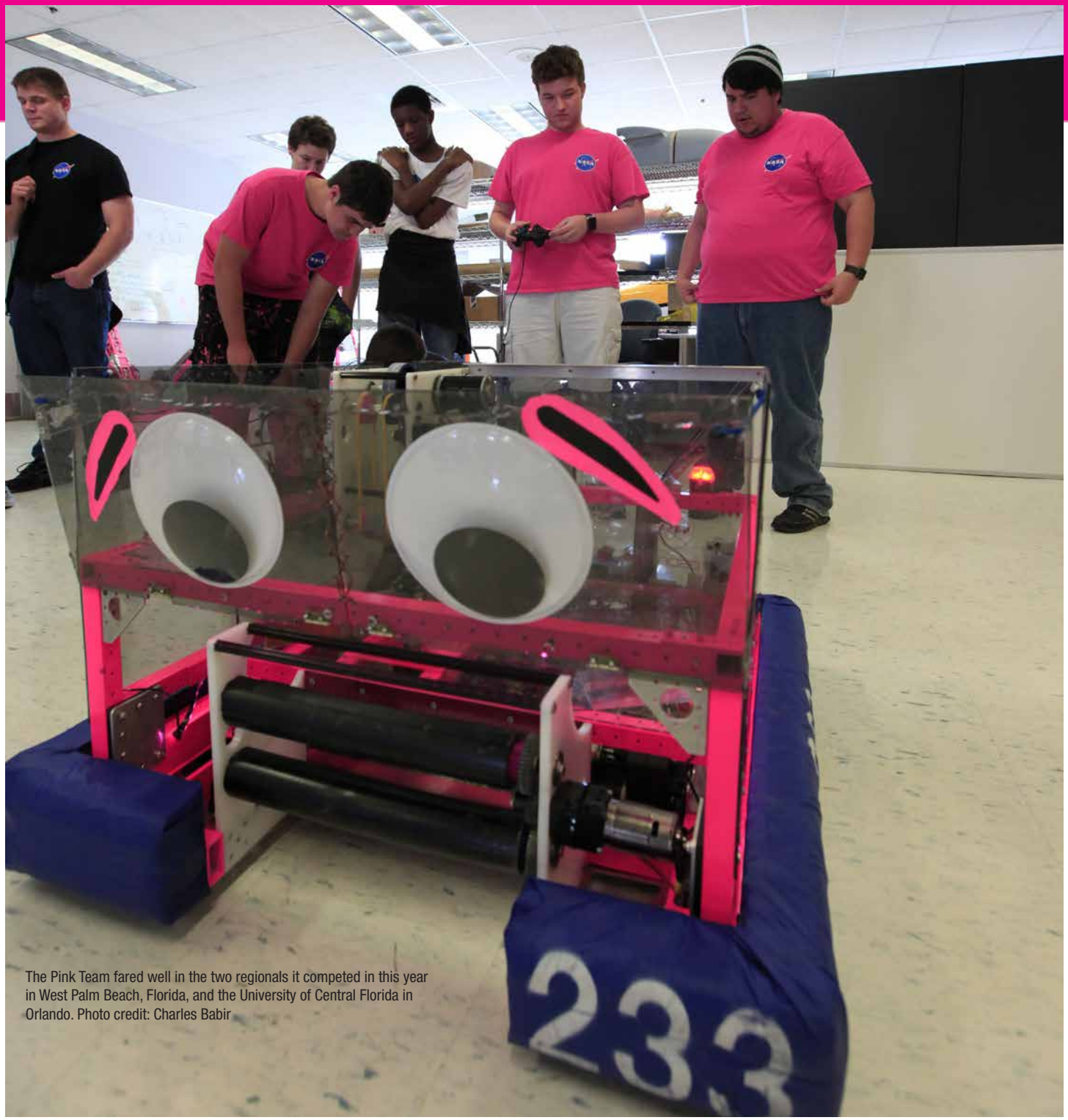
Called the "Pink Team," the Kennedy-sponsored group competes in the FIRST events, short for "For Inspiration and Recognition of Science and Technology." Two of the three team mentors retired last year leaving the group devoid of the mentorship necessary to compete.

So the Kennedy Engineering Directorate stepped up with 10 or so mentors eager to help.

The team was led by engineers Greg Clements and Andrew Bradley. Those involved celebrated the successful season April 5 at a facility near the Shuttle Landing Facility.

"It took a lot of teamwork, skill, communication, and a whole lot of brain power to get where we are," said Bradley, a control systems engineer at Kennedy and Pink Team mentor since its inception 20 years ago.

The "Pink Team" chose the phoenix as its mascot for the 2016 season. The group, its mentors and support personnel celebrated a successful season near the Shuttle Landing Facility at Kennedy Space Center on April 5. Photo credit: Charles Babir



The Pink Team fared well in the two regionals it competed in this year in West Palm Beach, Florida, and the University of Central Florida in Orlando. Photo credit: Charles Babir

"It was great to see our engineering group step up and help make this happen."

The team kicked off the season in January. They had six weeks to prepare for a pair of regionals, the first in West Palm Beach, Florida, and the second at the University of Central Florida in Orlando. With teams from Google, Microsoft, General Motors and representatives from each of the space centers, the competition was extraordinary.

The Pink Team faired very well in both competitions.

"Despite this being a rebuilding season, we couldn't have been more proud of our group of students," Clements said. "And it looks like nearly everyone is coming back for next year, so we have high expectations."

Comprised of students from Cocoa Beach, Rockledge, Viera and Space Coast high schools, Kennedy's house robotics team chose the phoenix mascot as a sign of rising from the ashes, Clements said.

And of course, the phoenix was pink.

I Will LAUNCH AMERICA

Restoring America's Human Launch Capability

Michelle Green

Manager for Policy, Planning and
Strategic Communications
NASA's Commercial Crew Program

I Will Launch America: Michelle Green

BY STEVEN SICELOFF

The myriad innovations working together to make NASA's Commercial Crew Program successful do not stop with advanced engineering of systems, printing of parts and mass production of rocket engines. Many of the most advanced concepts don't involve machinery at all. Rather, they are the background policies that embolden companies to reach out in new directions and the processes that give NASA's spaceflight experts the confidence to decide whether a rocket or spacecraft system will work.

"Commercial crew is changing the way we do things to streamline the process and make it more efficient," said Michelle Green, Strategic Communications, Policy and Planning manager for NASA's Commercial Crew Program. "There are a lot of plans, policies and laws that govern us so we are trying to break down some of those barriers."

The pursuit of change involves a careful balancing act to give aerospace industry the freedom to innovate while maintaining high standards for operations, reliability and above all, ensuring they meet NASA's safety requirements.

"Spaceflight is a difficult thing to do, and adding humans is another layer," Green said. "We have an obligation to protect our astronauts, and so while we want to do things differently, we don't want to add more risk into those systems."

Asked what days stand out in her Commercial Crew Program work, Green points to an effort that saw Congressional action taken.

"Some changes can be made quickly, but others take more time," Green said. "In one case it took us five years and I'm proud that it was accomplished."

Green also was part of the team that worked through the contract elements that NASA would require in choosing which spacecraft and systems would be built for the Commercial Crew Program. The choices — Boeing's Starliner and SpaceX's Crew Dragon — were announced Sept. 16, 2014.

"We worked for the better part of two years prior to that award and the immediate focus was the awarding of those contracts," Green said. "Starting with the very first day I worked in this office in March 2010, it was primarily focused on developing an acquisitions strategy that would meet both government and industry needs. We had some hairpin turns along the way, we had to remain flexible, but we were always constant in our purpose. So the day we awarded those contacts was really the culmination of all that work."

Although she and her team are not involved in the nuts and bolts of rocket science, she feels the need to get her part right so the overall program can keep advancing.

"We don't have the most exciting part, but we play a necessary role behind the curtain just to make everything easier for folks as they do the really important work of building systems," Green said. "What we're looking at in our office is the bureaucracy, the paperwork, the processes and policies. We ask ourselves, 'What can NASA do to enable industry innovation, while ensuring they meet our needs?' "

That said, Green is as astonished as anyone by the new generation of inventions and revolutionary techniques that are being applied to spacecraft and operations systems.

"We have such great expertise both within industry and NASA," Green said. "Industry is working to adapt hardware that is sometimes innovative and sometimes capitalizes on legacy designs that are tried and proven. You want to develop new innovations and new ways to do business, but especially when launching people, you have to have a healthy respect for the ways that are tried and proven."

Green is not new to the demands of forming partnerships to take advantage of the extraordinary research opportunities provided by spaceflight. Before coming to Kennedy Space Center, where the Commercial Crew Program is based, Green worked for years at the agency's Johnson Space Center in Houston. There she worked on teams defining the best ways to allow private research and partnership opportunities for what later became the International Space Station.

"I've worked in industry and I've really looked at what it takes to commercialize spaceflight and looked at the challenges of commercializing spaceflight," Green said. "There are different ways to set up a management approach and I believe what we have done with Commercial crew management is very aware of industry's needs."

Commercial crew's schedule aims to fly astronauts to the space station first on flight tests, then on operational missions. Boeing and SpaceX are building independent rockets, spacecraft, launch pads and networks of control centers in Florida, Houston and California. Green said getting both the commercial low-Earth orbit and deep-space exploration setup right is vital for NASA's plans. In a perfect world, we would take lessons from each other to make the work as effective and efficient as it can be.

"If we can make this low-Earth orbit marketplace successful, then we can adapt it to the exploration community, because that is going to be much more challenging," Green said. "For us, we are now in a situation where we need to work at that faster pace so we can accommodate the needs of our providers who want to build a system so they can sell it to other customers and build that market. We're working at Mach speed."

TEAM BUILDING

Pathways interns take on problem-solving tasks

BY FRANK GONZALES

Kennedy Space Center interns met for their annual team-building event March 31 and collaboration was the word tossed around most.

Sixty-four NASA Internships, Fellowships and Scholarships (NIFS) students and Pathways interns were divided into teams and rotated through six activities. Whether it be building a tower of plastic parts or completing a space-themed crossword puzzle, each activity required team members to communicate well, brainstorm, share knowledge, and problem-solve.

Hosting and engaging with them was Center Director Bob Cabana and senior managers at the Space Station Processing Facility, or SSPF, Conference Center.

"Being put to work on actual projects has proven to be helpful in gaining real world knowledge of finance and resources management," said Patricia Simonsen, a senior at Georgia Southern University. "It also was great to learn how to utilize better communication and teamwork skills due to the diverse customers we serve and the different organizations we interact with."

Hanna Matry, a spring intern and recent University of Florida graduate, found the choice of activities both challenging and enjoyable.

"It engaged critical thinking skills, which is always fun for an engineer," Matry said.

Matry added that her team members collaborated well on the problems they faced. "I've been in school projects where pride halted progress," said Matry, who'll matriculate at Rice University this fall in pursuit of her master's in mechanical engineering. "People here were more interested in the best solution versus putting their name on it . . . which means things get done faster."

Rob Cannon, a Project Specialist in KSC's Office of Education Projects and Youth Engagement, was a volunteer helping facilitate the activity focused on building a better paper airplane.

"It was entertaining to watch the kids get into it," said Cannon, himself a former co-op and intern. "They were quick to identify which team member had the most skills and expertise, then utilized that to maximize their team's success."

Also taken with that collaborative spirit was Jacob Moore, a year-long intern from Northern Kentucky University who's eyeing a career in computer science.

"It was really fun, really cool to get together and intermingle with people from different departments," said Moore, who also said he saw in this Kennedy intern team building event a microcosm of NASA. "You get the big picture and how things all merge together for a mission . . . plus the food was great!"

For George Lesko, a senior at Penn State University studying Information Science and Technology, there is a bigger picture.

"I like knowing all my work is helping employees get home safely to their families at the end of the day," Lesko said. "It also is exciting to know that my work has helped get us one-step closer to Mars. My time at NASA will always be a personal point of pride that I got to work towards something bigger than I am."

Hortense Diggs, left, Kennedy Space Center's deputy director for Communications and Public Engagement, gives a hand to interns exercising their collaborative skills.
Photo credit: Leif Heimbold

A team comprised of randomly-selected Kennedy Space Center interns admire their collaborative handiwork of building a tower. Photo credit: Leif Heimbold


Atlantis
Kennedy Space Center
VISITOR COMPLEX
HEDP 306

The Orion crew module from Exploration Flight Test 1 arrives at the entrance to NASA's Kennedy Space Center Visitor Complex on April 10. The crew module, secured on ground support equipment atop a flatbed truck, will be delivered to the IMAX Theater where it will be prepared for display in the NASA Now exhibit. The Orion spacecraft launched atop a United Launch Alliance Delta IV rocket Dec. 5, 2014, from Space Launch Complex 37 at Cape Canaveral Air Force Station. The spacecraft built for humans traveled 3,604 miles above Earth and splashed down about 4.5 hours later in the Pacific Ocean. Inset: Photo of Orion in the high bay being prepped for transport. Photo credit: NASA/Leif Heimbold

IN FULL BLOOM

NASA technicians lifted NASA's James Webb Space Telescope using a crane and moved it inside a clean room at NASA's Goddard Space Flight Center in Greenbelt, Maryland. Once launched into space, the Webb telescope's 18-segmented gold mirror is specially designed to capture infrared light from the first galaxies that formed in the early universe, and will help the telescope peer inside dust clouds where stars and planetary systems are forming today. The James Webb Space Telescope is the scientific successor to NASA's Hubble Space Telescope. It will be the most powerful space telescope ever built. Webb is an international project led by NASA with its partners, ESA (European Space Agency) and the Canadian Space Agency. For more information about the Webb telescope visit: **www.jwst.nasa.gov** or **www.nasa.gov/webb**. Photo credit: NASA/Desiree Stover

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