National Aeronautics and Space Administration

THE ARMSTRONG X-PRESS

Volume 60 Number 7 July 2018

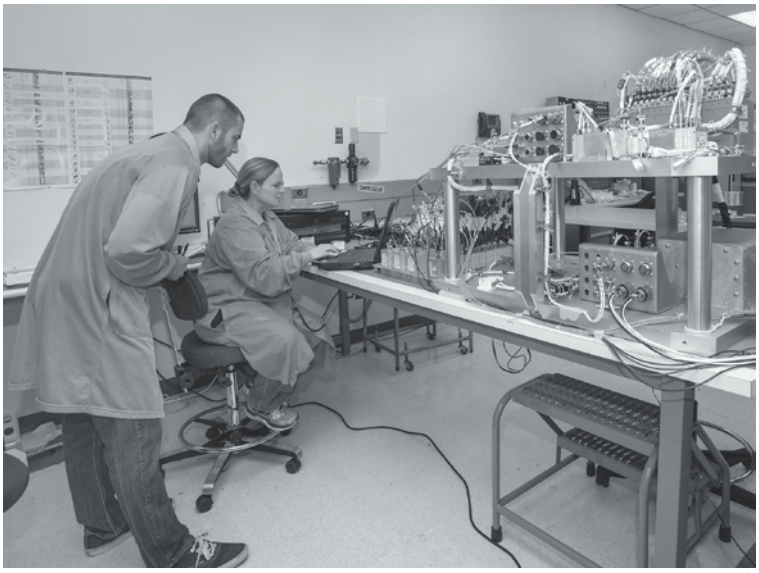
Armstrong assists on AA-2

By Jay Levine
X-Press editor

When the Orion spacecraft is on the launch pad preparing for liftoff atop the Space Launch System (SLS) rocket, the crew module will have a launch abort system (LAS) mounted on top. If there is a problem on the launch pad or during the first few minutes of the ascent to orbit, astronauts could use the system to separate from the rocket and escape to safety.

Armstrong has played a key role in developing systems and subsystems for an upcoming test of the LAS in 2019, called Ascent Abort-2 (AA-2).

During the AA-2, a test article sized and weighted to represent Orion will launch on an abort test booster from Cape Canaveral Air Force Station in Florida. Then the LAS abort motor will fire to propel the Orion test article to a safe distance away from the rocket. All required data will be captured and stored on 12 NASA-developed data recorders enabled with GPS and ejected from the crew module before it splashes into the water.



AFRC2018-0108-2 **NASA/Ken Ulbrich**

April Torres and Jeffery Sutherland complete a systems and functional check on the master data acquisition system for the Orion Ascent Abort 2 crew module. The system was sent from Armstrong to NASA's Johnson Space Center in Houston recently.

Armstrong is designing, acquiring, integrating and supporting the developmental flight instrumentation (DFI) subsystem that will collect and return engineering data to validate computer models of the spacecraft's LAS performance prior to travel with a human crew.

"The DFI is designed to collect critical test data from 890 sensors across all four modules of the flight test vehicle including the LAS, the crew module, the separation ring and the booster," said Gary Martin, Armstrong's Orion AA-2 project manager.

Armstrong specializes in instrumentation and integration of systems and was chosen for these tasks because of the center's expertise, he added. The first of two major data acquisition systems departed Armstrong in May for integration into the Orion test article at NASA's Johnson Space Center.

In addition to collecting all the data for the crew module, the crew module data acquisition system will also collect the LAS research and store it on the data recorders. Also contributing to the data collection is a digital camera system that will

AA-2, page 6

Air Force designates QueSST as X-59

Jim Banke
Aeronautics Research Mission Directorate

NASA's newest experimental aircraft, designed with quiet supersonic technology and intended to help open a new era in faster-than-sound air travel over land, will forever be known in the history books as the X-59 QueSST.

The U.S. Air Force, which is the government entity responsible for assigning X-number designations and the popular name associated with the aircraft, officially informed NASA of their decision June 26.

"For everyone working on this important project, this is great news and we're thrilled with the designation," said Jaiwon Shin, NASA's associate administrator for aeronautics.

"I'm confident that the contributions the X-59 QueSST will make to our nation and the world will ensure its place among the greatest NASA X-planes ever flown," Shin said.

The X-plane number designation continues a tradition of naming

X-59, page 8

New Shepard launches

By Leslie Williams
Armstrong news chief

Blue Origin successfully launched its New Shepard rocket from the company's West Texas launch site with five NASA-supported technologies onboard July 18. For each of these payloads, this flight was one in a series of suborbital demonstrations to facilitate technology development.

The flight helped researchers collect critical data to help them confirm theories, refine previous results and fine-tune experiments for future testing.

Selected for flight test by Flight Opportunities, many of the payloads on this New Shepard flight aim to provide value to other payloads on future flights. For example, a sensor package developed at NASA's Johnson Space Center in Houston will help characterize suborbital test flight environments — data critical for implementation of technology and science payloads.

"What we've done is put together an instrumentation package that can gather data to characterize the environment on these flight platforms," said Johnson's Kathryn Hurlbert, principal investigator (PI) for the SFEM-2, which stands for Suborbital Flight Experiment Monitor-2. "The data we gather will help identify the types of payloads that would be good candidates for testing on a suborbital vehicle."

SFEM-2 measures critical data, such as acceleration, pressure, temperature, humidity, carbon dioxide levels and acoustic levels. This sensor package first flew with Blue Origin in April 2018. This time, the SFEM-2 team was able to test the technology for a different flight profile.

"We modified the acceleration measurement range, allowing us to capture higher g levels from the flight," said Hurlbert. "This, combined with the data from the first flight, should provide an extensive set of parameters of the test environment."

Courtesy of Sophia Porter

The NASA SFEM-2 team stands by the Blue Origin capsule after a successful launch and landing that tested sensor technologies for measuring critical data.

Some of the payloads flying on this Blue Origin flight also aim to provide value to other researchers. For example, the company Solstar sent the world's first commercial tweet from space on the Blue Origin flight in April. This time, the company continued work toward increasing the robustness of WIFI in space with an antenna designed to withstand the rigors of a rocket demonstration.

Also, onboard New Shepard was the Vibration Isolation Platform from Controlled Dynamics. Designed to isolate payloads from the disturbances of flight – the platform is also capable of creating environments required for a particular test scenario.

"A main advantage of the platform is that it can cancel out certain kinds of disturbances for anything that's mounted to it, or it can introduce excitations at specific times to enhance an experiment," said PI Scott Green. "This platform is destined to be a resource for future payloads."

Green and his team flew a specific subset of the isolation technology on the flight, gathering data necessary to tune the full system for a future Blue Origin flight.

Other researchers leveraged the flight to gather data to reach specific goals.

Purdue University flew an experimental predictive technology for the control of liquid droplets and avoidance of liquid plugs in tubes — important considerations for condenser flow passage design in phase-change heat transfer systems. Such systems are advantageous for spaceflight because they provide better power capacity, lower volume and better temperature uniformity.

"We're flying the experiment to test our computer simulations so that we can publish that data and show the research community that our tool is useful for designing systems for the weightlessness of spaceflight," said PI Steven Collicott.

Collicott also acknowledged that further development may be needed, depending on the results from the flight.

"A lot of the next steps are driven by discovery," said Collicott. "We have to ask: What did we miss in our predictions? Are phenomena coming into play that we didn't anticipate? You have to fly to be sure."

Discovery is also key for a system designed to gather electromagnetic field measurements developed by the Johns Hopkins University Applied Physics Laboratory (APL). The objective for this flight was to characterize the electromagnetic field environment inside the spacecraft to understand the potential effects of strong external and internally generated fields on the spacecraft and payloads.

Echoing the other principal investigators on the flight, PI H. Todd Smith noted the value of being able to secure suborbital demonstration through Flight Opportunities.

"Flight Opportunities is the only way we've been able to secure funding for flights," Smith said. "We might not be doing what we're doing today if it hadn't been for the support NASA has provided for our technology development."

Through the program, the Space Technology Mission Directorate (STMD) selects promising technologies from industry, academia and government for testing. The Flight Opportunities program has helped to test and mature 136 technologies through 162 suborbital flights. The program is funded by STMD and managed at Armstrong.

"NASA needs technologies that enable space exploration," said Ryan Dibley, NASA Flight Opportunities campaign manager. "The Flight Opportunities program funds flights on commercial suborbital vehicles to test these technologies in a relevant environment, enabling researchers to validate their technology, as well as fostering the public and private relationships that grow this nation's economy."

Askins awarded scholarship

The NASA Armstrong Employee Exchange Council has presented its 2018 Harold W. Walker Memorial Scholarship Award to Erin Askins.

Askins is a 2018 graduate of Tehachapi High School in Tehachapi. She is seeking a major in civil engineering at Rensselaer Polytechnic Institute in Troy, New York, this fall and set to play NCAA softball for the institute's team called the Engineers. She earned a 4.22 grade-point average and graduated in the top 2 percent of her class.

"I was shocked at first that I was chosen out of all the qualified applicants," Askins said. "This scholarship will be very, very helpful toward college and earning my education."

The scholarship provides $2,000 per year for up to four years for attendance at a four-year college or university, providing the recipient maintains a minimum grade-point average of 3.0 or higher. Applicants for the annual scholarship must be high school seniors with a parent working as an Armstrong civil service or contract employee.

Erin Askins is the daughter of Dana and Paul Askins of Tehachapi. Dana Askins is the NASA Armstrong Human Resources director for the Human Capital Management Branch. As director, Askins is responsible for leading a team that provides a range of services including planning, developing, coordinating and delivering Armstrong's human resources programs.

AFRC2018-0181-1 NASA/Ken Ulbrich

Erin Askins, second from left, accepts the 2018 NASA Armstrong Exchange Harold W. Walker Memorial Scholarship from Center Director David McBride. Next to Erin Askins is her mother Dana Askins.

"I was thrilled when I learned Erin had won the scholarship," Dana Askins said. "It is a scholarship opportunity that could be available for four years. She has worked so hard to be ready for college and this is a signal that she is ready."

In 2017 and 2018, Askins was selected to a summer internship at NASA Armstrong, where she worked on systems integration of the flight computer and data acquisition systems on the Prandtl 3C subscale aircraft with other interns under direction of Armstrong's Chief

Scholarship, page 6

NASA/Matt Kamlet

Armstrong at Oshkosh

Armstrong's Director of Research and Engineering Brad Flick was interviewed by Timeless Voices of Aviation about how he became involved in aeronautics. The interview was one of many NASA Armstrong staff participated in during AirVenture 2018. The event is the Experimental Aircraft Association annual airshow. Armstrong's presence included speakers, an F/A-18 static display and exhibits that showcased NASA aeronautics from across the agency.

News at NASA

First major SLS rocket hardware assembled

The first major piece of core stage hardware for NASA's Space Launch System rocket has been assembled and is ready to be joined with other hardware for Exploration Mission-1, the first integrated flight of SLS and the Orion spacecraft. SLS will enable a new era of exploration beyond low-Earth orbit, launching crew and cargo on deep space exploration missions to the Moon, Mars and beyond.

The backbone of the world's most powerful rocket, the 212-foot-tall core stage, will contain the SLS rocket's four RS-25 rocket engines, propellant tanks, flight computers and much more. Though the smallest part of the core stage, the forward skirt will serve two critical roles. It will connect the upper part of the rocket to the core stage and house many of the flight computers, or avionics.

On July 24, forward skirt assembly was completed. As part of forward skirt testing, the flight computers were powered up for the first time as NASA engineers tested critical avionic systems that will control the rocket's flight. The construction, assembly and avionics testing occurred at NASA's Michoud Assembly Facility in New Orleans.

Located throughout the core stage, the avionics are the rocket's "brains," controlling navigation and communication during launch and flight. It is critical that all avionics units are installed correctly, work as expected and communicate with each other and other components, including the Orion spacecraft and ground support systems.

Message from space

Event includes talk with NASA astronaut Auñón-Chancellor

By Alyssa Lee
Armstrong Public Affairs intern

Eric Swanson was eager to ask Serena M. Auñón-Chancellor, a NASA astronaut, if she along with her crewmates were able to grow plants aboard the International Space Station. Eric along with more than 300 NASA children were virtually transported to the space station on June 28 through a live broadcast between the station and Armstrong.

As part of the center's bi-annual Take your Kids to Work Day, NASA families and students from Edwards Air Force Base and across the Antelope Valley were invited to learn about various careers, projects and programs at NASA. However, unlike past events, this year also included a live question-and-answer session with Auñón-Chancellor, a member of the Expedition 56/57 crew that launched to the orbiting laboratory in June. For the agency, this was the first time a downlink was hosted in an aircraft hangar.

AFRC2017-0212-19 **NASA/Lauren Hughes**

Eric Swanson asks NASA astronaut Serena M. Auñón-Chancellor a question during a special event at Armstrong. Auñón-Chancellor was answering questions live from the International Space Station.

Auñón-Chancellor answered several questions during the 20-minute Earth-to-space call, including how it felt to launch into space and what Mars exploration would look like. Those selected to ask questions approached the microphone one by one, excited to hear answers from space.

When 8-year-old Laura Krall stepped up to the microphone, she was interested in learning about the future of science and engineering from the astronaut. "What does society need to do to create more equality in the science and engineering field?"

As she continued to float in microgravity, Auñón-Chancellor shared her thoughts with Krall. "It's all about exposure at a young age. I was lucky enough that my mother and father exposed me to science and engineering at around the age of six or seven. If we can put kids in free camps or museums and show them about it early on, then that inspires them to follow that in the future. Another thing I notice is kids will find someone who has a really interesting job, but are too afraid to ask about it." Her advice to the children: "Go ahead and ask! Bother them about their job, and they will tell you."

Attendee and Armstrong employee Kate McMurtry couldn't agree more. McMurtry accompanied her friend's daughter to the event this year. "I have enjoyed the opportunity to bring her so she can get a glimpse of what we do at work. This exposure to new possibilities and career choices can influence the children for the future."

Along with the downlink, children were able to experience a weather

Event, page 7

AFRC2018-0067-24 **NASA/Lauren Hughes**

Rylee Ritter, first time visitor to Armstrong, sits in a mockup of an F-15 cockpit, during the center's Take Your Kids To Work Day event.

AFRC2018-0067-24 **NASA/Ken Ulbrich**

Nathalie and Donald Crawford pose for a photo during an Armstrong event June 28.

SARP is strong at 10

By Kate Squires
Armstrong Public Affairs

Twenty-eight undergraduate students are participating in an eight-week NASA airborne science program field experience designed to immerse them in the agency's Earth Science research.

Embarking on its tenth year, NASA's Student Airborne Research Program (SARP) provides a unique opportunity for undergraduate students majoring in the sciences, mathematics and engineering to participate in all aspects of a NASA Airborne Science research campaign. Flying aboard NASA's DC-8 airborne laboratory, students will sample and measure atmospheric gases to study pollution and air quality in the Los Angeles basin and in California's Central Valley.

Students will also use remote sensing instruments on NASA's ER-2 to study drought, fire burn scars and debris flows in Southern California and ocean biology along the California coast. In addition to airborne data collection, students will take measurements at field sites near Santa Barbara, Sequoia National Forest, and the Salton Sea. These ground-based measurements will be used for calibration and validation of measurements taken by the aircraft teams and will also serve as a complementary data set for students to use for their individual research projects.

SARP participants are given a rare behind-the-scenes look at the instrument installation, flight planning and scientific data collection that is the basis of every successful Earth Science airborne campaign carried out by NASA. These campaigns play a pivotal role in the acquisition of process-oriented knowledge about the Earth system, as well as calibration and validation of NASA's space-borne Earth observations, remote sensing measurements and high-resolution imagery for Earth system science.

NASA/Megan Schill

Mara Nutt, a geology student at Mills College in Oakland, California, connects empty canisters used to collect whole air samples onboard the NASA DC-8 at Armstrong. Students in SARP are divided into four groups that are each headed by a different university professor from universities around the country.

NASA/Megan Schill

NSRC instrumentation engineer Steven Schill shows students the aircraft installation for a chilled mirror hygrometer, an instrument used to measure the water content of the atmosphere, at Armstrong. Schill is part of a team of engineers and scientists that run many different instruments onboard the DC-8 for the SARP flights.

SARP began June 18 at NASA Armstrong Flight Research Center's Building 703 in Palmdale with lectures by university faculty members, NASA scientists and NASA program managers. The students flew onboard the DC-8 on three flights during the week of June 25.

They flew over dairies and oil fields in the San Joaquin Valley, and sampled the atmosphere in the Los Angeles basin, Santa Barbara Channel, and the Salton Sea at altitudes as low as 1,000 feet in order to collect air samples and measure atmospheric gases such as methane, carbon dioxide, carbon monoxide, nitrogen oxides and ozone in-flight.

The final six weeks of the program are at the University of California, Irvine where students are analyzing and interpreting the data they collected onboard the aircraft. In addition to the new data collected, students can use data gathered by SARP participants during the previous nine years of the program to compare with current observations.

At the conclusion of the program, each student will deliver a final presentation on his or her results and conclusions in front of an audience of NASA scientists, university faculty members and their fellow SARP students. Many students have gone on to present their SARP research projects at national conferences, frequently at the annual fall meeting of the American Geophysical Union.

Students participating in the 2018 SARP represent 28 different colleges and universities from 20 different states across the country. They were competitively selected based on their outstanding academic performance, future career plans and interest in the Earth System Science.

Students are mentored by scientists and engineers from NASA Headquarters in Washington, as well as Langley Research Center in Virginia, Goddard Space Flight Center in Maryland and Ames Research Center in California. Additional mentors are university faculty members and graduate students from University of California Irvine, University of California at Santa Barbara, University of California Santa

SARP, page 7

AA-2... from page 1

look up at the crew module and encode and transmit video of the separation, he added.

Along with a backup data acquisition system and additional sets of electronics, the system will serve as the central nervous system of the stack. The stack is the combination of the LAS, the crew module, the separation ring and the booster that connects the test capsule to the booster.

Armstrong staff continue to work on the LAS electronics. One set is expected to be complete by the middle of August and shipped to NASA's Michoud Assembly Facility in New Orleans, where Lockheed Martin is assembling those components, Martin said. The other three sets of electronics will be integrated at NASA's Kennedy Space Center in Florida starting in September.

Armstrong also acquired the booster rocket to simulate a ride on the SLS, along with avionics, flight software and supporting elements from Northrop Grumman (formerly Orbital ATK) through an agreement with the Air Force. Northrop Grumman is manufacturing the launch vehicle under its Sounding Rocket Program 3 contract with the Air Force and Missile Systems Center (SMC). Armstrong entered into an agreement with SMC in 2006 for the Air Force to acquire and provide the booster to NASA.

The crew module is currently being outfitted at Johnson and will depart in August for an acoustic test planned at NASA's Plum Brook Station in Sandusky, Ohio. Following the test, the crew module will return to Johnson in September for the installation of the separation ring. The combined elements then will ship to Kennedy for final integration, stacking and launch.

AFRC2018-0128-03 **NASA/Lauren Hughes**

R.J. Smith mills a plate for the backup data acquisition system for the Orion Ascent Abort 2 crew module.

AFRC2018-0128-19 **NASA/Lauren Hughes**

Randy Wagner prepares elements of the Orion Ascent Abort 2 crew module backup data acquisition system for thermal testing.

AA-2 marks the second dedicated LAS test. The first flight test of the abort system in 2010, called Pad Abort-1 (PA-1), was an effort led by Armstrong for the Orion program based at Johnson. During PA-1, an abort motor rocketed the test article and launch abort stack away from the launch pad. AA-2 will test the LAS during ascent, where it will encounter the greatest structural stress.

"This is different from the PA-1 test because you are inflight and you have that booster," Martin said. "With PA-1 the ground wasn't going to move. For this test, the abort test booster is moving at somewhere just above the speed of sound. This is a much more critical test condition for separation. You want to get away from that launch vehicle as fast as possible because the reason you aborted is something is going wrong."

AA-2 provides the only opportunity to test a fully active launch abort system during ascent before flying a crew and verify it works as predicted in the event of an emergency, making Armstrong's contributions and support for the data acquisition system critical for future deep space exploration missions.

Following AA-2, NASA will launch an uncrewed Orion spacecraft on the SLS rocket for Exploration Mission-1 and send the spacecraft around the moon to test systems prior to the first flight with astronauts on Exploration Mission-2.

Scholarship... from page 3

Scientist Al Bowers.

Her problem solving, critical thinking and work ethic helped her earn a Rensselaer Medal scholarship for distinguished academic achievement in mathematics and science. She was a member of the National Honor Society, serving as treasurer and a member of the California Scholarship Federation. In addition to excelling in advanced placement and honors classes during her high school career, Erin Askins was active in numerous school and community activities.

She also served as captain of the varsity softball team and earned back-to-back First Team All-League MVP honors, in addition to back-to-back first team all-area honors. Askins was active in the Tehachapi High School Marching and Concert bands, where she was trombone section leader. She was a youth volleyball coach volunteer for third and fourth graders at the Tehachapi Valley Recreation and Park District. In addition, she was a volunteer at the Tehachapi Pops Orchestra.

Exchange council scholarships are named for former employees of the NASA center, with honorees selected on a rotating basis. Walker was the Aerodynamics branch chief and was associated with the X-15, XB-70, lifting body aircraft, the supercritical wing and oblique wing projects. Scholarship funds are raised from various council activities, including proceeds from vending machines, Armstrong Gift Shop, the Armstrong Flightline Eatery food court sales and fundraising events.

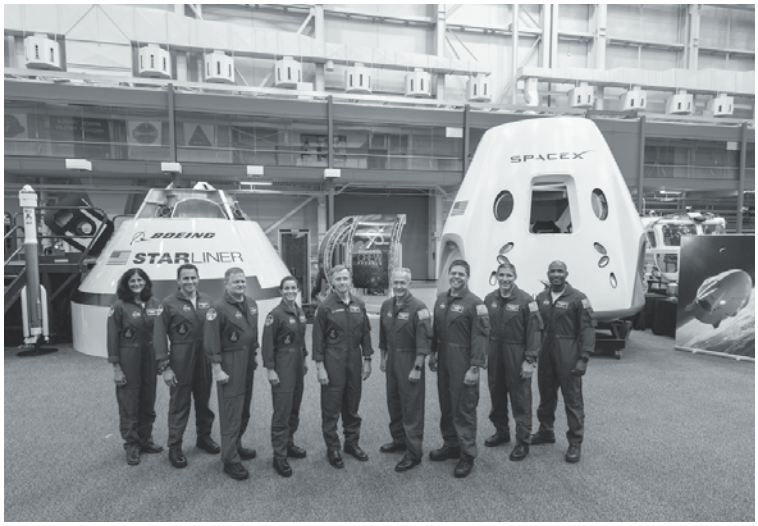
NASA announces crews

NASA introduced to the world on Friday the first U.S. astronauts who will fly on American-made commercial spacecraft to and from the International Space Station – an endeavor that will return astronaut launches to U.S. soil for the first time since the space shuttle's retirement in 2011.

"Our country's dreams of greater achievements in space are within our grasp," said NASA Administrator Jim Bridenstine. "This accomplished group of American astronauts, flying on new spacecraft developed by our commercial partners Boeing and SpaceX, will launch a new era of human spaceflight. Today's announcement advances our great American vision and strengthens the nation's leadership in space."

The agency assigned nine astronauts to crew the first test flight and mission of both Boeing's CST-100 Starliner and SpaceX's Crew Dragon. NASA has worked closely with the companies throughout design, development and testing to ensure the systems meet NASA safety and performance requirements.

"The men and women we assign to these first flights are at the forefront of this exciting new time for human spaceflight," said Mark Geyer, director of NASA's Johnson Space Center in Houston. "It will be thrilling to see our astronauts lift off from American soil, and we can't wait to see them aboard the International Space Station."



NASA

NASA introduced the first U.S. astronauts who will fly on American-made commercial spacecraft to and from the International Space Station – an endeavor that will return astronaut launches to U.S. soil for the first time since the space shuttle's retirement in 2011. The agency assigned nine astronauts to crew the first test flight and mission of Boeing's CST-100 Starliner and SpaceX's Crew Dragon. The astronauts are, from left to right: Sunita Williams, Josh Cassada, Eric Boe, Nicole Mann, Christopher Ferguson, Douglas Hurley, Robert Behnken, Michael Hopkins and Victor Glover.

Starliner Test Flight Astronauts

Eric Boe was born in Miami and grew up in Atlanta. He came to NASA from the Air Force, where he was a fighter pilot and test pilot and rose to the rank of colonel. He was selected as an astronaut in 2000 and piloted space shuttle Endeavour for the STS-126 mission and Discovery on its final flight, STS-133.

Christopher Ferguson is a native of Philadelphia. He is a retired Navy captain, who piloted space shuttle Atlantis for STS-115, and commanded shuttle Endeavour on STS-126 and Atlantis for the final flight of the Space Shuttle Program, STS-135. He retired from NASA in 2011 and has been an integral part of the Boeing CST-100 Starliner program.

Nicole Aunapu Mann is a California native and a lieutenant colonel in the Marine Corps. She is an F/A-18 test pilot with more than 2,500 flight hours in more than 25 aircraft. Mann was selected as an astronaut in 2013. This will be her first trip to space.

The Boeing Starliner will launch aboard a United Launch Alliance (ULA) Atlas V rocket from Cape Canaveral Air Force Station in Florida.

Crews, page 8

Event... from page 4

balloon launch, sit in a mock-up of an F-15 cockpit, observe moon rocks through a microscope and play with robots from local robotics teams. The close-up exposure to programs and careers at NASA has already started to influence these young minds. Attendee Joe Dinius now aspires to be an engineer and work on planes similar to the ones found in the hangars at Armstrong. For Rylee Ritter, joining the U.S. Air Force is what she hopes for when she gets older.

Whether it is growing plants in space or gathering critical data for future space exploration, Auñón-Chancellor let Eric Swanson know how incredibly rewarding her work is on the space station. As for the NASA children, the experience of talking to a NASA astronaut on the space station was equally rewarding for them.

SARP... from page 5

Cruz, the University of Virginia, the University of Houston, and the University of Notre Dame.

The Student Airborne Research Program is one of NASA's tools for exposing future scientists to the Earth Science missions that support environmental studies and the testing and development of new instruments and future satellite mission concepts. The program's goal is to stimulate interest in NASA's Earth Science research and aid in the recruitment and training of the next generation of scientists and engineers, many of whom will be getting their first hands-on research experience during this program.

Jack Kaye, Associate Director for Research of NASA's Earth Science Division said, "SARP provides a fabulous opportunity for these students to get hands-on experience in Earth System science using NASA's unique combination of aircraft, sensors, systems, and people. The experience will likely have a lifelong impact, in part by helping them better understand their interests as they contemplate their post-college plans."

Of the 277 students that have completed the SARP program, 93 percent have moved on to science, technology, engineering or math (STEM) related careers or are pursuing additional STEM education.

SARP is managed by NASA's Ames Research Center through the National Suborbital Research Center at the Bay Area Environmental Research Institute with funding and support from NASA's Earth Science Division. Armstrong manages NASA's DC-8 and ER-2 aircraft, which are operated from Building 703.

X-59... from page 1

important experimental aircraft and rockets that dates back to 1947 and the X-1, the rocket-powered airplane that Chuck Yeager flew to become the first human to fly faster than the speed of sound.

While that famous X-1 was nicknamed the Glamorous Glennis, for Yeager's wife, today's X-59 takes its QueSST nickname from the quiet supersonic technology the aircraft will be equipped with.

Now under construction by Lockheed Martin Aeronautics Company at its famed Skunk Works plant in Palmdale, the X-59 QueSST is designed so that when flying supersonic, people on the ground will hear nothing more than a sonic thump, if anything at all.

Once NASA accepts the X-59 from Lockheed Martin, Armstrong will perform additional flight tests to prove the quiet supersonic technology works as designed, the aircraft performance is robust and that it's safe to operate in the National Airspace System.

Once fully tested and pronounced safe to fly within the National Airspace, the X-59 in late 2022 will begin making supersonic flights over select communities to measure residents' reactions to any noise they might hear.

The scientific data gathered from these community overflights will be presented to U.S. and international regulators, who will use the information to help them come up with rules based on noise levels that enable new commercial markets for supersonic flight over land.

Crews... from page 7

Crew Dragon Test Flight Astronauts

Robert Behnken is from St. Ann, Missouri. He has a doctorate in engineering and is a flight test engineer and colonel in the Air Force. He joined the astronaut corps in 2000 and flew aboard space shuttle Endeavour twice, for the STS-123 and STS-130 missions, during which he performed six spacewalks totaling more than 37 hours.

Douglas Hurley calls Apalachin, New York, his hometown. He was a test pilot and colonel in the Marine Corps before coming to NASA in 2000 to become an astronaut. He piloted space shuttle Endeavor for STS-127 and Atlantis for STS-135, the final space shuttle mission.

The SpaceX Crew Dragon will launch aboard a SpaceX Falcon 9 rocket from Launch Complex 39A at Kennedy Space Center in Florida.

After each company successfully completes its crewed test flight, NASA will begin the final process of certifying that spacecraft and systems for regular crew missions to the space station. The agency has contracted six missions, with as many as four astronauts per mission, for each company.

Starliner First Mission Astronauts

Josh Cassada grew up in White Bear Lake, Minnesota. He is a Navy commander and test pilot with more than 3,500 flight hours in more than 40 aircraft. He was selected as an astronaut in 2013. This will be his first spaceflight.

Sunita Williams was born in Euclid, Ohio, but considers Needham, Massachusetts, her hometown. Williams came to NASA from the Navy, where she was a test pilot and rose to the rank of captain before retiring. Since her selection as an astronaut in 1998, she has spent 322 days aboard the International Space Station for Expeditions 14/15 and Expeditions 32/33, commanded the space station and performed seven spacewalks.

Crew Dragon First Mission Astronauts

Victor Glover is from Pomona, California. He is a Navy commander, aviator and test pilot with almost 3,000 hours flying more than 40 different aircraft. He made 400 carrier landings and flew 24 combat missions. He was selected as part of the 2013 astronaut candidate class, and this will be his first spaceflight.

Michael Hopkins was born in Lebanon, Missouri, and grew up on a farm near Richland, Missouri. He is a colonel in the Air Force, where he was a flight test engineer before being selected as a NASA astronaut in 2009. He has spent 166 days on the International Space Station for Expeditions 37/38, and conducted two spacewalks.

Additional crew members will be assigned by NASA's international partners at a later date.

NASA's continuous presence on the space station for almost 18 years has enabled technology demonstrations and research in biology and biotechnology, Earth and space science, human health and physical sciences. This research has led to dramatic improvements in technology, infrastructure and medicine, and thousands of spinoff technologies that have improved quality of life here on Earth.

The new spaceflight capability provided by Boeing and SpaceX will allow NASA to maintain a crew of seven astronauts on the space station, thereby maximizing scientific research that leads to breakthroughs and also aids in understanding and mitigating the challenges of long-duration spaceflight.

NASA's Commercial Crew Program is facilitating the development of a U.S. commercial crew space transportation capability with the goal of achieving safe, reliable and cost-effective access to and from the International Space Station and low-Earth orbit.The public-private partnerships fostered by the program will stimulate growth in a robust commercial space industry and spark life-changing innovations for future generations.

The X-Press is published the first Friday of each month for civil servants, contractors and retirees of the NASA Armstrong Flight Research Center.

**Address: P.O. Box 273,
Building 4800, MS 1422
Edwards, California, 93523-0273
Phone: 661-276-3449
FAX: 661-276-3167**

**Editor: Jay Levine,
Logical Innovations, ext. 3459**

Managing Editor: Steve Lighthill, NASA

**Chief, Strategic Communications:
Kevin Rohrer, NASA**

National Aeronautics and Space Administration

NASA Armstrong Flight Research Center
P.O. Box 273
Edwards, California, 93523-0273

Official Business
Penalty for Private Use, $300