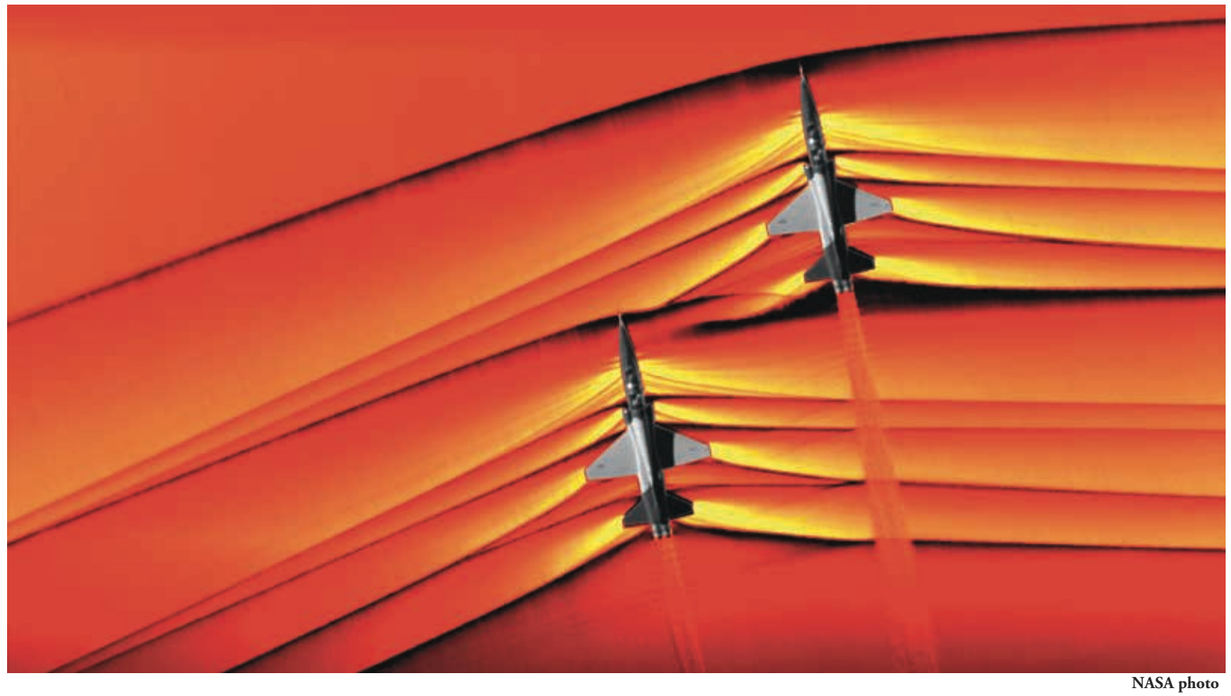
National Aeronautics and Space Administration

THE ARMSTRONG
X-PRESS

Volume 61 Number 1 February 2019



NASA photo

Using the schlieren photography technique, NASA captured the first air-to-air images of the interaction of shockwaves from two supersonic aircraft flying in formation. These two U.S. Air Force Test Pilot School T-38 aircraft flew about 30 feet apart at supersonic speeds, or faster than the speed of sound, producing shockwaves that are typically heard on the ground as a sonic boom. The images, originally monochromatic and shown here as colorized composite images, were captured during a supersonic flight series flown in part to better understand how shockwaves interact with aircraft plumes as well as with each other.

Shockwave interaction

By Matt Kamlet
Armstrong Public Affairs

"We never dreamt that it would be this clear, this beautiful."

Physical Scientist J.T. Heineck of NASA's Ames Research Center in California's Silicon Valley gets his first glimpse at a set of long-awaited images, and takes a moment to reflect on more than 10 years of technique development – an effort that has led to a milestone for NASA's Aeronautics Research Mission Directorate.

NASA has successfully tested an advanced air-to-air photographic technology in flight, capturing the first-ever images of the interaction of shockwaves from two supersonic aircraft in flight.

"I am ecstatic about how these images turned out," said Heineck. "With this upgraded system, we have, by an order of magnitude, improved both the speed and quality of our imagery from previous research."

The images were captured during the fourth phase of Air-to-Air Background Oriented Schlieren

First images, page 4

Second NASA mission complete

By Nicole Quenelle
Fuentek

Virgin Galactic's SpaceShipTwo successfully completed its second mission for NASA Feb. 22 by testing four Agency-supported technologies. The flight was about 10 weeks after its first venture to suborbital space with its first NASA payload.

The experiments included research ranging from life support systems to electromagnetic fields. Most of the technologies flew onboard SpaceShipTwo in December 2018; two of those recently launched on a Blue Origin rocket. Regular access to reduced gravity enables researchers to collect the data needed to mature technologies for use in deep space.

The four technology payloads are:

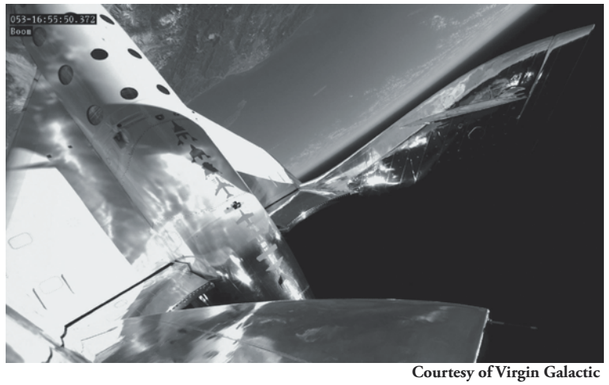
• Microgravity Multi-Phase Flow Experiment for Suborbital Testing, from NASA's Johnson Space Center in Houston

• Vibration Isolation Platform, from Controlled Dynamics Inc. in Huntington Beach, California

• Collisions into Dust Experiment, from the University of Central Florida in Orlando

• Electromagnetic Field Measurements, from Johns Hopkins University in Baltimore

Virgin Galactic and other U.S. commercial spaceflight providers are contracted to provide flight services to NASA for flight testing and technology demonstration. Researchers from academia and industry with concepts for exploration, commercial space applications or other space utilization technologies of potential interest to NASA can receive grants from the Flight Opportunities program to purchase suborbital flights from various U.S. commercial spaceflight providers.



Courtesy of Virgin Galactic

Virgin Galactic made two trips to suborbital space in about 10 weeks.

The Flight Opportunities program is funded by NASA's Space Technology Mission Directorate at the agency's Headquarters in Washington and managed at Armstrong. NASA's Ames Research Center in California's Silicon Valley manages the solicitation and selection of technologies to be tested and demonstrated on commercial flight vehicles.

NASA, Armstrong, great places to work

By Jay Levine
X-Press editor

NASA has an energized workforce that is ready to meet challenging missions, which is reflected by the agency's top ranking by employees for the seventh year in a row.

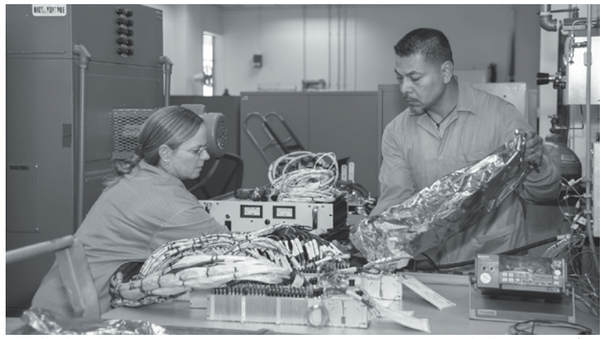
"It's my great pleasure to share with the entire NASA workforce that our agency has once again been named the 'Best Place to Work' among large agencies in the federal government,'" said NASA Administrator Jim Bridenstine. "I could not be prouder of the work each of you have done to create such a positive work environment."

From working toward missions to the moon, Mars and beyond and flying experimental aircraft to a slate of earth and space science and developing the latest in technology for the U.S. and the world, employees are enthused. From a ranking of 69.7 percent in 2007 the direction of employee satisfaction rose to a high in 2018 of 81.2 percent.

The ranking emerges from the annual results of the Federal Employee Viewpoint Survey (EVS). The "Best Places to Work" results are published by the Partnership for Public Service. It ranks about 400 federal organizations by overall employee satisfaction and commitment to mission and evaluates key areas such as innovation, training and development, leadership and diversity.

"At NASA, we're creating something bold and lasting for the future," Bridenstine said. "Your hard work is valued, and I want to assure you that your agency leadership shares your dedication and commitment to our mission. Thank you for making NASA worthy of this recognition."

NASA Armstrong employees are exited about new experimental aircraft such as the X-57 and X-59, center roles in earth and space science and contributions to the future exploration spacecraft called Orion. That enthusiasm is reflected in the EVS the past two years, with 79.5 percent this year and 80.5 percent last year.



AFRC2018-0128-09 **NASA/Lauren Hughes**

April Torres and Angelo De La Rosa remove wire harnesses for signal input for the Orion AA-2 vehicle from electrostatic discharge protective covers, an example of the Center's exciting work. The AA-2 test article is set for a flight in 2019.

"Every day, I am proud of the work that the Armstrong people do here in advancing technology and science through flight," said Center Director David McBride. "It is the work that we all do together and the support that we all provide each other that continues to make this a great place to work. Congratulations to the Armstrong workforce in achieving another high score that reflects your pride in NASA,

Best place to work, page 8

Employees earn SFA Awards

Two NASA Armstrong employees were recently recognized with NASA's Space Flight Awareness Awards for outstanding support of human space flight.

David B. Dowdell, Armstrong senior instrumentation lead, was recognized for a career of consistent and outstanding leadership and technical expertise. He was recognized with the Honoree Award for his work in flight instrumentation on the hypersonic X-43A, the Orion Pad Abort Test (crew module and launch abort system) and the current preparation for the Orion Ascent Abort 2 test.

Ron Young

Ron Young, who recently retired as Flight Opportunities program manager based at Armstrong, was recognized for outstanding leadership in that role.

Dowdell leads the development flight instrumentation team for the Orion Ascent Abort 2 project which includes the crew module, launch abort system, separation ring and abort test booster integration. In each case he was responsible for the overall design, management of requirements, test program, integration and operation of the instrumentation system, as well as management of the work across multiple organizations, centers and contractors.

NASA/Aubrey Gemignani

David Dowdell, second from right, is congratulated by NASA astronauts Mark Vande Hei, shaking hands, Jeanette Epps, left, and Randy Bresnik, right.

Design of these high integrity data acquisition systems is a specialized, but often underappreciated engineering discipline, nominators wrote. Adding to the difficulty is the need for flight data collection in very challenging environments and conditions, such as in extreme temperatures, with high data rates and where new instrumentation techniques are needed. These instrumentation systems are often required for monitoring information that is critical to the safety of people and assets. Dowdell has built a

SFA Awards, page 7

Manke, manager, test pilot, dies

By Jay Levine
X-Press editor

John Manke, a former NASA Armstrong, then called the Ames-Dryden Flight Research Facility, site manager, chief of Flight Operations and research pilot died Jan. 31, 2019. He was 87.

He was hired by NASA on May 25, 1962, as a flight test engineer and had a 22-year career here. He was later assigned to the Pilots' Office where he flew more than 4,500 hours in 56 different aircraft in 11 years.

"John Manke was one of the

Manke, page 8

NASA photo

John Manke was a manager and test pilot. He is seen with the X-24B.

News at NASA

Crew Dragon is a success

NASA passed a major milestone March 8 in its goal to restore America's human spaceflight capability when SpaceX's Crew Dragon returned to Earth after a five-day mission docked to the International Space Station.

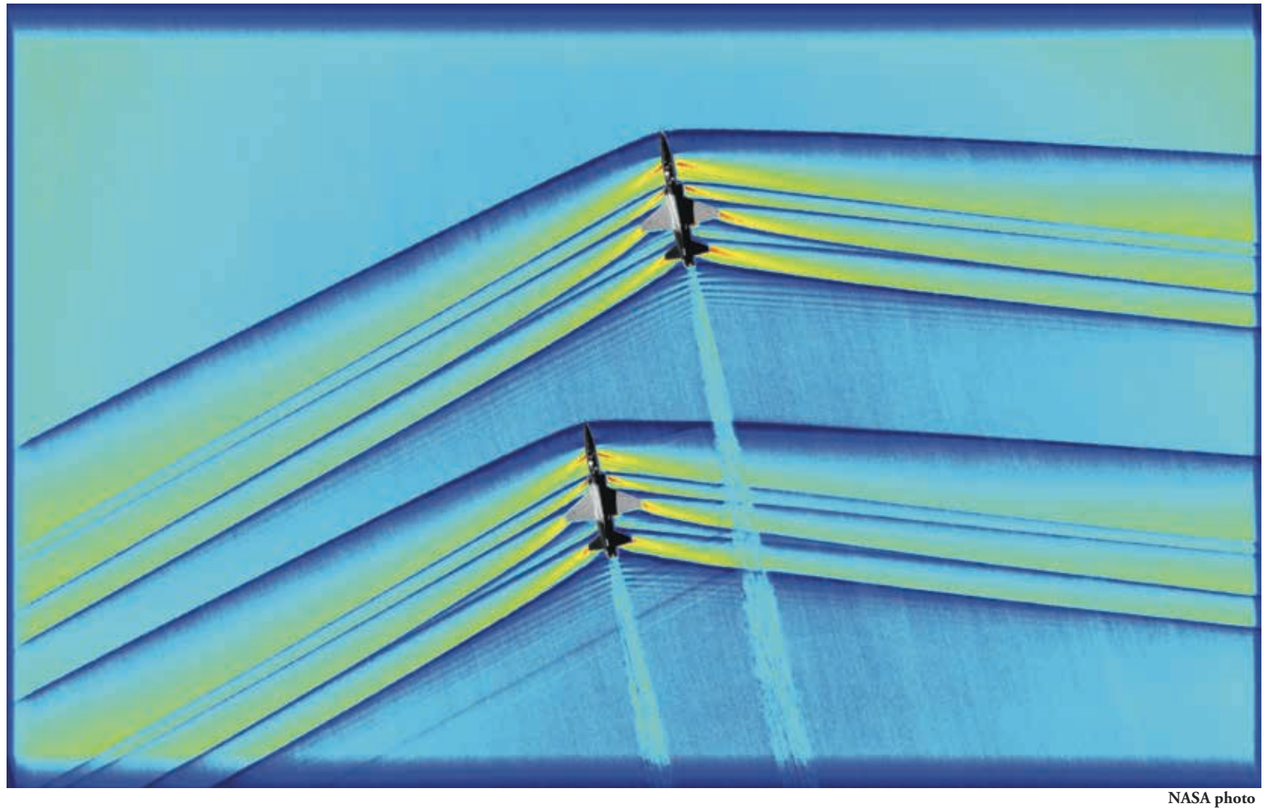
Crew Dragon splashed down about 230 miles off the coast of Cape Canaveral, Florida. SpaceX retrieved the spacecraft from the Atlantic Ocean and transported it back to port.

"Congratulations to the NASA and SpaceX teams on an incredible week," said NASA Administrator Jim Bridenstine. "Our Commercial Crew Program is one step closer to launching American astronauts on American rockets from American soil. I am proud of the great work that has been done to get us to this point."

Demonstration Mission-1 was an uncrewed flight test designed to demonstrate a new commercial capability developed under NASA's Commercial Crew Program. The mission racked up a number of firsts:

- First commercially-built and operated American crew spacecraft and rocket to launch from American soil on a mission to the space station.
- First commercially-built and operated American crew spacecraft to dock with the space station.
- First autonomous docking of a U.S. spacecraft to the space station.
- First use of a new, global design standard for the adapters that connect the space station and Crew Dragon, and also will be used for the Orion spacecraft for NASA's future mission to the Moon.

First images... from page 1



NASA photo

In order to acquire this image, originally monochromatic and shown here as a colorized composite image, NASA flew a B-200, outfitted with an updated imaging system, at around 30,000 feet while the pair of T-38s were required to not only remain in formation, but to fly at supersonic speeds at the precise moment they were directly beneath the B-200. The images were captured as a result of all three aircraft being in the exact right place at the exact right time designated by NASA's operations team.

flights, or AirBOS, at Armstrong. The flight series saw successful testing of an upgraded imaging system capable of capturing high-quality images of shockwaves, rapid pressure changes which are produced when an aircraft flies faster than the speed of sound, or supersonic. Shockwaves produced by aircraft merge together as they travel through the atmosphere and are responsible for what is heard on the ground as a sonic boom.

The system will be used to capture data crucial to confirming the design of the agency's X-59 Quiet SuperSonic Technology X-plane, or X-59 QueSST, which will fly supersonic but will produce shockwaves in such a way that instead of a loud sonic boom, only a quiet rumble may be heard. The ability to fly supersonic without a sonic boom may one day result in lifting current restrictions on supersonic flight over land.

The images feature a pair of T-38s from the U.S. Air Force Test Pilot School at Edwards Air Force Base, flying in formation at supersonic speeds. The T-38s are flying approximately 30 feet away from each other, with the trailing aircraft flying about 10 feet lower than the leading T-38. With exceptional clarity, the flow of the shock waves from both aircraft is seen, and for the first time, the interaction of the shocks can be seen in flight.

"We're looking at a supersonic flow, which is why we're getting these shockwaves," said Neal Smith, a research engineer with AerospaceComputing Inc. at Ames' fluid mechanics laboratory.

"What's interesting is, if you look at the rear T-38, you see these shocks kind of interact in a curve," he said. "This is because the trailing T-38 is flying in the wake of the leading aircraft, so the shocks are going to be shaped differently. This data is really going to help us advance our understanding of how these shocks interact."

The study of how shockwaves interact with each other, as well as with the exhaust plume of an aircraft, has been a topic of interest among researchers. Previous subscale schlieren research in Ames' wind tunnel revealed distortion of the shocks, leading to further efforts to expand this research to full-scale flight testing.

While the acquisition of these images for research marked one of the goals of AirBOS, one of the primary objectives was to flight test advanced equipment capable of high quality air-to-air schlieren imagery to prepare for X-59's Low-Boom Flight Demonstration. The mission will use the X-59 to provide regulators with statistically valid data needed for potential regulation changes to enable quiet commercial supersonic flight over land.

While NASA has previously used the schlieren photography technique to study shockwaves, the AirBOS 4 flights featured an upgraded version of the previous airborne schlieren systems, allowing researchers to capture three times the amount of data in the same amount of time.

"We're seeing a level of physical detail here that I don't think anybody has ever seen before," said Dan Banks, senior research engineer at NASA Armstrong. "Just looking at the data for the first time, I think things worked out better than we'd imagined. This is a very big step."

Additional images included a "knife-edge" shot of a single T-38 in supersonic flight, as well as a slow-speed T-34 aircraft, to test the feasibility of visualizing an aircraft's wing and flap vortices using the AirBOS system.

The images were captured from a NASA B-200 King Air using an upgraded camera system to increase image quality. The upgraded system included the addition of a camera able to capture data with a wider field of view. This improved spatial awareness allowed for more accurate positioning of the aircraft. The system also included a memory upgrade for the cameras, permitting researchers to increase the frame rate to 1400 frames per second, making it easier to capture a larger number of samples. Finally, the system received an upgraded connection to data storage computers, which allowed for a much higher rate of data download. This upgrade also contributed to the team being able to capture more data per pass, boosting the quality of the images.

In addition to a recent avionics upgrade for the King Air, which improved the ability of the aircraft to be in exactly the right place at exactly the right time, the team also developed a new installation system for the cameras, drastically reducing the time it took to integrate them with the aircraft.

"With previous iterations of AirBOS, it took up to a week or more to integrate the camera system onto the aircraft and get it working. This time we were able to get it in and functioning within a day," said Tiffany Titus, flight operations engineer. "That's time the research team can use to go out and fly, and get that data."

While the updated camera system and avionics upgrade on the B-200 greatly improved the ability to conduct these flights more efficiently than in previous series, obtaining the images still required a great deal of skill and coordination from engineers, mission controllers, and pilots from both NASA and Edwards' U.S. Air Force Test Pilot School.

NASA photo

The X-59 Quiet SuperSonic Technology X-plane, or QueSST, will test its quiet supersonic technologies by flying over communities in the United States. X-59 is designed for people on the ground to hear nothing more than a quiet sonic thump – if anything at all – when it is flying supersonically.

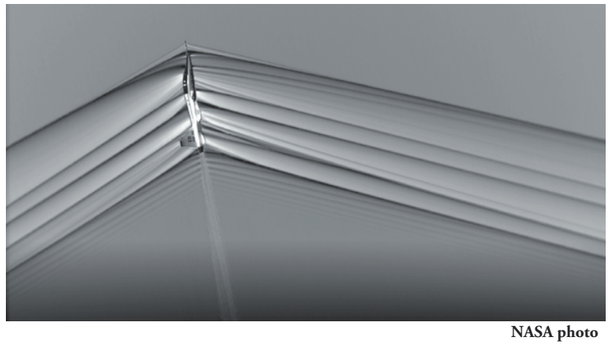
In order to capture these images, the King Air, flying a pattern about 30,000 feet, had to arrive in a precise position as the pair of T-38s passed at supersonic speeds approximately 2,000 feet below. Meanwhile, the cameras, able to record for a total of three seconds, had to begin recording at the exact moment the supersonic T-38s came into frame.

"The biggest challenge was trying to get the timing correct to make sure we could get these images," said Heather Maliska, AirBOS sub-project manager. "I'm absolutely happy with how the team was able to pull this off. Our operations team has done this type of maneuver before. They know how to get the maneuver lined up, and our NASA pilots and the Air Force pilots did a great job being where they needed to be."

"They were rock stars."

The data from the AirBOS flights will continue to undergo analysis, helping NASA refine the techniques for these tests to improve data further, with future flights potentially taking place at higher altitudes. These efforts will help advance knowledge of the characteristics of shockwaves as NASA progresses toward quiet supersonic research flights with the X-59 and closer to a major milestone in aviation.

AirBOS was flown as a sub-project under NASA's Commercial Supersonic Technology project.



NASA photo

When aircraft fly faster than the speed of sound, shockwaves travel away from the vehicle, and are heard on the ground as a sonic boom. NASA researchers use this imagery to study these shockwaves as part of the effort to make sonic booms quieter, which may open the future to possible supersonic flight over land. The updated camera system used in the AirBOS flight series enabled the supersonic T-38 to be photographed from about 2,000 feet away.

E49-0091-1 NASA photo

Howard Lilly was the first engineering pilot assigned to what is now Armstrong.

EC82-17954 NASA photo

Richard Gray lost his life during a proficiency flight in a Cessna T-37.

Fallen pilots remembered

By Christian Gelzer
NASA Armstrong Historian

NASA honored members of the NASA family who lost their lives while furthering the cause of exploration and discovery, including the crews of Apollo 1 and space shuttles Challenger and Columbia, during the agency's annual Day of Remembrance Feb. 7.

In addition, NASA Armstrong recognized the loss of four pilots who died at the controls of a NASA, formerly known as National Advisory Committee for Aeronautics (NACA), aircraft.

"On this solemn day, we want to pay tribute to the pilots who were pursuing the agency's mission of advancing the technical boundaries of aviation through flight as well as recognize the sacrifice of the families of the deceased," said David McBride, Armstrong center director.

Howard C. "Tick" Lilly became the first NACA engineering pilot assigned to the Muroc Flight Test Unit, now known as NASA Armstrong. He served as a Naval aviator before joining the NACA's Langley Memorial Aeronautical Laboratory in Virginia in 1942. In 1943 he transferred to the NACA's Lewis Flight Propulsion Laboratory in Cleveland (renamed Glenn Research Center) and then to the NACA's Muroc unit in 1947.

E61-6682 NASA photo

Joe Walker was well known as a test pilot for the X-15 rocket-powered aircraft.

There he flew the Douglas D-558-1 transonic research aircraft and the Bell X-1. Lilly was the fourth person to exceed the speed of sound. He died May 3, 1948, when components of the D-558-1's engine compressor failed, severing control cables, causing the airplane to crash. He was the first NACA pilot to die in the line of duty.

Joseph A. "Joe" Walker was a chief research pilot at the NASA Flight Research Center (NASA Armstrong) during the mid-1960s. Walker flew P-38 aircraft for the Army Air Force in North Africa during World War II. He joined the NACA's Lewis Flight Propulsion Laboratory in Ohio in 1945 and transferred to the High-Speed Flight Research Station in 1951.

Walker made the first NASA-piloted X-15 flight March 25, 1960, and flew the aircraft 24 times, achieving its highest altitude (354,300 ft.) Aug. 22, 1963. He made the first flight in the Lunar Landing Research Vehicle in 1964 that led to the Lunar Landing Training Vehicle used in Houston to train astronauts to land on the moon. Walker perished June 8, 1966, when his F-104 was caught in the wingtip vortex of the North American XB-70.

In 1982, Richard E. "Dick" Gray was killed on a pilot proficiency flight while flying for NASA Armstrong. Gray joined NASA's Johnson Space Center in Houston, in 1978 after completing his service in the U.S. Navy. He flew 48 combat missions in F-4s over Vietnam while assigned to squadron VF-111 aboard the USS Coral Sea in 1972.

After joining Kennedy Space Center in Florida, he flew as chief project pilot on the WB-57F high-altitude research aircraft and served as the prime chase pilot in the T-38 aircraft for video documentation of the landing portion of space shuttle orbital flight tests.

He was fatally injured Nov. 8,

Remembered, page 7

SFA Awards... from page 3

career of being the best of the best in this field, his nominators wrote.

Young received the management award for his consistent excellence and proactivity. His nominators said he did "an exceptional job of developing and managing the Flight Opportunities program for the Space Technology Mission Directorate (STMD."

The focus of the program is to mature space technologies developed by universities, industry, government and international partners and work with emerging commercial suborbital flight providers to purchase flights to test the technologies.

The program spans multiple NASA Centers and facilities including: Armstrong, Ames Research Center and the Jet Propulsion Laboratory in California; Glenn Research Center in Ohio; Johnson Space Center in Houston; Kennedy Space Center in Florida; Langley Research Center in Virginia; Marshall Space Flight Center in Alabama; Stennis Space Center in Mississippi; Goddard Space Flight Center in Maryland and its Wallops Flight Facility in Virginia.

Nominators said Young's proactive pursuit of acquisition strategies in order to promote commercial suborbital activity and pursuit of small business led to NASA's recognition of Flight Opportunities as Program Team of the Year in 2013 for the Small Business Advocates Award. Young's successful collaboration with academia, industry and international entities has led to more than 200 technology agreements, with about one-third of those industry, public and private partnerships and three of those with international partners in Australia, Italy and Great Britain.

Young's collaboration with the STMD's Tipping Point Solicitations led to the selection of 24 commercially-led public private partnerships for development and demonstration of commercial reusable small launch vehicle enabling technologies. His work with the Science Mission Directorate and the Human Exploration and Operations Mission Directorate have led to additional opportunities for researchers to demonstrate their technologies on commercial suborbital vehicles.

Young successfully led the team on payload selections from 2013-2018, which resulted in more than 175 payload selections with awards valued at more than $50 million. His leadership led to advancing space technology readiness levels through reusable suborbital launch vehicles, balloons and parabolic flight aircraft.

Nominators also wrote that the Flight Opportunities program served as inspiration for the recently established Commercial Lunar Payload Services program. The new program seeks to use emerging commercial flight services to deliver payloads to the lunar surface.

Astronauts Mark Vande Hei, Randy Bresnik and Jeanette Epps, along with Stennis Associate Director John Bailey, presented the Honoree Awards during a ceremony in Washington, D.C.

NASA's Space Flight Awareness Program recognizes outstanding job performances and contributions by civil service and contract employees and focuses on excellence in quality and safety in support of human spaceflight.

EC67-1652 **NASA photo**

Michael Adams stands in front of X-15 No.1 on Rogers Dry Lake.

Remembered... from page 6

1982, in the crash of a Cessna T-37 aircraft while on a flight to hone his skills flying the airplane.

Air Force pilot Major Michael J. Adams was selected in 1962 for the Experimental Test Pilot School at Edwards Air Force Base in California. He also was one of four Edwards Aerospace research pilots to participate in a series of NASA moon landing practice tests.

Adams joined the joint USAF/NASA X-15 program in July 1966 and flew seven flights. On his last flight Nov. 15, 1967, Adams died when the rocket plane disintegrated following reentry and crashed. An investigation concluded that the distraction of malfunctioning systems, coupled with possible vertigo, led to the accident.

He was flying the 191st flight of the X-15 program, his first suborbital mission. Adams was the 27th American to fly more than 50 miles above the Earth's surface and was awarded astronaut wings posthumously. His accident was the only fatality of the 199-flight program. His name was added to the Astronauts Memorial at Kennedy Space Center, Fla., and a memorial was established at the crash site in 2004.

Carroll, project manager, dies

Starla Carroll, a former Armstrong manager, died Feb. 22. She was 66.

She began her Armstrong career at the Dryden Aeronautical Test Range. She accepted a position in the Armstrong Business Office where she worked to help the Center and its customers.

Carroll most recently was in the Space Projects and Partnerships Branch as a project manager for the small Unmanned Aircraft System work. She supported customers that needed to develop and flight test small unmanned aerial vehicles. Also in that branch she was a project manager for sensor development programs and managed the customer satisfaction element.

People she worked with said she had a good sense of humor, was upbeat, open, honest and bright, treated people well and worked hard to support them. Carroll was into fitness and healthy living and enjoyed travel and hiking.

Williams, former employee, dies

Marva Williams, a former NASA Credit Union employee, died Jan. 10. She was 77.

Williams was hired by the NASA Federal Credit Union in 1969 and she retired in the 1990s. People who knew her said she had a great sense of humor, was smart, kind, caring and loved the people at the Center and her job.

She had several positions within the Business and Professional Women's Organization and volunteered at a domestic violence shelter.

Manke... from page 3

most effective test pilots during a time period of many exploratory experimental flight programs," said Ken Szalai, a former center director. "He flew missions that had high risks and returned to the ground safely greatly expanding knowledge. With a keen analytic mind he almost always sat down with the engineers to look at the flight data to correlate what he was seeing, feeling and doing with the measured flight parameters. It made him and the engineers at the table smarter and better."

Manke began flying lifting body aircraft in 1968, including the X-24B, X-24A, HL-10 and the M2-F3. He made 42 lifting body aircraft flights, more than any other pilot. He also participated in the high-technology programs including the X-15, the space shuttles and the X-29 and the YF-12 Blackbird.

Lifting body aircraft research provided key data to the Space Shuttle Program to validate that an unpowered lifting body aircraft could make a precision landing on a concrete runway.

"John, and a bit later, Mike Love, took on a very visible challenge of doing a 'spot landing' on Runway 04 with the X-24B with several senior NASA officials watching, who were in the final phase of committing to unpowered landings of the orbiter," Szalai said. "This was the first landing on a hard runway for any lifting body."

Manke also tested key controls systems for the orbiters.

"He also joined two test pilots in an F-8 Digital Fly-by Wire test series to look for a controllability 'cliff' when large time delays were added to a flight control system," Szalai said. "These flights tests were supporting the work to eliminate pilot induced oscillations which were seen on the last 'Enterprise' orbiter approach and landing test. John took this F-8 to the edge of the cliff to reveal what could only be done in flight test."

Manke later served as chief of Flight Operations, where he was responsible for flight research with some of the most advanced aircraft, such as the flight test program of the mated NASA 747 Shuttle Carrier Aircraft called the Approach and Landing Tests. He also was selected to serve as site manager in addition to his job as chief of Flight Operations after the consolidation of the Center and Ames Research Center in 1981.

"There was no precedent at the Flight Research Center for this major management restructuring," Szalai said. "John acted always to serve both Dryden and Ames interests. Safety, project accomplishment and continuing to build the competency and teamwork were his clear objectives."

Manke excelled in engineering, piloting and leadership roles because of talent, courage, honesty, integrity and a commitment to the workforce, Szalai said.

"John did not give lengthy speeches, but what he said was always important, and we listened closely," Szalai said. "His influence is a permanent part of the Center's success and its continuing spirit."

Manke was honored with the NASA Medal for Outstanding Leadership, the NASA Medal for Exceptional Service, was nominated by NASA in 1984 for the Presidential Rank of Meritorious Executive and was named to the Aerospace Walk of Honor in 1997.

He attended the University of South Dakota before joining the U.S. Navy in 1951, during the Korean War. He graduated from Marquette University, Milwaukee, in 1956 with an Electrical Engineering degree and a commission in the United States Marine Corps.

After graduation from Marine Corps Officers Basic School, he entered flight training and served as a fighter pilot with the Marines. He left the service in 1960 and was a major in the USMC Retired Reserve. John worked for Honeywell Corporation as a flight research engineer for two years before joining NASA.

Best place to work... from page 2

Armstrong and each other."

Armstrong's ranking the past two years are the best marks since the inception of the EVS. In fact, scores have increased almost every year since 2012 and are significantly better than the first tally of 60.7 percent in 2005.

Employees awarded the highest marks to empowerment, or thier satisfaction with decisions that affect their work. The 68-percent ranking was the best ever for Armstrong, 3.2 percentage points better than last year and the center's best ranking of 19 out of 408 federal agency subcomponents.

Other areas that saw at least a 2-percent increase included employee skill to the missions match and pay and support for diversity. Also up in the current survey were strategic management, performance based rewards, advancement and training and development, work-life balance and effective leadership in fairness. The increases in workers perceptions of pay and work-life balance are improvements in the only two categories in which the center is not in the top percentages of the survey, but is still above the median.

Areas that employees rated lower, but still in the top percentages, included senior leadership, effective leadership, teamwork and innovation.

Safety Day is set for April 3

Safety Day is set for April 3 and the theme is "Safe by Choice."

The day begins at 8 a.m. at the Edwards Theater, with afternoon safety activities and information at the theater and main campus.

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