



THE ARMSTRONG X-**XPRESS**

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BOSCO impresses

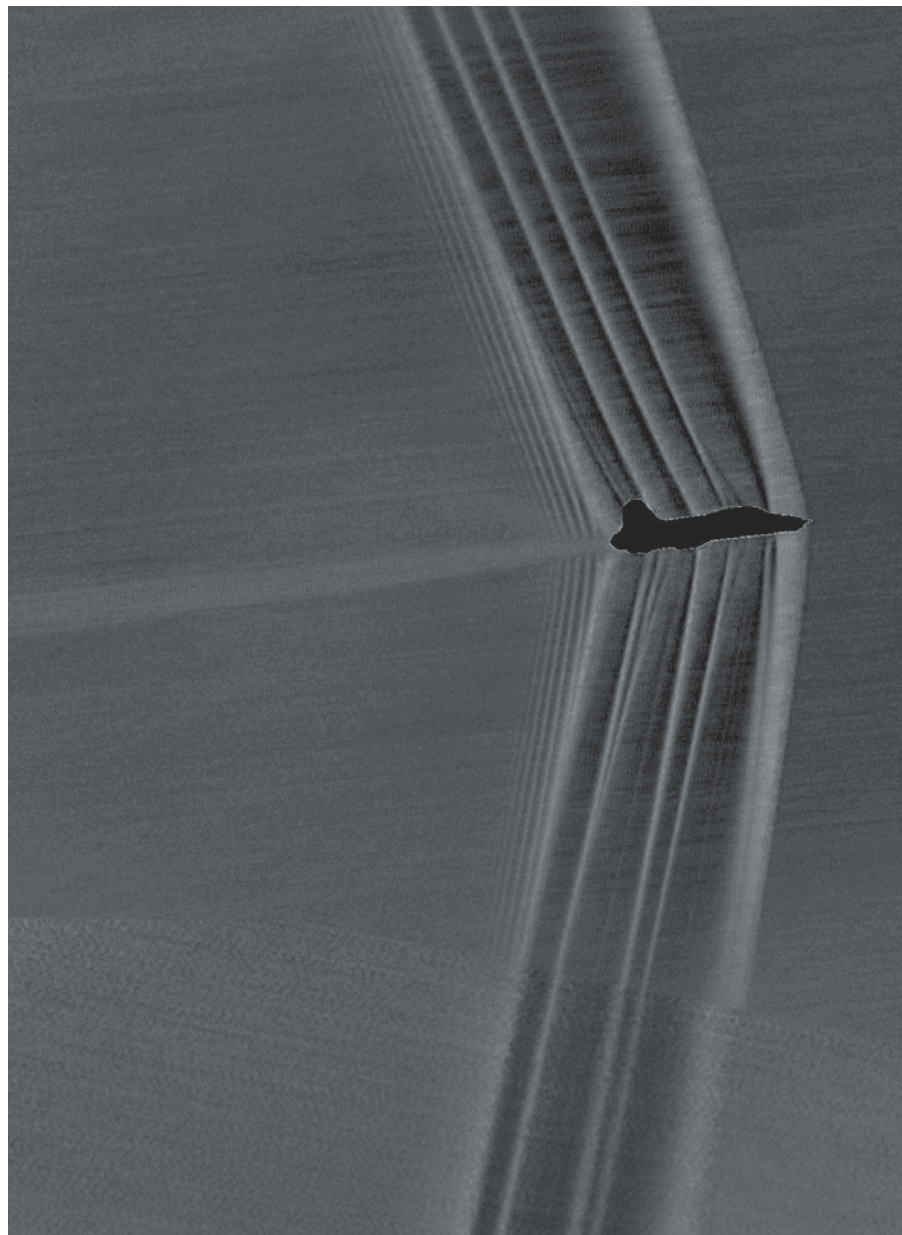
By Matt Kamlet

Armstrong Public Affairs

NASA's goal of developing a quiet supersonic aircraft is another step closer following a pair of successful first flights in a series demonstrating patent-pending Background Oriented Schlieren using Celestial Objects (BOSCO) technology, effectively using the sun as a background in capturing unique, measurable images of shockwaves.

Improved image-processing technology makes it possible to capture hundreds of observations with each shockwave, benefiting engineers in their efforts to develop a supersonic aircraft that will produce a soft "thump" in place of a disruptive sonic boom.

The tests flown from Armstrong build on other recent NASA tests to further the art of schlieren photography. Schlieren is a technique that can make important invisible flow features visible. Although schlieren has been in use for over a century, recent research by NASA has enabled its application in flight and greatly enhanced the detail of the images that can be obtained. In this case, NASA-improved schlieren captured the visual data of shockwaves produced by a U.S. Air Force Test Pilot School T-38 aircraft traveling at supersonic speeds. The tests used a camera lens filter commonly used when photographing the sun. The filter, known as a hydrogen-alpha solar filter was installed in one of three modified high-speed cameras positioned strategically on the ground, and allowed visually fine details of the sun to be seen.



Shockwaves produced by a U.S. Air Force Test Pilot School T-38 banking at Mach 1.05 are captured by a new ground-operated camera and filter to study flow patterns and provide NASA engineers with methods of furthering research toward developing a soft "thump" in place of a heavy sonic boom.

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AFRC2016-0072-01

NASA

Flight Test 4 begins this month

By Anna Kelley

Armstrong Public Affairs

NASA and its partners are validating and advancing technologies that will assist the Federal Aviation Administration as they develop the regulations to allow integration of Unmanned Aircraft Systems (UAS) into the National Airspace System (NAS).

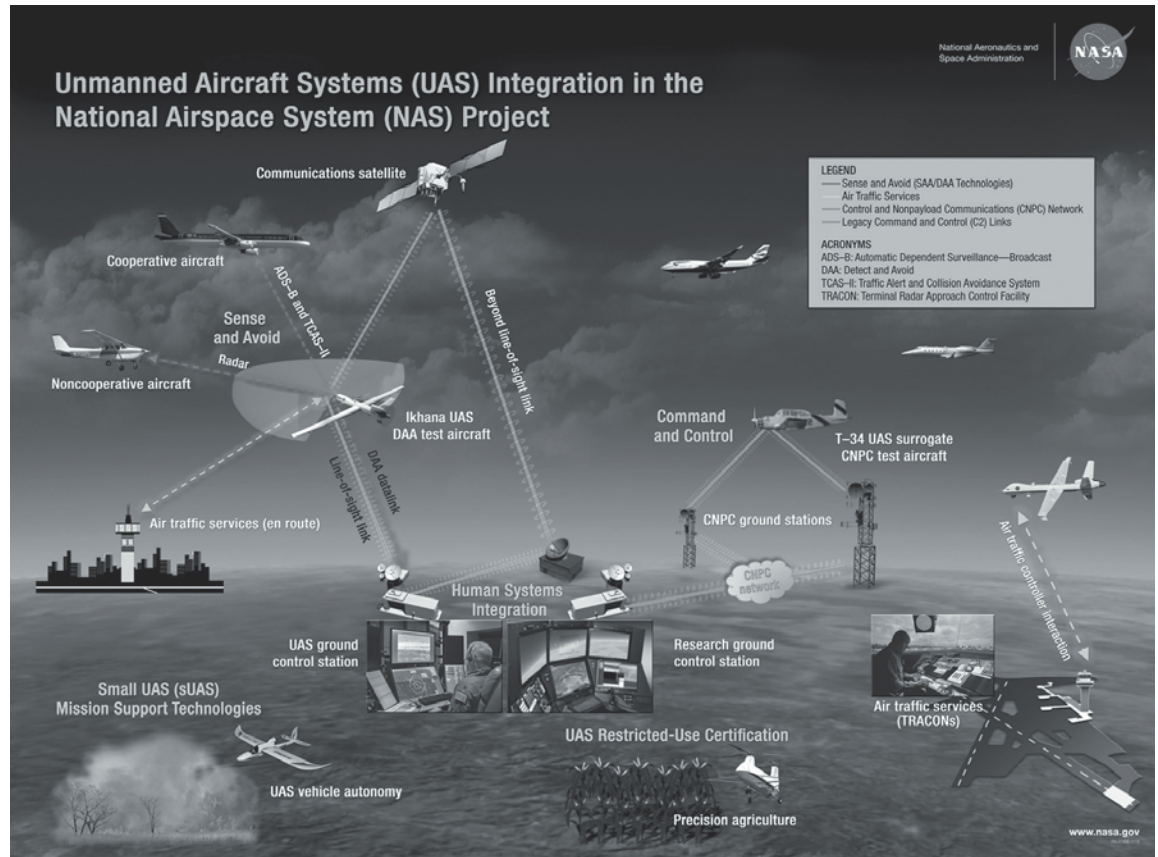
The upcoming flight test series will be the fourth for the project, also known as Flight Test Series 4 (FT4) and will be based at Armstrong. Flights will begin toward the end of April and continue through June.

Test objectives will require 15 flights and more than 270 encounters. These encounters will consist of flying several piloted aircraft, referred to as intruders, into different positions near or around NASA Armstrong's Predator B remotely piloted aircraft named Ikhana.

Intruder aircraft will include NASA's B200 King Air, T-34C, G-III, TG-14, Honeywell's C-90 King Air and the U. S. Air Force's C-12 King Air. These intruders will function as high speed and low speed aircraft to verify and validate the requirements of the minimal operational performance standards for UAS.

FT4 will leverage lessons learned and risk reduction from Flight Test 3, which took place in summer 2015, while continuing to introduce new capabilities and technology refinements in support of validating the Detect and Avoid (DAA) systems. These systems will allow Ikhana to detect intruders and either alert its pilot on the ground or fly a programmed maneuver to avoid collision.

Each of the intruders will be equipped with different systems for operations in the NAS. They will represent aircraft equipped with cooperative systems, such as a transponder, as well as non-cooperative aircraft that have no equipment and will require an air-to-air radar to detect and track.



NASA

NASA and its partners are validating and advancing technologies that will assist the Federal Aviation Administration as it develops regulations to integrate Unmanned Aircraft Systems into the National Airspace System.



ED14-0341-34

NASA/Carla Thomas

NASA's Ikhana is assisting in efforts to develop regulations to integrate Unmanned Aircraft Systems into the National Airspace System.

"Our engineers have generated a very detailed and complex flight test plan that integrates all of the variables needed to execute

the DAA systems, intruder aircraft equipment and speeds, design of encounter geometries, and the number of intruder aircraft needed to conduct the encounter in order to meet NASA's and the community's requirements."

In preparation for the flight tests, engineers are completing ground testing and validating software prior to the flights. Following ground testing, crews will conduct check out flights to ensure the systems work in flight and that researchers get the data they need.

The data retrieved from this round of flight tests will provide valuable information to researchers for a future round of flight tests as well as play an important role in evolving the technologies that are necessary for UAS to fly in the NAS.

"NASA is providing critical data to support the ongoing efforts

Initiative, page 8

Mental health help available

By Jay Levine

X-Press editor

People struggling with mental health challenges and who need help can find it in a number of places, said Ashley Prueitt, who has a doctorate in psychology and is NASA Armstrong's Employee Assistance Program (EAP) manager.

While any time is a good time to seek help, Mental Health Awareness Month in May offers an opportunity to detail the many services available to people if they want them, she added. Resources are available on center, on base or in the Antelope Valley community.

"EAP is a resource, but there are others if you are not comfortable coming here," Prueitt said. "It is important that people seek out help if they need it and for new employees to know where resources are available."

People who have mental health challenges sometimes do not seek out help because of some of the societal stigmas.

"Mental health is not treated like a medical condition," Prueitt explained. "When a shooting, or bombing is reported in the media



AFRC2016-0122-058

NASA/Ken Ulbrich

Ashley Prueitt, Armstrong's EAP manager, talks to an employee during the center's Safety Day. Brian Barr is seated next to Prueitt.

and it happens to involve a person who was depressed, or bipolar, the stigma is that if a person has a mental health challenge that they must be dangerous. Individuals with mental health disorders are no more violent than people in the general population. It just happens that's what gets attention in the media.

"We need to remind people it's not their fault if they have a mental

illness and it is treatable," she said. "It is a chemical imbalance."

People can seek help because what they say, as long as it does not pose a danger to themselves or others, is confidential.

"Some people do not want to come to EAP at work," Prueitt said. "There are other resources available

Mental health, page 8

Living in space explained

By Barbie Buckner

Texas State University, NASA Armstrong

Regional teachers participated in a workshop to learn about the one-year study of identical twins astronaut Scott Kelly, who was on the International Space Station, and former astronaut Mark Kelly who remained on Earth. The study is referred to as: A Stepping Stone Toward Our Journey to Mars.

The March 2 workshop was held at the NASA Armstrong Office of Education's Resource Center.

Education specialist Barbara Buckner and Scott Wiley, aerospace meteorologist for Jacobs Technology at Armstrong, spoke to 26 educators.

The event also celebrated the

Workshop, page 8



AFRC2016-0066-15

NASA/Lauren Hughes

Participants are learning about the electromagnetic spectrum as they look through diffraction slides that bend visible light into rainbow colors.

News at NASA

Grunsfeld to retire April 30

John Grunsfeld will retire from NASA April 30, capping nearly four decades of science and exploration with the agency. His tenure includes serving as astronaut, chief scientist and head of NASA's Earth and space science activities.

Grunsfeld has directed NASA's Science Mission Directorate as associate administrator since 2012, managing more than 100 science missions – many of which have produced groundbreaking science, findings and discoveries.

"John leaves an extraordinary legacy of success," said NASA Administrator Charlie Bolden. "Widely known as the 'Hubble repairman,' it was an honor to serve with him in the astronaut corps and watch him lead NASA's science portfolio during a time of remarkable discovery. These are discoveries that have rewritten science textbooks and inspired the next generation of space explorers."

Geoff Yoder, currently the directorate's deputy, will serve as acting associate administrator until a successor is named.

Notable science achievements under Grunsfeld's leadership include the Curiosity rover Mars landing in 2012 – and its discoveries about the habitability of ancient Mars – and the July 2015 New Horizons Pluto flyby, completing initial reconnaissance of the solar system.

Grunsfeld was a five-time space shuttle astronaut, the lead spacewalker during the last Hubble Space Telescope servicing flight in 2009.

In 2015, Grunsfeld was inducted into the U.S. Astronaut Hall of Fame.

Safety Day

Everyone has a responsibility for safety at home and work

By Jay Levine

X-Press editor

As Armstrong prepares for a new era in flight research with the New Aviation Horizons initiative and science and astrophysics flights around the world, the center's focus on safety has never been more important, said Center Director David McBride.

Speaking to employees at Safety Day April 20, McBride stressed the need for personal safety and to be aware at home and at work.

"Our safety posture is vital to the center," McBride said. "We are doing a great job, but there is room for improvement. We have to raise our game. Before things go wrong, we need to take a pause. If things are not safe at work or at home, make it so. You and I can prevent accidents," McBride said.

David Fedors was the next speaker and he focused on surviving an aircraft crash.

"A very small percentage of people die in aircraft accidents and are more likely to die driving to the airport than flying in an aircraft," Fedors said. "Of those people involved in an aircraft accident, 90 percent survive the crash."

Aircraft in the U.S. and Western Europe are usually well maintained and safe. However, there are actions people can take to be prepared such as wearing walking shoes and non-flammable clothing and sitting within five rows of an exit. Aircraft accidents mainly happen (80 percent) at takeoff and landing.

Many of the presentations were from people who experienced a safety challenge first hand.

For example, William Ko explained how a sun-exposed bottle of water could start a fire.



AFRC2016-0122-7

NASA/Ken Ulbrich

Center Director David McBride said safety is vital to Armstrong's mission.



AFRC2016-0122-18

NASA/Ken Ulbrich

The TG-14 Engine Investigation Team was recognized for safety contributions. Jim Smolka, left and David McBride, right, present the team award to Tom Jones, Michelle Haupt, Tiffany Titus, Rich Souza, Enrique Hernandez, James Ford and Dale Hogg.

A bottle of water exposed to the sun functioned as a big lens and caused the focal point to fall on the surface of a nearby mattress stored in the garage and ignited

it. Lesson learned – don't leave a sun-exposed bottle of water next to combustible materials.

Another presentation looked at what to do in an active shooter

situation. Wayne Dedafoe said there is no profile for people who perpetrate multiple shootings. Victims are chosen at random, situations unfold rapidly and there are no common links.

"Situational awareness is important because there are three options – run, hide or fight. Pay attention wherever you are on how to evacuate in case of a fire, earthquake or an active shooter. Hide if you can't escape. If you can lock the door, do it, pull the shades and silence your cell phone. If you can't evacuate, or hide, try to fight. You cannot fight just to survive, you have to win – you have to be fully committed to attack.

Darlena Dotson, California Highway Patrol officer, explained April is National Drowsy Driving Month. A drowsy driver looks like someone who is intoxicated. Drowsy drivers weave all over the road endangering themselves and others.

Long distance drivers should take a break every two hours, she said. She also reminded people that texting is a distraction people must avoid when driving. If you intend to drink avoid drunk driving, or riding with someone who is intoxicated.

Mother nature can also provide danger. Brett Pauer explained what happened when he was caught in a flash flood on Highway 58 in October. Heavy rain caused cars to slow and then stop in bumper-to-bumper traffic. It wasn't an accident, but when the cars started moving again it was because they were floating. He stayed in the car because it was dry and it appeared to be the safest place as cars bumped into each other. After the rain stopped and the flood subsided, he crawled through the passenger window onto the



AFRC2016-0122-16

NASA/Ken Ulbrich

Paul Newton, center, was recognized as the government employee of the year for safety for helping dislodge food from a choking person. Jim Smolka, left, and David McBride, right, presented the award.

sandy, beach-like ground when the vehicle finally came to rest – on the hood and windshield of a pickup truck. He walked four miles before a semi-truck driver picked him up on a side road only open to local residents. The road remained closed for six days.

Lessons learned – he enhanced the emergency supplies in his car to include a glass breaking tool, warm clothes, a blanket, a flashlight and other supplies that could be used in the event of an accident, earthquake or other challenges. He said keeping a cell phone charged also is critical.

Traffic accidents are another danger many face. Chico Rijfkgogel discussed two motorcycle accidents 19 years apart with two very different outcomes. Wissam “Sam” Habbal nearly two decades ago had an accident resulting in six broken bones and severe skin damage resulting in 18 months of skin grafts. He continues to have pain from the accident caused when his motorcycle hit an uneven manhole cover on the road and crashed.

Rijfkgogel had a similar accident when his motorcycle hit a pothole going about 40 mph. Because of modern day emphasis on safety, he was wearing protective gear and padding that limited his injuries to a bruised wrist and a scratch on his arm.



Courtesy Brett Pauer

Flash floods can quickly become a life-threatening danger.



Courtesy Brett Pauer

Brett Pauer's car came to a rest after the flood subsided.

During summer holidays, some people enjoy boating. Steve Sterk and Bullhead Arizona Police Department Sgt. Reid McNally discussed how to do it safely. Avoiding collisions with small personal watercraft is a main concern. The watercraft should be maintained, have a current registration and contain life preservers that fit each person.

McNally suggested novice captains take a boating safety course that includes the laws of



AFRC2016-0122-17

NASA/Ken Ulbrich

Jim Smolka, left and David McBride, right, recognize Ed Mathieson as safety contractor of the year. Mathieson spearheaded an effort to abate a safety issue with a fuel tank at Building 703 after a person nearly lost their balance.

the state in which he or she plans to navigate the waters. People must pay attention to changing or extreme weather conditions including lightning storms and a friend or family member should be aware of travel plans and expected departure and return times. Also important is to stay hydrated and wear a hat, a high protection sunblock and sunglasses.

Sometimes you don't know what you don't know and that was the focus of Kevin Reilly's presentation. Two years ago, he couldn't remember his dreams and needed six alarms to wake up. His wife noticed and mentioned to him that he snored and at times stopped breathing. When he mentioned that conversation to Jack Trapp, it was suggested Reilly talk to a co-worker who recommended a sleep apnea test.

“I learned I had extremely severe sleep apnea, where I would stop breathing on average of 97 times an hour,” Reilly explained. “Lack of sleep can result in physical or mental health complications. Some signs include memory impairment, stress, high blood pressure, heart attack, stroke, obesity, diabetes and difficulty dealing with life.”

“After the sleep study, my cardiologist warned me that I could die if I did not use my CPAP (a continuous positive airway pressure

machine that essentially forces air into the lungs), which I received a week later. I began to use the CPAP when I slept as instructed. When my condition was treated, my energy and clarity of thought returned practically overnight.”

The safety threat is sometimes internal. Flight Surgeon Gregg Bendrick covered the signs of a heart attack, stroke and blood clots. Heart attack signs include chest pain and pressure, heaviness and an impending feeling of doom. Bendrick said not to rationalize away the signs and have it checked out.

If a person has stroke symptoms, he or she might not be able to move an arm or leg, or can't talk or write. In such cases, one should call 9-1-1 immediately. Symptoms of a calf in the lower leg being swollen, tender or having a lot of pain could signal a blood clot; it can be serious and should be evaluated by a healthcare professional as soon as possible.

In a related presentation, Tim Risch described how he had a heart attack and didn't even know it. Six months ago he had a heart attack when he was traveling. In the evening he said he felt like he had food poisoning. He went to sleep and the next morning, he felt better and then after an hour he felt a whole lot worse. He collapsed and paramedics were called. Tests later confirmed he had a heart attack.

BOSCO... from page 1

As a result of the research, the supersonic aircraft and its shockwaves are seen with distinct clarity in front of the solar background. Observing air density changes makes the details clearer, explained BOSCO principal investigator Mike Hill.

“The hydrogen-alpha filter basically looks at light coming off of certain hydrogen atoms on the sun’s surface,” Hill said. “By looking at one specific wavelength of light it brings texture out on the image of the sun. That texture is what we use to process the raw images into schlieren images.

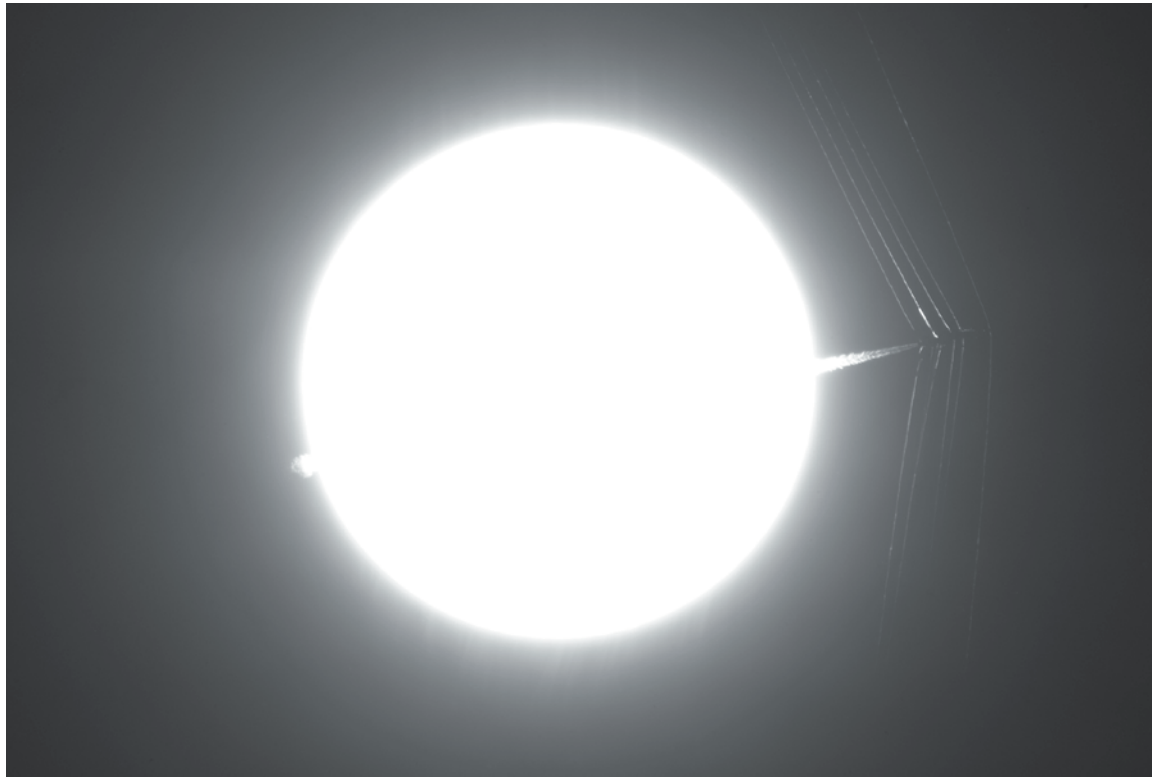
“As the light rays come through the flow around the airplane, the different air density caused by the flow bends the light, which allows us to see the texture of the sun’s surface move on the digital image. We can calculate how far each ‘speckle’ on the sun moved, and that gives us the schlieren image.”

This concept is similar to seeing heat waves that are coming off of a hot surface in the summer. The blur of the objects in the distance is visible because the hot air over the surface is a different density than the air around it. When light travels through that density change, it bends, causing objects in the background to appear blurry to the eye.

The BOSCO technique is one of two new NASA developments in the field of schlieren. The second involves using cameras on one airplane to photograph another. Both techniques are capable of producing images of greatly improved quality, and each has unique features.

“One advantage for BOSCO is that we’re flying one airplane,” Hill explained. “We can have our cameras on the ground, and we can use consumer-grade telescopes and non-flight rated equipment. We don’t need to put any imaging equipment on an airplane, so there are obvious savings in operational costs.”

This method can be applied to imaging wing vortex locations and



AFRC2016-0093-0701

NASA/Ken Ulbrich

An Air Force Test Pilot School T-38 passes in front of the sun at supersonic speed, creating shockwaves that are captured using schlieren photography to visualize supersonic flow.



AFRC2016-0093-028

NASA/Ken Ulbrich

Principal investigator Mike Hill, left, awaits data along with subproject manager Brett Pauer as the Air Force Test Pilot School T-38 creates shockwaves during supersonic flights in March 2016.

relative strengths important for NASA Armstrong’s research into improved efficiency for subsonic aircraft.

Background Oriented Schlieren (BOS), which is a useful method for capturing clear and accurate images of shockwaves, distorts background

patterns, allowing the location of the waves to be analyzed, tracked and compared in a series of photographs captured by the high-speed cameras.

BOSCO continues the work of Calcium-K Eclipse Background Oriented Schlieren, or CaKEBOS,

which initially validated the concept of using the sun as a background in BOS photography. The hope with the new imaging system used in BOSCO is to capture a more detailed picture of the flow field around the aircraft.

Commercial Supersonic Technology subproject manager Brett Pauer says the first flights for BOSCO met high expectations. Pauer was involved in NASA’s photographic research of shockwaves through AirBOS, CaKEBOS, and Ground-to-Air Schlieren Photography System (GASPS).

“I am very happy with these flights,” Pauer stated. “Our Air Force pilots were spot on, our ground operators performed very well, and we captured some spectacular images. These have been our most successful ground-based schlieren flights yet.”

The data collected from the flights will help engineers determine

Images, page 8

Rare skills save center millions

By Jay Levine

X-Press editor

No matter what the challenge with an aircraft engine, Armstrong's Enrique "Henry" Hernandez can fix it.

Along with long-time engine shop technician Bill McCarty and colleague Rich Souza, the Armstrong Engine Shop saves millions in repairs for engines that don't have to be sent to other facilities or to manufacturers, Hernandez said. In fact, other U.S. government agencies and a few international partners have sought help from Hernandez.

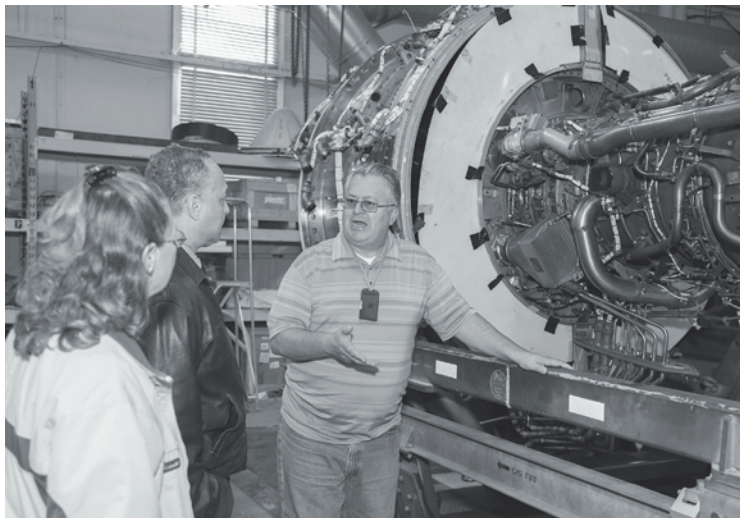
The engine shop's expertise recently was tapped to make sure engines for an Air Force C-17 engine test were ready to go. Called the Vehicle Integrated Propulsion Research (VIPR) program, the engine degradation research included feeding volcanic ash into the engine.

Hernandez and his crew made sure the engine was ready for the research tests by inspecting it on the Edwards Air Force Base ramp with visual inspection cameras called borescopes, he explained. Every night for two to three weeks Hernandez and his crew performed the inspections. They also assisted in some of the VIPR engine modifications and instrumentation.

Fixing and maintaining engines offers daily challenges, Hernandez explained. That is especially true at NASA Armstrong, where the center's fleet of aircraft are diverse and some of the aging powerplants require parts that are becoming harder to locate.

For example, the center flies up to four missions a week on the workhorse Stratospheric Observatory for Infrared Astronomy, a NASA 747SP with the world's largest flying telescope. Keeping up with inspections, maintenance and spare engine parts are some of the ongoing challenges.

In addition, Hernandez and his



ED15-0348-01

NASA/Lauren Hughes

Enrique Hernandez shows Alex Ray and Tami McCoy an engine used in the recent Vehicle Integrated Propulsion Research project during a tour of the NASA Armstrong Engine Shop. The most recent phase of VIPR research included volcanic ash being fed into a C-17 engine to observe the degradation.



ED15-0348-12

NASA/Lauren Hughes

Bill McCarty, Enrique Hernandez, and Rich Souza save NASA Armstrong millions in repairs and inspections that are completed in-house.

crew are responsible for the engine inspections and repairs for NASA's aircraft at Armstrong including the F-15Ds and F/A-18s, used for research and to observe experiments in flight, and a DC-8, Global Hawks and high-flying ER-2 aircraft used for science missions.

In fact, before the DC-8 leaves for deployments, the engine shop crew examines the engines. On a recent DC-8 mission to Florida, the DC-8 crew was concerned that the

moisture from a hurricane could have caused damage. Hernandez flew down to Florida to determine the condition of the engines. Everything checked out and the mission continued, he recalled.

The shelves of the facility Hernandez operates house components for combustors and fuel nozzles, parts needed for overhaul when the powerplant reaches a milestone number of flight hours, he said. Inspections

are completed prior to any aircraft mission and the engine shop has the capabilities to take out and put back together engines and run them in the test cell to make sure they are mission ready.

Hernandez' team can complete an engine inspection in a day depending on the type, he said. It is required that an engine undergo inspection every 100 hours of operation, where the key components will be inspected with a borescope, filters will be changed and igniters viewed.

"There are always issues where XYZ parts are ordered and we do the work," he said.

However, Hernandez and his crew are up to the challenges. Hernandez worked on engines at General Electric prior to accepting his current position about two decades ago. His knowledge of powerplants is vast, as are his partnerships with other government agencies and industry partners. It is through some of those alliances that he has secured parts at no cost when he has seen opportunities, saving millions in the process, he explained.

A key partnership is with the U.S. Air Force Test Center on Edwards Air Force Base. Hernandez explained he works closely with the Air Force engine staff that is co-located in the same area. Hernandez can bring engines to the adjoining test cell facilities to test engines like the GE 400 engines used in F/A-18 aircraft. Armstrong is the only NASA center capable of working with that engine, he added. The engine facility can handle the 26,000 pounds of thrust generated when the engine is tested, he said.

Hernandez is willing to share his vast knowledge and occasionally has requests for engineers who want to learn more about the shop's work. In fact, a few years ago six-week mentorships were offered to engineers to learn how engines work.

No matter what the challenges, Hernandez and his crew will be ready to meet them.

Workshop... from page 3

return of Kelly and Cosmonaut Mikhail Kornienko from the ISS. The educators learned how living in space affects astronauts' nutrition, radiation, solar energy and light spectrum as well as highlighted the accomplishments of the One-Year Crew mission.

"What a great way for educators to celebrate the accomplishments of NASA's One-Year Crew mission but also think about the next steps in our Journey to Mars,"

remarked Barbara Buckner. "While Astronaut Scott Kelly made the American record for the longest time off our planet at 340 days, understanding the physical, mental and social impacts of long-term space flight is a stepping stone toward what is needed for our Journey to Mars."

Scott Wiley explained the dynamics of space weather including solar flares and radiation. He highlighted Armstrong's Upper-

atmospheric Space and Earth Weather experiment, which uses dosimeters that monitor radiation dosing aboard Armstrong aircraft.

"Radiation in the upper atmosphere is harmful to humans and sensitive electronic equipment," Wiley explained. "When aircraft are flying at higher altitudes and over polar routes they are exposed to much higher radiation than the non-flying public.

"Real-time, broad spectral-based radiation measurements are needed to improve both radiation forecasts and space weather observations needed to increase NASA scientists' understanding for the agency's Journey to Mars," Wiley added.

M. Jamison, a mathematics and science teacher at Luther Burbank Middle School in Burbank, said, "I was enriched in my understanding about space weather and radiation while being reminded of the great opportunity that I have to be a

positive influence on the students within my classroom every day."

Besides learning about the effects of radiation on the human body due to living in space, participants engaged in activities that introduced proper dietary requirements of the astronauts on station through a space food demonstration. Educators also signed a "Welcome Home, Scott" return-to-Earth banner.

"Teachers who come to these workshops are exceptionally dedicated and gifted," exclaimed Wiley. "Space weather and radiation are complex issues having advanced scientific concepts. The intellectual nature of the teacher's questions indicated an advanced understanding of heliophysics."

The workshop aligned with NASA education's goal to support STEM educators through the delivery of NASA education content and engagement in educator professional development opportunities.

Mental health... from page 3

all around for people to seek help. There are times, like contract or workplace changes, a death in the family, or a significant change where a person needs help. It's not where they get help that matters, it's that they seek it."

Many Armstrong employees are aware of the services at the center and willing to use them if needed, she added. The EAP is available to government and contractor employees and their dependents. Services are available at the main Armstrong campus Monday through Wednesday and Thursday

at Hangar 703 in Palmdale and at the Aerospace Education Research and Operations (AERO) Institute, also in Palmdale.

Antelope Valley Youth and Family Services maintains a comprehensive list of services offered locally at <http://www.avys.av.org/redbook.php>.

The website offers categories for a number of challenges people in the Antelope Valley might have with substance abuse, family, senior care, legal or health. It also provides support group, emergency, or shelter services and hotlines information.

Initiative... from page 2

to develop technical standards for both sensor data links," said Paul McDuffee, Co-chair of Radio Technical Commission for Aeronautics Special Committee 228. "The UAS community looks forward to the results of this historic flight test campaign."

Partners include General Atomics Aeronautical Systems Inc., Honeywell International and the RTCA Special Committee 228. NASA's participation includes Armstrong, Ames Research Center in California and Langley Research Center in Virginia.

Images... from page 6

the most sufficient method of designing and executing further tests in NASA's research of shockwaves created by supersonic flight. The overall goal of the schlieren imaging research is to develop a system to image the shock waves propagating from the bottom of the aircraft to the ground. This necessitates imaging a side view of the aircraft in near level flight.

Visualizing these complex flow patterns of shockwaves produced by a supersonic vehicle will allow NASA researchers to validate design tools used to develop the proposed Quiet Supersonic Technology (QueSST) research aircraft. QueSST will be the first ever aircraft to demonstrate supersonic flight with the soft sonic "thump," and could unlock the future to commercial supersonic flight over land.

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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
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