



# THE ARMSTRONG X-PRESS

Volume 58 Number 3 March 2016

## Sonic boom probe flies

**By Jay Levine**

X-Press editor

An air data probe intended to improve investigation of sonic booms is flying on the F-15B aircraft at NASA Armstrong.

NASA's goal for sonic boom research is to find ways to control and lessen the noise from shockwaves so that federal regulators will allow commercial supersonic flight over land.

The current seven-flight series is set to continue through early April, said Brett Pauer, F-15B project manager. Much like earlier flight tests in 2011 and 2014, the Eagle Aero Probe is flying on the F-15B's test fixture called the centerline instrument pylon. The pylon is located under the aircraft's fuselage.

Researchers will be evaluating the performance of the probe originally developed by Eagle Aeronautics of Hampton, Virginia, and redesigned by NASA for this phase. The probe will be tested in a flight environment and the results will be compared with a traditional NACA-style probe that was flown on the centerline instrumented pylon in 2012. In addition to obtaining air data measurements underneath the F-15B, the probe will measure the strength of a shockwave generated from, as of yet, an undetermined part of the F-15B aircraft structure.

"You want to have minimal lag in your measurement system in order to accurately characterize the



AFRC2016-0072-01

NASA/Jim Ross

*Research on the Eagle Aero Probe is ongoing from an F-15B flight test fixture, as the aircraft flies missions over the high desert.*



ED16-0038-69

NASA/Lauren Hughes

*A new supersonic probe seen affixed to a F-15B flight test fixture might one day measure the sonic booms of a new generation of supersonic aircraft.*

intensity of the shockwave," said Mike Frederick, NASA Armstrong principal investigator of the Eagle Aero Probe. "With this probe, pressure changes are seen almost immediately because the pressure sensors are located within about four inches of the pressure ports on the nosecone. For comparison, on the F-15B nose boom, which has been used for air-to-air probing in the past, the pressure transducers are located back in the radome, approximately 15 feet behind the pressure ports."

A later phase of the testing will be to install the probe on either the nose of the F-15B, or on one of NASA's F-15D aircraft based at Armstrong, Pauer said. The Eagle Aero Probe will replace the current nose boom during shockwave probing research flights, he added.

The later flights will look at shockwaves generated by another nearby supersonic aircraft and are expected to obtain more accurate data than traditional probes, Pauer explained.

"If the flights go as planned, the Eagle Aero Probes could be used to measure the shockwaves generated by future supersonic aircraft," Pauer said. "This data could help improve aircraft design tools that would ultimately reduce the loudness of sonic booms."

Previous generations of the

**Probe, page 12**

# Shin explains aeronautics initiative

By Jay Levine

X-Press editor

A new NASA initiative could redefine current airplanes by building confidence in new technologies and designs that could lead to aircraft that substantially reduce fuel consumption, emissions and noise. In addition, the plan includes an experimental aircraft aimed to enable commercial supersonic flight.

The NASA aeronautics New Aviation Horizons initiative is a 10-year plan developed to achieve those goals by designing, building and flying a number of flight demonstration vehicles, or X-planes, said Jaiwon Shin, NASA aeronautics associate administrator. Experimental aircraft test advanced technologies and revolutionary designs and reduce the time it takes for industry to incorporate them into commercial products.

The initiative could have far-reaching implications for government, industry and air travelers, Shin explained March 17 at Armstrong. He is scheduled to travel to all of NASA's aeronautics centers including Ames Research Center in California, the Glenn Research Center in Ohio and the Langley Research Center in Virginia to discuss the plan.

"We're at the right place, at the right time, with the right technologies," said Shin. "We need the X-planes to prove, in an undeniable way, how that tech can make aviation more Earth friendly, reduce delays and maintain safety for the flying public, and support an industry that's critical to our nation's economic vitality."

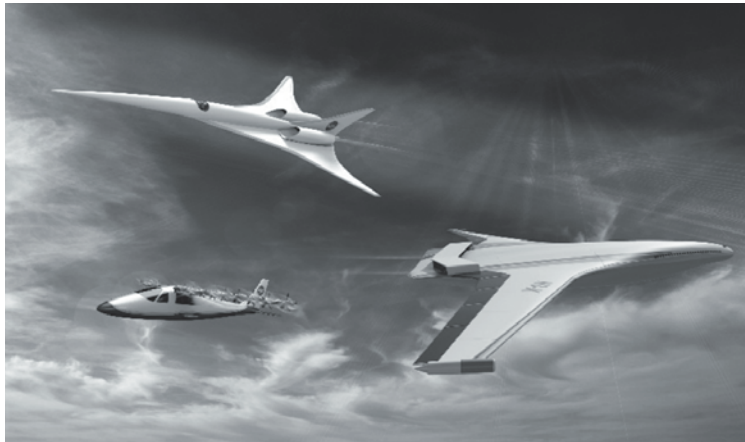
The economics of leading the world in aeronautical innovations, fuel savings and creation of good, high-paying jobs are other compelling reasons the initiative is attracting wide-based support, Shin said. It is estimated that billions of dollars are at stake in the global aviation industry as it grows from 3.3 billion passenger trips in 2014 to



AFRC2016-0090-13

NASA/Ken Ulbrich

*Jaiwon Shin, NASA associate administrator for aeronautics, talked to staff and managers at NASA Armstrong Flight Research Center in California March 17 about the New Horizons initiative. The 10-year plan could substantially improve aviation and provide major economic benefits.*



NASA

*NASA officials see experimental airplanes proving technologies to substantially improve future aircraft, while providing major economic benefits. Aircraft concepts include, from bottom left, electric distributed propulsion, quiet supersonic flight and hybrid wing aircraft.*

an estimated seven billion passenger trips in 2034. During that same time it is estimated that 36,000 new aircraft will fly as a result of growth and replacement during that 20-year period with an estimated value of \$4-5 trillion.

It's all a part of NASA Aeronautics Research Mission Directorate's six strategic thrusts including safe, efficient growth in global operations, innovation in commercial supersonic aircraft

and ultra-efficient commercial vehicles. In addition, the thrusts include transition to low-carbon propulsion, real-time, system-wide safety assurance and assured autonomy for aviation transformation.

The technology and foundational aeronautics work accomplished in the past six years, especially through the Environmentally Responsible Aviation project, or ERA, is how those thrusts work

together. The work accomplished through that program has prepared NASA's Aeronautics Research Mission Directorate to be in a position to take on the challenges in the Aviation Horizons plan.

"Without ERA the technologies would be at a low readiness level if we did not do the ground testing and small-scale flight tests," he added. "We are ready to take these technologies to flight with X-planes. We are on the cusp of that reality."

ERA technologies proved, if the recommendations are followed, up to 85 billion gallons of fuel could be saved by the airline industry at a cost savings exceeding \$255 billion by 2050, Shin explained.

A 10-year plan is rare, but the advanced planning for building X-planes cannot be accomplished in a short time frame for the number of technologies that are ready for flight and that lead time is required to allow it to happen, Shin explained.

Armstrong Center Director David McBride welcomed the good news and said the center is ready to help.

"Armstrong's expertise in integrated systems and flight research supported fundamental aeronautics work that is the foundation for the New Aviation Horizons Initiative," McBride said. "The plan will enable NASA to use technologies the agency has proven for experimental aircraft that will build industry's confidence in using the innovations. Future aircraft will more efficiently use fuel, reduce noise and air pollution, boost the economy and continue U.S. leadership in aeronautics. We will also lead the way in technologies that will allow commercial overland supersonic aircraft."

The New Aviation Horizons X-planes will typically be about half-scale of a production aircraft, although some may be smaller or larger, and are likely to be piloted. Design-and-build will take several years, with vehicles going to flight starting around 2020 depending

**Initiative, page 11**

# News at NASA

## NASA awards ISS contract

NASA has awarded three cargo contracts to ensure the critical science, research and technology demonstrations needed for the agency's journey to Mars are delivered to the International Space Station (ISS) from 2019 through 2024. NASA unveiled its selection of Orbital ATK of Dulles, Virginia; Sierra Nevada Corporation of Sparks, Nevada; and SpaceX of Hawthorne, California.

These Commercial Resupply Services contracts are designed to obtain cargo delivery services to the space station, disposal of unneeded cargo, and the return of research samples and other cargo from the station back to NASA.

"Few would have imagined back in 2010 when President Barack Obama pledged that NASA would work 'with a growing array of private companies competing to make getting to space easier and more affordable,' that less than six years later we'd be able to say commercial carriers have transported 35,000 pounds of space cargo (and counting) to the International Space Station – or that we'd be so firmly on track to return launches of American astronauts to the ISS from American soil on American commercial carriers. But that is exactly what is happening," said NASA Administrator Charles Bolden.

The contracts, which begin upon award, guarantee a minimum of six cargo resupply missions from each provider. The contracts also include

**Contracts, page 11**



Submitted photo

*The Airborne Collision Avoidance System Development and Flight Test team, comprising the Federal Aviation Administration, NASA, General Atomics Aeronautical Systems, Honeywell and BAE Systems, was a finalist in the Aviation Week Laureate Awards in the technology category. ACAS integrates sensors and algorithms, with the goal of preventing all mid-air collisions, including those involving unmanned aircraft. From left are Neal Suchy (FAA), Scott Krambeck (GA-ASI), unidentified, Eric Euteneuer (Honeywell), unidentified, Laurie Grindle (Armstrong), Brandon Suarez (GA-ASI), Mauricio Rivas (Armstrong), Davis Hackenberg (Armstrong), Heather Maliska (Armstrong), unidentified, Anya Blue (GA-ASI), Charlie Leaper (MIT-Lincoln Labs), Erik Theunissen (GA-ASI), Vibhor Bageshware (Honeywell) and Jay Newlin, Kim Rutherford and Ramon Estrada (all of GA-ASI).*

## AV Week recognition

*The NASA Environmentally Responsible Aviation (ERA) project team won the Technology category for Aviation Week's Laureate Awards. The commendation read: "ERA, for developing and demonstrating performance improving technologies that could be used to make the next generation of civil aircraft more efficient, economical, and environmentally friendly." Attendees of the award presentation were, from left, Anthony Washburn (Langley Research Center in Virginia), Richard Wahls (Langley), Fayette Collier (Langley), Gaudy Bezos-O'Connor (Langley), Cathy Bahm (Armstrong), Rachael Buckman (Langley), Pamela Davis (Langley), Lee Noble (Langley), and Heather Maliska (Armstrong).*



Submitted photo



AFRC2016-0057-06

NASA/Ken Ulbrich

*The Armstrong Acquisition Management Office was recognized as the Procurement Team of the Year 2015. Presenting the award was Glenn Delgado, far left, and David McBride, far right. Next to Delgado, from left are Jenny Staggs, Andrea Basham and Brian Bowman (accepting for Alex Greenlee).*



AFRC2016-0057-15

NASA/Ken Ulbrich

*Delgado and McBride presented the NASA Armstrong Small Business Advocates Award – Technical Team of the year 2015 to the Armstrong Facilities-Engineering team. Next to Delgado, from left, are Ying Yi, Jin Oh, Gemma Flores, Stanford Dickson, Dan Crowley (accepting for Dan Eason), Ed Carroll (accepting for Robert Medina) and Bill Werner.*

# Delgado recognizes excellence

**By Jay Levine**

X-Press editor

The NASA Small Business Advocate and Small Business Industry awards ceremony Feb. 23 recognized outstanding teams and individuals key to small businesses success at Armstrong.

Glenn Delgado, NASA associate administrator, Office of Small Business Programs, presented

the certificates and honors to the recipients.

The Armstrong Acquisition Management Office Construction and Facilities team was selected as the 2015 Procurement Team of the Year. Andrea Basham, Alex Greenlee and Jenny Staggs were members of the team that was recognized for its contributions to the NASA Small Business Program,

as 100 percent of the requirements they processed last year were awarded to small business.

The NASA Armstrong Small Business Advocates Award – Technical Team of the Year went to the Armstrong Facilities-Engineering team. The facilities and engineering team was recognized for awarding 100 percent of its contracts to small

business, a major contributor to the center reaching its 2015 business goals. In fact, 100 percent of the center achievement in awarding contracts to businesses in the Historically Underutilized Business Zone (HUBZone) category is attributed to the efforts of this team. HUBZone businesses are from areas

**Awards, page 5**



AFRC2016-0057-16

NASA/Ken Ulbrich

*The NASA Flight Opportunities team was honored as the NASA Small Business Advocates Award Technical Team of the Year 2015. Zach Wright, center, accepted the award on behalf of the team from Delgado, left and McBride.*



AFRC2016-0057-17

NASA/Ken Ulbrich

*Ron Young, Armstrong's small business technical advisor, was recognized as Armstrong and the agency's Small Business Technical Advisor of the Year 2015. Young, center, received the recognition from Delgado, left, and McBride.*



AFRC2016-0057-18

NASA/Ken Ulbrich

*Robert Medina, Armstrong's small business specialist, was recognized as Armstrong and the agency's Small Business Specialist of the Year 2015. Medina, center, received the recognition from Delgado, left, and McBride.*



AFRC2016-0057-19

NASA/Ken Ulbrich

*InuTeq was recognized as Small Business Contractor of the Year 2015. Delgado, left and McBride, right, presented the award to Denise Harris and Timothy Breyer.*

## Awards... from page 4

with high unemployment, or that are economically depressed, or have a large, low-income population. Team members included Edward Carroll, Stanford Dickson, Dan Eason, Gemma Flores, Daniel Mullen, Jin Oh, James Paul, Benjamin Robles, Bill Werner and Ying Yi.

The NASA Flight Opportunities Program team, under the NASA Space Technology Mission Directorate, received the NASA

Small Business Advocates Award – Program/Science/Research and Development Team of the Year 2015. The team helped prove that small business commercial suborbital launch providers are capable of supporting NASA technology flight payloads or missions. Up Aerospace, Masten Space Systems, World View and Near Space Corp. conducted and flew seven successful flight campaigns. Team members

included Robert Ashley, Chris Baker, Paul De Leon, Ed Hamlin, Gregory Noffz, Steve Ord, Bobby Roe and Zach Wright.

Ron Young, Armstrong's small business technical advisor and former Flight Opportunities program manager, was recognized for Armstrong and the agency's Small Business Advocates Award – Small Business Technical Advisor/Coordinator of the Year 2015. Young has demonstrated an

understanding of the importance of assessing the capabilities of the small business community and its willingness to accept risk and expand the envelope for the technologies NASA requires for its mission. Specifically, he recognizes the role small business can take in commercial, reusable, suborbital flights in the development of future

## Recognition, page 12



AFRC2016-0057-23

NASA/Ken Ulbrich

*Arcata Associates are Armstrong and the agency's selection as the Small Business Contractor of the Year 2015. Delgado, left and McBride, right, presented the award to Connie Moore and Robert Jones.*



AFRC2016-0057-27

NASA/Ken Ulbrich

*Jacobs Technology was honored as the Large Business Prime Contractor of the Year 2015. Delgado, left and McBride, right, presented the award to Brian Eslinger, Debby Parham, Sherry Schmitz, Nick DeMarco and James Ung.*



AFRC2016-0092-114

NASA/Ken Ulbrich

*Crowds responded with cheers to the many aerial exhibits and demonstrations, including this pass of the NASA Armstrong ER-2 high-altitude science platform.*

# Airshow

## Armstrong staff impresses at Los Angeles County Airshow

By Jay Levine

X-Press editor

About 100 NASA Armstrong staff and volunteers explained a cross section of activities ongoing at the center during the Los Angeles County Airshow in Lancaster March 19-20.

Crowds for the two days are estimated to have exceeded 137,000 people. The Blue Angels dazzled with aerial aerobatics as the crowd responded with cheers. The crowd also was enthusiastic about historic aircraft flights and demonstrations and that of NASA's ER-2, based at an Armstrong hangar in Palmdale, which passed high above the event.

On the ground, Armstrong aircraft displays included the F/A-18, a T-34 and a Super King Air 200. Center displays and exhibits featured Armstrong professionals, who explained the work they do. One example was the

**Airshow, page 7**



AFRC2016-0092-102

NASA/Ken Ulbrich

*The Los Angeles County Airshow crowds were large, but NASA Armstrong exhibits were prominent. A NASA Super King Air 200 can be seen to the left and the tail of one of NASA's F/A-18 aircraft also is visible.*



AFRC2016-0092-148

NASA/Ken Ulbrich

The U.S. Navy Blue Angels impressed crowds with their aerial acrobatics at the Los Angeles County Airshow.



AFRC2016-0092-101 NASA/Ken Ulbrich

Rebecca Richardson, from left, Scott Kelly (a cutout of the astronaut), Alexander Flock and Cassidy McLaughlin help staff a NASA education exhibit.



AFRC2016-0092-085 NASA/Ken Ulbrich

Sean Clarke explains electric motors.



AFRC2016-0092-098

NASA/Ken Ulbrich

Flight test engineer Brian Griffin, from left, and pilots Troy Asher and Nils Larson sign autographs for airshow attendees.



AFRC2016-0092-60

NASA/Ken Ulbrich

From left, Jim McNally and Hernan Posada explain how NASA uses the Super King Air 200.

## Airshow... from page 6

display on the proposed piloted experimental airplane called Sceptor, short for the Scalable Convergent Electric Propulsion Technology and Operations Research.

Sceptor co-principal investigator Sean Clarke had one of the research electric motors and explained the Sceptor concept involves removing the wing from an Italian-built Tecnam P2006T aircraft and

replacing it with an experimental wing integrated with electric motors.

Subscale research aircraft, including one that could one day fly on Mars, were on display. Students who work on the Mars airplane project were on hand to explain their roles.

Also available to airshow attendees was a simulation of

Armstrong's Automatic Dependent Surveillance Broadcast (ADS-B) Technology that could provide Unmanned Aircraft Systems (UAS) operators a 3-D view of collision threats, along with an operator display of real-time aircraft location.

NASA's Airborne Science aircraft, which are based at Armstrong's hangar in Palmdale, and the science

they help enable also were included in the displays. A demonstration on life support systems pilots use, next generation aircraft models and pilots autograph sessions were also featured. In addition, attendees were able to learn how the NASA 747SP Stratospheric Observatory for Infrared Astronomy is a valuable tool for investigating major space science questions.

# Prandtl technical paper released

By Jay Levine

X-Press editor

Future aircraft fuel efficiency could be dramatically increased thanks to ideas validated with increasingly complex subscale, experimental, remotely piloted aircraft at NASA Armstrong.

Flights are scheduled to resume this summer on the flying wing-shaped Preliminary Research Aerodynamic Design to Lower Drag, or Prandtl-D No.3. The project features a new wing design method and a twist. If the concept continues to prove its value, it could forward NASA's research goals to prove technologies leading to significant fuel economy and emissions reduction.

The NASA Aeronautics Research Mission Directorate has provided funds for student assistance with the flight research that has been ongoing for more than three years at Armstrong. The Prandtl-D No. 3 is undergoing the addition of instrumentation in preparation for the upcoming flights, said Al Bowers, NASA Armstrong chief scientist and Prandtl-D project manager.

Through a series of remotely controlled, subscale Prandtl-D models in 2013, 2014 and 2015, several with sensors that validated aerodynamic design merits and control expectations of the concept, Bowers, colleagues and students recorded more than three hours of flight data. This research confirms that the bell-shaped spanloading method generates proverse yaw. Proverse yaw is thrust, rather than drag, at the wingtips and makes the aircraft's tail unnecessary because of the design and not because of the need for electronic controls. The result is greater efficiency and the potential to reimagine airplane design.

Researchers, industry and academia can learn how wing twist and a radically different bell-shaped spanloading – the load distribution over the wing's span – could lead



ED15-00330-079

NASA/Lauren Hughes

*The Prandtl-D No. 3 research aircraft is being readied for new flight tests this summer. It had its first flight on Oct. 28, 2015.*



Image Credit: J. Phillip Barnes / [www.HowFliesTheAlbatross.com](http://www.HowFliesTheAlbatross.com)

*Al Bowers, Prandtl-D project manager, believes that birds like this wandering albatross hold some of the answers to efficient flight.*

to a substantial reduction in drag detailed in a technical paper released in March.

The NASA technical publication is entitled, "On Wings of the Minimum Induced Drag: Spanload Implications for Aircraft and Birds," NASA/TP – 2016-219072. It is available at: <http://go.usa.gov/csvr3>

"The NASA technical paper is the right approach because we heartily encourage open access to the data," Bowers said.

paper asserts a corollary to birds. Humans first looked to birds as the model of flight but turned away from that model more than a century ago. Bowers contends that birds are the right place to look. Birds, for example, do not have vertical tails but manage coordinated turns and their wings taper to narrow tips without stalling. Unlike aircraft with standard elliptical spanload, which achieves the best efficiency in formation flight by trailing one wingtip directly behind another, birds fly in formation with their wingtips overlapped. Prandtl-D demonstrates why the overlapping of birds in flight is the optimal aerodynamic answer.

The Prandtl-D wing, which is the foundation of the experiment, will reduce aerodynamic drag by at least 11 percent, Bowers said. Aircraft that use the Prandtl-D configuration without a traditional fuselage and tail could see fuel efficiency gains of more than three times that, or divide gains to obtain increased speed or range using the same amount of fuel, Bowers said.

Thrust at the wingtips is an idea that flies against the winds of traditional aeronautical thought and is now developing wider acceptance.

"No one has criticized the math in our paper," Bowers said of peer reviewers. "No one has found any sort of defect in the logic. The revolutionary part of this is it allows aircraft designers to completely eliminate the tail on an aircraft and you end up with a flying wing. All of the problems that have traditionally been associated with flying wings, and the reason we put tails on airplanes, appear to be solved by doing this."

"The Prandtl-D solution contends that once you pick a certain size of aircraft that the purely aerodynamic answer is no longer sufficient. The amount of payload the airplane is going to carry and the amount of structure necessary to carry that

The methodology detailed in the report is available for licensing through NASA's Technology Transfer Program, which seeks to transfer knowledge into and out of NASA to benefit aeronautics, the space program and U.S. Industry. NASA invites companies to consider licensing the Prandtl-D innovations for further development and commercial applications.

In addition to detailing how the Prandtl-D achieved its data, the



# Awareness, prep key to survival

By Jay Levine

X-Press editor

When a person is killing or trying to kill people in a confined and populated area, typically with a gun, it's what law enforcement officers call an active shooter. It can be anyone, anywhere – a work place, a store or even a bus stop.

People who are aware of their surroundings and are prepared to get away or fight increase the chance that they will survive the encounter, said Matt Rieck, a NASA Protective Services site supervisor at NASA Armstrong.

"If you find yourself in that situation, the first thing you want to do is run or evacuate," added Kevin Leupold, also an Armstrong Protective Services site supervisor. "If you cannot evacuate effectively, try to hide and barricade. If you find a weapon – a letter opener, a keyboard, a wrench, a hammer – consider fighting back. Don't be a sitting duck."

Awareness of the situation and preparation are key to survival. John Zellmer, Armstrong chief of Protective Services, will focus on those points during a Safety Day presentation at the center April 20.

"Have an evacuation plan," Leupold stressed. "Know what you are going to do if someone comes into your area and starts shooting. Can you run? Can you push your desk against the door? A shooter knows law enforcement is coming and they want to kill as many people as possible, so if there is a locked door, they will probably move on. Be mentally prepared. If you can jump out a window, jump out the window. Also, obey responders and don't get in the way."

People shouldn't do some things in such a situation.

"Don't confront them and try to negotiate," he stressed. "They are not there to negotiate, they are there to kill."

When two students at the Columbine High School in Littleton, Colorado, pushed



AFRC2016-0068-11a

NASA/Jim Ross

*Dominating the hallway during a practice scenario are Protective Services officers, from left, Brian Homiak, Joel Curtis, Matt Rieck, Anthony Garcia and Kevin Leupold.*

aside tables and shot and killed 13 students and wounded an additional 23 people before killing themselves in 1999, how authorities respond to active shooter situations radically changed, Rieck explained.

Instead of waiting for the shooter to give up or negotiate, now law enforcement personnel work to swiftly stop the violence, he added.

Although active shooting situations are not common, a more recent incident occurred less than 100 miles south of the NASA center. A mass shooting in San Bernardino, California, resulted in 14 people killed and 21 more injured on Dec. 2, 2015. A heavily armed husband and wife, who had ties to a terrorist group, entered a government facility and opened fire. They were killed in an exchange of gunfire with law enforcement.

There were multiple shooters in the Columbine and San Bernardino situations, but most mass shootings are the work of a single person, usually someone seeking fame or notoriety, Rieck said.

NASA Armstrong Protective Services officers recently practiced a drill that helps them to prepare for some potential scenarios at the NASA center. They simulated receiving a call that an active shooter was in the main building at the Palmdale facility. An officer drove up in a vehicle and watched the door for threats until other officers arrived.

Seeing no obvious threats, the officers moved into position. One went through the door first. Once the first man entered the building, other officers moved into position

to dominate the hallway and provide overwhelming firepower if necessary.

It was just one of a number of scenarios Protective Services officers practice at least twice a year. As supervisory police and training officers, Armstrong's Rieck and Leupold are required to attend the NASA Protective Services Academy at Kennedy Space Center in Florida annually to retain their academy training certification.

They spend a week each year renewing their instructor certifications and specializing in a special skill set each year, such as range master, use of force and defensive tactics for which they earn separate certifications.

Called Advanced Law Enforcement Rapid Response

**Security, page 10**

# Armstrong researchers publish results

NASA Armstrong research resulted in a number of technical publications.

## November

Hon M. Chan, Allen R. Parker, Anthony Piazza, and W. Lance Richards collaborated on, "Fiber Optics Sensing System: Overview, Development and Deployment in Flight at NASA," which was prepared for a presentation at the IEEE Photonics Society Avionics and Vehicle Fiber-Optics and Photonics Conference in Santa Barbara, California, Nov. 10-12, 2015.

## December

Michael A. Frederick, Daniel W. Banks, G. A. Garzon and J. R. Matischeck co-authored, "Flight Tests of a Supersonic Natural Laminar Flow Airfoil," NASA/TM-2015-218940.

Sean McMorrow, Roberta

Sherrard and Yvonne Gibbs collaborated on, "Mission Information and Test Systems Summary of Accomplishments, 2012-2013," NASA/TM-2015-218343.

## January

Robert Clarke, Louis Lintereur and Catherine Bahm collaborated on, "Documenting the NASA Armstrong Flight Research Center Oblate Earth Simulation Equations of Motion and Integration Algorithm," NASA/TP-2016-218956.

Josue Cruz and Eric J. Miller co-authored, "Evaluation of Load Analysis Methods for NASA's GIII Adaptive Compliant Trailing Edge Project," AIAA-2016-0804, prepared for presentation at the AIAA Science and Technology Forum and Exposition (SciTech 2016) conference, San Diego, California, January 4-8, 2016.

Claudia Y. Herrera, Natalie D. Spivey, and Shun-fat Lung collaborated on, "Aeroelastic Response of the Adaptive Compliant Trailing Edge Transition Section," AIAA-2016-0467, prepared for presentation at the AIAA Science and Technology Forum and Exposition (SciTech 2016) conference, San Diego, California, January 4-8, 2016.

Eric J. Miller, Josue Cruz, Shun-Fat Lung, Sridhar Kota, Ph.D., Gregory Ervin, Kerr-Jia Lu, Ph.D., and Pete Flick collaborated on, "Evaluation of the Hinge Moment and Normal Force Aerodynamic Loads from a Seamless Adaptive Compliant Trailing Edge Flap in Flight," AIAA-2016-0038, prepared for presentation at the AIAA Science and Technology Forum and Exposition (SciTech 2016) conference, San Diego, California, January 4-8, 2016.

Chan-gi Pak and Roger Truax co-authored, "Acceleration and Velocity Sensing from Measured Strain," AIAA-2016-1229, prepared for presentation at the AIAA Science and Technology Forum and Exposition (SciTech 2016) conference, San Diego, California, January 4-8, 2016.

## March

Albion H. Bowers, Oscar J. Murillo, Robert "Red" Jensen, Brian Eslinger and Christian Gelzer collaborated to publish, "On Wings of the Minimum Induced Drag: Spanload Implications for Aircraft and Birds," NASA/TP-2016-219072.

Larry J. Cliatt II, Edward A. Haering Jr., Sarah R. Arnac, and Michael A. Hill co-authored, "Lateral Cutoff Analysis and Results from NASA's Farfield Investigation of No-Boom Thresholds," NASA/TP-2016-218850.

## Prandtl... from page 8

payload changes the answer."

The new research does not preclude traditional methods.

"There are still many situations where the old solution is the correct one. If you have a certain constraint on wingspan, the old solution is the right one. Very large aircraft that barely fit within the current infrastructure we have would still want to solve those problems the exact same way we are now."

However, times are changing.

"There has been a recent trend for airliners to be smaller than the maximum size. We're seeing companies move away from the ultra large capacity airliners. With that move, the Prandtl-D wing offers a very viable solution. We think in the long term most aircraft will use this solution because of its minimum drag for a given amount of structure. The same structure with 22 percent longer wing span will result in 11 percent less drag

on the aircraft."

Flight data thus far supports the aircraft wing design solutions first proposed by aeronautical engineers in the first half of the 20th century including Ludwig Prandtl. Prandtl was a German whose research is considered a foundation of modern aerodynamics. The aircraft's designs are based on glider concepts of German brothers Reimar and Walter Horten and the conclusions of NASA aerodynamics pioneers

R.T. Jones and Richard Whitcomb.

Aeronautical engineers labor for ways to gain a few percentage points of efficiency and the idea that a different solution could yield such efficiency, "people can't conceive it can be true," Bowers said.

As Bowers and his colleagues continue to build the case for the concepts proven with the Prandtl-D, the time may be coming for a new paradigm in aviation, Bowers concluded.

## Wilma Williams, former lead accountant at Dryden, passes

Wilma Williams, a former NASA Dryden (now Armstrong) lead accountant, died March 29. She was 70.

People who knew her said she was well respected and known for her soft-spoken, diplomatic approach. She also earned the center's Pride in NASA award.

Williams worked at the center

from 1984 to 2003. During that time she worked her way up from accounting technician to lead accountant. She used her experience and knowledge to guide the center through milestones in financial management systems and software and Web-based government timecard information collecting.

## Security... from page 9

Training, the procedures are standardized to ensure there is no confusion in an active shooter situation, Rieck said. The goal is for all law enforcement agencies to use the same methods. That way, when additional support arrives, they know exactly what to do.

All Protective Services officers have a combination of classroom and field-based scenarios to remain up to date. In addition,

there is semiannual use-of-force training and annual active shooter training. Use of force requires all officers to qualify with shotguns and handguns.

Regardless of the situation, Protective Services officers will be ready. At the same time, they said they want people to be aware of their surroundings and think about what they would do if an emergency unfolded.

## Initiative... from page 2

on funding. Included in the plan are ultra-efficient aircraft such as a hybrid wing body aircraft, a hybrid electric airplane and a flight demonstrator that reduces the sound of supersonic flight to a soft thump.

For the past decade, NASA and partners have studied the performance and benefits of the hybrid wing body configuration using computers, wind tunnels and subscale unpiloted flight tests on the X-48 aircraft flown at Armstrong. A lot of data is already in hand to inform development of an X-plane that will test the largest number of advanced technologies.

In fact, NASA Administrator Charles Bolden on Feb. 29 announced the award of a contract to Lockheed Martin for the preliminary design of a Quiet Supersonic Technology demonstration aircraft, called QueSST for short. The demonstrator is expected to reduce the sound of faster-than-sound flight to a thump as part of the New Aviation Horizons initiative.

The 10-year initiative also includes major field tests in collaboration with airlines, airports and the Federal Aviation Administration to continue improving air traffic flow in the air and on the ground at airports. Improving the flow leads to reduced fuel use and emissions, and less noise during takeoff, approach and landing. And NASA will continue researching and testing technologies that could be used to safely integrate unmanned aircraft systems, or drones, into the airspace.

## Associate Administrator Award

**By Jay Levine**

X-Press editor

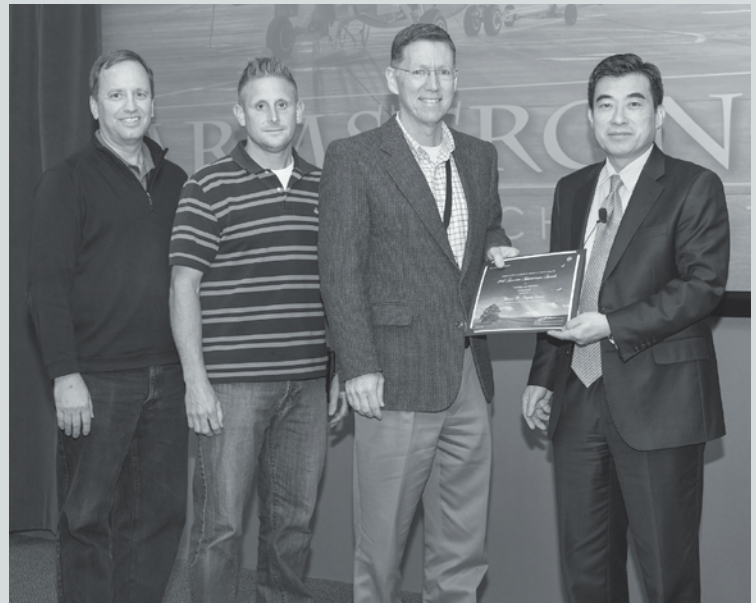
When Jaiwon Shin, associate administrator for the Aeronautics Research Mission Directorate, came to Armstrong March 17, he presented an Associate Administrator Award and an honorable mention in the annual recognition.

In the Technology and Innovation category for groups, the Environmentally Responsible Aviation program and Integrated Technology Demonstration teams at Armstrong, NASA Ames Research Center in California, NASA Glenn Research Center in Ohio and NASA Langley Research Center in Virginia were the winners.

The ERA team was awarded for successfully achieving its goals of maturing airframe and propulsion technologies. A total of eight integrated technology demonstrations were conducted during three fiscal years within budget and schedule. The ERA Project's accomplishments have boosted U.S. industry competitiveness and positioned NASA Aeronautics on the



Dennis Hines



AFRC2016-0090-02

NASA/Ken Ulbrich

Jaiwon Shin, NASA Aeronautics associate administrator, right, presents an award to Armstrong members of the Environmentally Responsible Aviation team. Accepting the award are members of the team Craig Stephens, from left, John Ruhf and Tom Rigney.

forefront of green aviation innovation, Shin said.

Armstrong Director for Programs Dennis Hines was recognized as the runner up for the Associate Administrator Award for Leadership and Management Excellence. Hines was recognized for leading the implementation of Critical Chain Project Management, a new method at NASA Armstrong to manage projects and resources.

As part of his work to show the benefits of the management system, he implemented a new center-wide metric known as, Days to Flight." That metric is a single number that represents how well the center satisfies its customer commitments. As a result of CCPM, the metric showed the time to complete projects was reduced by more than half and a number of aeronautics experiments were completed on time, or ahead of schedule.

## Contracts... from page 3

funding ISS integration, flight support equipment, special tasks and studies, and NASA requirement changes.

"The second generation of commercial cargo services to low-Earth orbit begins today," said Kirk Shireman, ISS Program manager at NASA's Johnson Space Center in Houston. "By engaging American companies for cargo transportation, we can focus our attention on using

this one-of-a-kind laboratory in the sky to continue advancing scientific knowledge for the benefit of all humanity."

Selecting multiple providers assures access to ISS so crew members can continue to conduct the vital research of the National Lab. Awarding multiple contracts provides more options and reduces risk through a variety of launch options and mission types,

providing the ISS program a robust portfolio of cargo services that will be necessary to maximize the utility of the station.

NASA has not yet ordered any missions, but will make a total of six selections from each menu of mission options at fixed prices, as needed. Each task order has milestones with specified amounts and performance dates. Each mission requires complex

preparation and several years of lead time. Discussions and engineering assessments will begin soon, leading to integration activities later this year to ensure all space station requirements are met, with the first missions beginning in late 2019.

While the maximum potential value of all contracts is \$14 billion from 2016 through 2024, NASA will order missions, as needed, and pay based on mission requirements.

# Myers, simulation pioneer, passes at 70

Albert F. Myers, key to the development of NASA Armstrong's simulation capabilities and modern day simulation work, died March 20. He was 70.

Myers is considered the principal founder of Armstrong's modern simulation capability. He was the first to develop an all-digital, full-envelope, real-time simulation in a high order language (FORTRAN) when experts at other NASA centers

advised him that it was impossible with available technology. Myers success formed the foundation of Armstrong's simulation capability of today that has been widely shared throughout government and industry.

People who knew Myers described him as an intellectual with a high degree of energy.

While serving on active duty with the Army, Myers was

stationed at NASA Dryden from 1972-1975. He then converted to NASA civil service. In addition to his work in simulation, he was a driving force in the development of the Highly Maneuverable Aircraft Technology (HiMAT) project. He served as chief of the controls branch before leaving NASA in late 1981 to join Northrop in the development of the B-2 Bomber as chief

project engineer and retiring as corporate vice president of strategy and technology of the Northrop Grumman Corporation.

Myers honors included the NASA Exceptional Service Medal and the 1981 Dryden Director's Award. In 2006 he was elected a member of the National Academy of Engineering for his technical contributions at NASA and Northrop Grumman.

## Recognition... from page 5

science and exploration workforce capabilities, according to his nomination letter.

Robert Medina, Armstrong's Small Business specialist, was named the NASA Armstrong Small Business Advocates Award – Small Business Specialist of the Year 2015. Medina consistently leads the agency in percent of direct dollars awarded to each of the small business categories through a balanced program.

Timothy Breeyear, InuTeq vice president and general manager, and Denise Harris, Armstrong site manager, represented the company, which was selected as Small Business Contractor of the Year. The Research Facilities and Engineering Support Service Contract provides support for Armstrong's Mission Information and Test Systems Directorate. InuTeq is the prime contractor supporting information technology, high fidelity flight

simulations, multimedia support, procurement and logistics support, range operations, maintenance and engineering support. InuTeq was recognized for a seamless transition to the new contract in November 2014. The company retained most of the staff from the previous contract and continued to perform at high levels.

Arcata Associates was recognized as the agency's and Armstrong's Small Business Subcontractor of the Year 2015. Connie Moore, Arcata vice president of human resources and site manager Robert Jones accepted the honor. Arcata is a major subcontractor to InuTeq and is responsible for the operations and maintenance of the Dryden Aeronautical Test Range that includes engineering, communications, audio visual, telemetry, radar and maintenance support of systems and range

infrastructure to support aeronautical flight test and research.

Jacobs Technology earned the NASA Armstrong Small Business Industry Award – Large Business Prime Contractor of the Year 2015. Representing the Jacobs team was Brian Eslinger, site manager, Nick DeMarco, deputy site manager,

Sherry Schmitz, Debby Parham and James Ung. Jacobs provides engineering services to eight different areas. Jacobs's support is pivotal in advancing NASA's research and research from industry, academia and other NASA centers. Their engineering support has resulted in NASA firsts in aerospace, according to the nomination letter.

## Probe... from page 1

Eagle Aero Probes flew on the F-15B as part of a continuing effort that began as a NASA Research Announcement effort in 2009. The probes were tested in the Unitary Plan Wind Tunnel at NASA's Langley Research Center in Hampton, Virginia, prior to flight research at NASA Armstrong.

From the data obtained

during this current flight phase, a key deficiency with the previous generations of the probe appears to be solved, Frederick said. A heater control system added into the probe keeps the pressure transducer temperatures stable at 150 degrees F, minimizing temperature effects on the pressure transducers and resulting in more accurate pressure measurements.

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

