



2018 Spring Edition

LANGLEY INSIGHT

NASA's Langley Research Center Quarterly Update for Legislators and Staff



Winning entry submitted by Anna Fox, seventh grader from Virginia Beach Middle School

Langley Art Contest Grand Prize Goes to Virginia Beach Seventh-Grader

There were 831 entries from 39 states, including the District of Columbia and Puerto Rico, and 13 first-place honors in grades K-12, but there was only one grand-prize winner of Langley Research Center's 2018 Student Art Contest.

Seventh-grader Anna Fox of Virginia Beach Middle School won the grand prize with her

depiction of this year's theme, "The Next 100 Years." Her artwork portrays an astronaut planting a flag on an unnamed planet, a colorful night sky provides the backdrop for the scene, and in the distance a rocket launches. The picture was created digitally with the use of Photoshop, a medium Anna began to explore when at the age of 11.

The 13 first-place honors were chosen by five judges from the art community of Hampton Roads and the grand prize winner was voted on by employees at Langley. The piece is being displayed at the Virginia Air & Space Center in Hampton, Virginia.

<https://www.nasa.gov/feature/langley/virginia-middle-schooler-takes-grand-prize-at-nasa-langley-student-art-contest>



Savior Giuliana, left, is with his granddaughters, Belle Esquilin, 10, and Ame' Esquilin, 8, as family and friends of the NASA Langley team who built Orion's Launch Abort System shares an opportunity to view the capsule and hardware.

NASA Langley Bids Farewell to Orion Crew Module

The Orion Crew Module has left for NASA's Johnson Space Center, but not before Langley said goodbye. The Orion capsule was on display February 22 in the hangar for employees and their families to view before being shipped to Houston for the next phase of development.

The farewell was an opportunity for the team who worked on the module to take in their work and share the project with colleagues and friends. It was also a chance for families to see the work done at Langley, and for families of the Orion team to share in an accomplishment that has occupied so much of their loved one's time. An accomplishment that was in fact finished ahead of schedule.

While the capsule will be used to simulate the module that will carry an actual crew, this Orion is not intended to be manned. Instead, the module will be used in the Ascent Abort Test 2 (AA-2) in order to test the Launch Abort System (LAS). As an Orion test module, it will be launched from Cape Canaveral in Florida and the LAS will be activated in an effort to propel the capsule away from the rocket.

<https://www.nasa.gov/feature/langley/nasa-langley-family-bids-goodbye-to-orion-crew-module>

Senator Mark Warner and NASA Langley Promote Entrepreneurship in Hampton Roads at 757 Launch

On March 30, three new resources aimed at helping entrepreneurs in Hampton Roads, StartWheel.org, 757 Accelerate, and 757 Seed launched. The 757 Launch event held at Selden Market in Norfolk showcased the new resources.

StartWheel.org is a website that connects entrepreneurs to resources, while 757

**“Entrepreneurship
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comes from, it’s how
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-Senator Mark Warner

Accelerate and 757 Seed connect them to mentors and funding. 757 Accelerate received

funding with the support of NASA Langley whose Regional Economic Development (RED) program supported the proposal for the program submitted to the U.S. Economic Development Administration’s i6 challenge. With help from Langley, the National Institute of Aerospace, the i6 applicant, was awarded \$499,833.00 to start the accelerator program.

Langley’s Center Director Dave Bowles was in attendance in recognition of NASA’s continued support for the start-ups. Langley’s RED program will provide assistance via an Entrepreneurial Opportunity Program (EOP), Entrepreneur in Residence (EIR), and help with technical difficulties. EOP will provide training while EIR will invite entrepreneurs into NASA Langley to learn and to make connections between NASA technology and business problems.



Senator Warner speaks during the 757 Launch event held in Norfolk at the Selden Market.

Key speaker, Senator Mark Warner, praised the efforts to promote entrepreneurship in the area and emphasized its importance in the community. “Entrepreneurship is where energy comes from, it’s how communities are built,” said Warner.

https://pilotonline.com/inside-business/news/entrepreneurs-innovation/article_bfe0cfd6-369d-11e8-b797-77f6d03b5078.html

Global Orchestra at NASA Langley

Composer Charlie Chan and interactive technology specialist Justin Baird, founders of the Global Orchestra, visited NASA’s Langley Research Center April 3. Based out of Australia, the founders came to explain the Global Orchestra and the idea of merging environmentalism with music and technology.

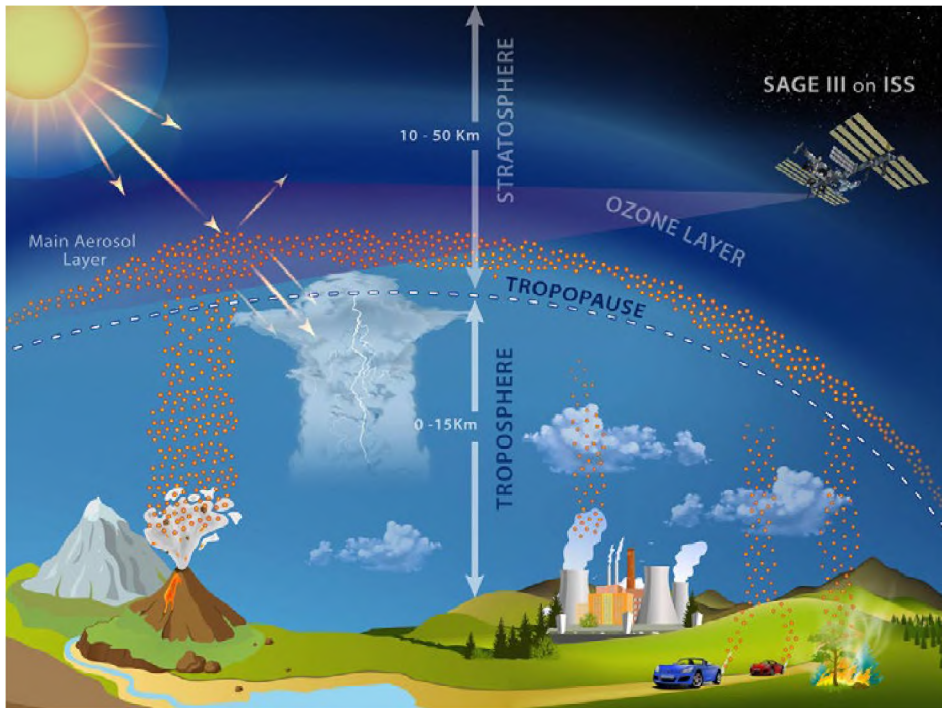
The idea has culminated in a series of international events, open to public participation. For the first time in 2015, thousands of musicians from 350 different locations connected over video to play music from “The Planets” by Holst for Earth Hour. Langley was in attendance then, and researchers were in attendance on March 24 when the Global Orchestra reconvened to play again.



During an April 3, 2018, talk at NASA’s Langley Research Center, composer Charlie Chan, left, and interactive technology specialist Justin Baird, standing beside her, offer insight into the inspiration behind Global Orchestra. On the video screen, Langley researcher Alexandra Loubeau performs during a Global Orchestra event at the center.

During the visit to Langley, Chan described music as a unifying force that connects people and communities. Both founders went on to commend Langley for their participation and the impact the center’s involvement has on the Global Orchestra’s overall goals. “Thanks to NASA, people saw that the world was a smaller place than they thought it was,” said Chan.

<https://www.nasa.gov/image-feature/langley/saving-the-planet-one-global-concert-at-a-time>



Data Validation for SAGE III Set to Begin

On February 19, 2017, the Stratospheric Aerosol and Gas Experiment III (SAGE III) instrument launched from Cape Canaveral to the International Space Station. The instrument was installed on the station over a span of ten days and began collecting first light data in March 2017.

SAGE III, a mission led by NASA Langley Research Center, will measure the stratosphere, as well as aerosols, and various other gases by focusing on either the sun or the moon, while scanning the profile, or limb, of Earth's atmosphere. The measurements collected provide key data about the atmosphere, data international leaders have trusted in the past to guide them in their policy formation. In fact, SAGE II data contributed to the establishment of the 1987 Montreal Protocol by helping to confirm humans' role in ozone transformations.



The protocol banned particular chemicals deemed harmful to the atmosphere and as a result the decreasing in the ozone stopped.

Before the data from SAGE III can be used in any meaningful way, it needs to be validated, because it is collected from a distance, or via remote sensing. Validating the data will determine if the information collected and received from SAGE III is accurate. It is a process that adds clout to the instrument and the data it gathers in the eyes of the science community. The data validation team will compare the data acquired from SAGE III to the data collected by the Network for Detection of Atmospheric Composition Change (NDACC) using other instruments.

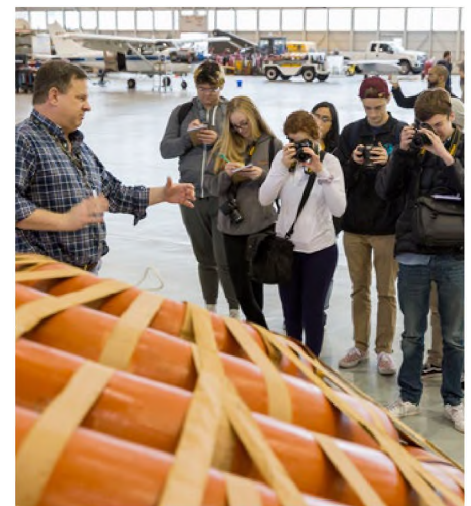
The initial validation findings was presented in April of this year by the SAGE III team in Vienna, Austria at the European Geosciences Union conference.

<https://www.nasa.gov/feature/langley/sage-iii-science-data-validation-efforts-begin>

Photography Students Create New NASA Langley Exhibit at Chrysler Museum

Inspired by the NASA Langley photo exhibit at the Chrysler Museum of Art, "Capturing Innovation: The Next 100 Years of NASA Langley through Our Lens" was an exhibit of student produced photos that was on display until April 29 at Chrysler. Photography students from Green Run Collegiate High School in Virginia Beach, Virginia, toured Langley Research center in order to capture NASA innovation digitally.

Students were able to hone their photography skills while simultaneously learning about the advancements being made just a short drive from where they learn. "Learning about all these advancements that have occurred over the years is proof that the best is yet to come," said student Mireen Yabut. Thirty-four photos from the tour were on display for public viewing.



Green Run Collegiate High School students photograph a HIAD (Hypersonic Inflatable Aerodynamic Decelerator) model at NASA's Langley Research Center for a photo exhibit at the Chrysler Museum of Art.

<https://www.nasa.gov/feature/langley/photography-students-discover-art-in-space>

Climate Science a Hot Topic on Earth Day at NASA Langley

Everything on Earth is connected – its climate system is no exception. That statement was driven home in a recent report, which was discussed by one of its lead authors as part of the Earth Day observances at NASA's Langley Research Center.

Patrick Taylor, a research scientist at Langley, gave attendees of his talk a lesson in how society and Earth's climate are inexorably linked – for better or for worse. Taylor was

"These changes that are happening all around the world, even in far reaches of the planet such as the Arctic, are affecting us here in Hampton Roads."

-Patrick Taylor

a lead author on the 2017 Climate Science Special Report, a 15-chapter, multi-agency report looking at climate change in the United States. The U.S. Global Change Research Program oversaw production of the report. Climate impacts our daily lives whether people realize it or not – from food and water

availability to energy prices.

In his talk April 23, Taylor localized the report's findings to the Hampton Roads area, where Langley is based. The region is susceptible to high-tide flooding thanks to its low-lying location on the Atlantic coast. The flooding can make roads impassable, infiltrating structures and requiring costly cleanups, and is becoming increasingly common as sea levels rise.

The report found that this type of flooding – called "nuisance" flooding – has risen between five-and 10-fold since the 1960s in coastal communities, and the rates are expected to continue to rising.

"We expect going forward that the frequency and the intensity of these coastal flooding-type events will just get even stronger," Taylor said. "These changes that are happening all around the world, even in far reaches of the planet such as the Arctic, are affecting us here in Hampton Roads."

Sea-level rise has global economic and national security implications. Sea-level rise alone is putting \$100 billion of U.S. military

assets at risk, according to the Department of Defense. Langley is in the same region as Naval Station Norfolk and Joint Base Langley-Eustis, both of which have experienced increased flooding over the years.

The Earth's climate has been a longtime fascination for Taylor. In the fourth grade he was assigned to be the class's data entrant, and would write the day's temperature, humidity and wind speed on the chalkboard to spur discussion.

"All of us really have a role to play in educating folks about these systems that we often take for granted," Taylor said. "As a society, we still control the future."

<https://www.nasa.gov/feature/langley/climate-science-a-hot-topic-on-earth-day-at-nasa-langley>

Ceremony for the Measurement Systems Laboratory

In March, workers for W.M. Jordan Co. signed a construction beam and lowered it on to the Measurement Systems Laboratory facility in a traditional "topping out" ceremony. The ceremony marks a major milestone in the construction of the new laboratory.

The facility, expected to be completed in 2019, is a part of NASA Langley's overall revitalization plan. At 175,000 square feet, the lab will stand four stories tall and is currently the largest building planned as part of the center's transformation efforts.



Workers for builder W.M. Jordan Co. enjoy food provided by the company at the topping ceremony.

<https://www.nasa.gov/feature/langley/new-nasa-lab-reaches-for-the-stars>

Mary Jackson Honored by the City of Hampton

On March 14, a \$3.5 million Olde Hampton neighborhood center was renamed in honor of Mary Jackson in the Hampton City Council chambers. Jackson grew up in Olde Hampton and worked at NASA



Langley Research Center as one of the first female African-American computers, whose work was illuminated in Margot Lee Shetterly's book and subsequent movie of the same name, "Hidden Figures."

A public space named in honor of Jackson is something for which members of the United Steelworkers Local 8888 have lobbied the City Council. The city is looking for a firm to design the building, although according to Vice Mayor Linda Curtis, a precise location for the Mary Jackson Neighborhood Center has not yet been decided.

In 2015, the Olde Hampton Neighborhood Center was closed due to its deterioration. \$3.5 million was allotted for a new center by the City Council.

Source: "Hampton renames \$3.5M neighborhood center for 'Hidden Figure'" — Lisa Vernon Sparks, Daily Press

Local Entrepreneurs Consult NASA Experts

NASA's Regional Economic Development Program (RED) and Virginia's Manufacturing Extension Program GENEDGE organized a Technology Docking event in Hampton, Virginia at the National Institute of Aerospace.

The event coupled tech challenges in the commercial sector with the expertise found at NASA to work out potential solutions. Business professionals shared their challenges with NASA employees and together they worked through the problem. It was an opportunity for the public sector to get

a different perspective on problems they're facing. Participants may not necessarily get an immediate solution, but they did get a useful conversation that they may not have had otherwise.

The purpose of an event like Technology Docking is to support the economy. Businesses have problems but they don't always have enough resources to work through them. Experience and talented employees is one resource Langley can provide to the area through these activities.



Yalani Camara, a Fairfax, Virginia, entrepreneur, sought help with his concept for solar-powered mobile devices. Camara, at left, listens as NASA's Nathanael Miller, standing at center, asks questions about plans for the product.

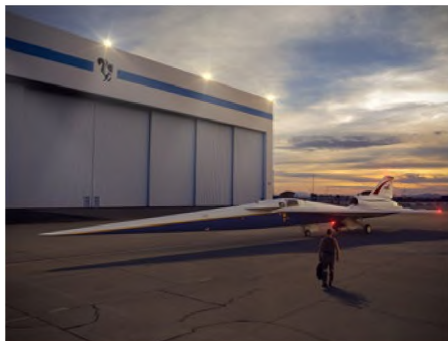
<https://www.nasa.gov/feature/langley/at-new-event-nasa-shares-fresh-ideas-to-help-industry-thrive>

NASA's Aeronautical Innovators are Ready to Take Things Supersonic, but with a Quiet Twist

For the first time in decades, NASA aeronautics is moving forward with the construction of a piloted X-plane, designed from scratch to fly faster than sound with the latest in quiet supersonic technologies.

The new X-plane's mission: provide crucial data that could enable commercial supersonic passenger air travel over land.

To that end, NASA on April 2 awarded a \$247.5 million contract to Lockheed Martin Aeronautics Company of Palmdale, California, to build the X-plane and deliver it by the end of 2021.



An artist's concept of the low-boom flight demonstrator outside the Lockheed Martin Aeronautics Company's Skunk Works hangar in Palmdale, California.

The key to success for this mission – known as the Low-Boom Flight Demonstrator – will be to demonstrate the ability to fly supersonic, yet generate sonic booms so quiet, people on the ground will hardly notice them, if they hear them at all.

Current regulations, which are based on aircraft speed, ban supersonic flight over land. With the low-boom flights, NASA intends to gather data on how effective the quiet supersonic technology is in terms of public acceptance by flying over a handful of U.S. cities, which have yet to be selected.

Years of sonic boom research, beginning with the X-1 first breaking the sound barrier in 1947 – when NASA was the National Advisory Committee for Aeronautics – paved the way for the Low-Boom Flight Demonstration X-plane's nearly silent treatment of supersonic flight.

NASA's confidence in the Low-Boom Flight Demonstrator design is buoyed by its more recent research using results from the latest in wind-tunnel testing, and advanced computer simulation tools, and actual flight testing.

Recent studies have investigated methods to improve the aerodynamic efficiency of

supersonic aircraft wings, and sought to better understand sonic boom propagation through the atmosphere.

The X-plane's configuration will be based on a preliminary design developed by Lockheed Martin under a contract awarded in 2016. The proposed aircraft will be 94 feet long with a wingspan of 29.5 feet and have a fully-fueled takeoff weight of 32,300 pounds.

The design research speed of the X-plane at a cruising altitude of 55,000 feet is Mach 1.42, or 940 mph. Its top speed will be Mach 1.5, or 990 mph. The jet will be propelled by a single General Electric F414 engine, the powerplant used by F/A-18E/F fighters.

A single pilot will be in the cockpit, which will be based on the design of the rear cockpit seat of the T-38 training jet famously used for years by NASA's astronauts to stay proficient in high-performance aircraft.

NASA Langley Research Center in Virginia will lead the systems engineering, configuration assessment and research data, flight systems, project management, and community response testing.

<https://www.nasa.gov/lowboom/new-nasa-x-plane-construction-begins-now>

Surviving the Inferno of Entry, Descent and Landing



InSight

Launch **May 2018**
Landing **Nov 2018**

Before the roar of the rocket lifting off from Vandenberg Air Force Base in California subsided, a NASA team was hard at work preparing for NASA's Interior Exploration using Seismic Investigations, Geodesy, and Heat Transport (InSight) to plunge through the Martian atmosphere.

Experts from NASA's Langley Research Center were key to providing modeling and computer simulations, used by the InSight entry, descent and landing (EDL) team.

Since early missions, such as Viking in 1976, Langley has played a central role in EDL simulations. The Langley group, led by Rob Maddock with Carlie Zumwalt, Alicia Dwyer Cianciolo, and Daniel Litton, is continuing that job today, building on previous projects including the Mars Science Laboratory (MSL), one of the largest and most complicated landings so far, and Phoenix, which is very similar to InSight.

"EDL has historically been a NASA Langley role in missions, ever since Viking, we've been known as 'the center' for EDL simulations," Maddock said.

And it's not an easy job. It's difficult to land on other planets, there are a lot of factors, and EDL performance assessment seeks to accurately predict what conditions will be like on arrival.

The team will support operations at landing. EDL begins when the spacecraft arrives about 80 miles above the surface of Mars and ends after about six minutes with the lander safe on the ground.

For InSight, this phase will be very similar to NASA's Phoenix Mars Lander with a few key differences. InSight will enter the atmosphere at a higher velocity than Phoenix and has more mass. It will also land at a higher elevation so it has less atmosphere to use for deceleration, and the area is prone to dust

storms. To address these challenges, InSight uses a thicker heat shield and its parachute will open at higher speed with stronger suspension lines.

After landing, the EDL team's job is not over. They will complete what they call 'reconstruction.' "We will take the data (acceleration, inertial measurement unit, trajectory) and rebuild what happened during the actual landing to try and update our simulations and build better predictions," Maddock said.

NASA's Interior Exploration using Seismic Investigations, Geodesy, and Heat Transport (InSight) lander will study the deep interior of Mars to learn how all rocky planets formed, including Earth and its moon. The lander's instruments include a seismometer to detect marsquakes and a probe that will monitor the flow of heat in the planet's subsurface.

NASA's Pioneering Women Displayed in Art Exhibit

Marie-Helena Peeters always had an interest in art and science but couldn't find the right place to marry the two. That all changed a year ago, and an exhibit that recently opened bore the fruit of her labors.

The exhibit, called "Pioneer Women of NASA," featured portraits of women who work at NASA's Langley Research Center in Hampton, Virginia, and NASA's Goddard Space Flight Center in Greenbelt, Maryland. Her paintings were on display at the Williamsburg Art Gallery located in Williamsburg, Virginia.

"I wanted to transmit their stories," said Peeters, who attends Jamestown High School in Williamsburg and created the images as an honors project.

The paintings, done in black and white acrylic paint, highlight the work of women scientists and engineers. The goal, Peeters said, is to encourage girls to pursue careers in STEM (science, technology, engineering and math) fields.

Peeters traveled to Langley and Goddard to interview women of NASA. She took photographs of them, which she used to paint the portraits.

"I really found an interest in doing portraits, especially in black in white, because you can really capture the raw emotion," she said. "NASA does so many cool things and not a lot of people knows what NASA does, so it was interesting to hear current projects – especially people trying to go to Mars."

Lisa Rippey, Langley's associate director for aeronautics, said she enjoyed hearing why Peeters chose this topic for her project. "It is clear that she put a tremendous amount of work into these," she said.

Peeters spent the summer of 2017 traveling between Langley and Goddard for her project,



Virginia high school senior Marie-Helena Peeters painted portraits of 10 women from NASA Langley and Goddard as part of an honors program class. The paintings were on display at the Williamsburg Art Gallery.

which was born through a suggestion from her older sister, former Langley intern Marie-Christina, to look at the agency's Women@NASA initiative. Through that, she was able to get in contact with her subjects for the art project.

The younger Peeters, who has been involved in art since the ninth grade, will attend the University of Virginia in the fall and aims to keep art foremost in her work – despite not knowing what she wants to major in.

"I hope that I can incorporate art into whatever I do in the future," she said. "You can really transmit meaningful messages through art."

The portraits feature 10 women, eight of whom are from Langley. They are Associate Director

Cathy Mangum, Aeronautics Research Directorate engineer Gaudy Bezos-O'Connor, Flight Projects Directorate Manager Wendy Pennington, NASA Engineering and Safety Center (NESC) Integration Office Manager Jill Prince, Convergent Aeronautics Solutions (CAS) Project Execution Manager Debbie Martinez, Engineering Directorate Supervisor Engineer Junilla Applin, Rippey, and NASA Technical Fellow Cynthia Null. The other two women are from Goddard – Deputy Chief Technologist Deborah Amato and Navigation and Mission Design Branch Aerospace Engineer Sabrina Thompson.

<https://www.nasa.gov/feature/langley/nasa-s-pioneering-women-displayed-in-art-exhibit>

Langley Insight is published quarterly by the Office of Legislative Affairs at NASA Langley Research Center in Hampton, VA. The publication highlights technology, educational outreach and the interesting workforce of Langley.



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