National Aeronautics and Space Administration

# AeroSpace FRONTIERS

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## To the Moon: Success Lessons From Apollo

*July 20, 2019, marks the 50th Anniversary of the Apollo 11 Moon landing. As we commemorate this anniversary milestone with immense national pride, we reflect on the many successes and lessons in Apollo history. The Apollo 1 fire taught us the importance of candid discussions to solve problems and assure mission success. The historical Moon landing demonstrated the recovery that led to many future successes in the Apollo Program and beyond.*

*Robert Gilruth, the first director of NASA's Manned Spacecraft Center (now Johnson Space Center) once said, "Someday people are going to try to go back to the Moon and they'll find out how hard it really is." That day has now arrived.*

*As we take the next steps in the Artemis Program to further human exploration, I encourage all of us to continue to reflect on the invaluable Apollo lessons learned and implement them in our journey forward to the Moon!*

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Submit short articles and calendar items to the editor at doreen.b.zudell@nasa.gov.

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# Glenn Celebrates Apollo and the Next Giant Leap

This month, America celebrates humankind's first steps on the Moon. In April, employees gathered for a celebration of the Apollo Program's 50th Anniversary prior to the closing of an exhibit honoring the anniversary. "Apollo and the Next Giant Leap" was on display in the upper level of the Lewis Field Cafeteria, from April 9 to 22.

The Glenn-designed exhibition features a unique collection of exhibits and artifacts—including an actual Apollo spacesuit—that showcases the amazing achievements of Apollo and NASA's plans for the next giant leap. Other highlights include exhibits for the Space Launch System and Orion spacecraft, which will be used for these bold new journeys. A Moon rock, returned by the Apollo astronauts, was also on display to hold and photograph during the event.

Center Director Dr. Janet Kavandi highlighted the legacy of Apollo and Glenn's contributions to the program. She talked about NASA's plans to go forward to the Moon and the key roles Glenn is playing.

"None of this would be possible without the individuals designing the systems, testing the hardware and developing the processes that allow us to visit the Moon," Kavandi said. She then recognized 11 current employees who were working at NASA Glenn during the Apollo Program. "We will return to the Moon in 2024 because of people like you," she said.

Portions of the traveling exhibit will be used to enhance the collections at Neil Armstrong's namesake museum in Wapakoneta, Ohio, during the Summer Moon Festival and the NASA exhibit at AirVenture 2019 in Oshkosh, Wisconsin.

By Doreen B. Zudell

***At left:*** *Eight out of 11 current employees who worked at the center during the Apollo years. Left to right: Albert Juhasz, Robert Cataldo, James Smialek, Robert Hendricks, Center Director Kavandi, Deputy Director Marla Pérez-Davis, Gustave Fralick, Robert Anderson, Gerald Brown and Louis Povinelli. Not pictured: Marvin Goldstein, Earl Hanes and Peter Sockol.*

**Photo by Bridget Caswell GRC-2019-C-01413**


**Photo by Marvin Smith**
**GRC-2019-C-01443**

*The Glenn-designed "Apollo and the Next Giant Leap" exhibit swept across the upper level of the Café.*


**Photo by Bridget Caswell**
**GRC-2019-C-01438**

*Deborah Thompson relishes the opportunity to hold an actual Moon rock from an Apollo mission.*


**GRC-2019-C-04155** **Photo by Bridget Caswell**

### *On the Cover:*

*Current employees, Robert Hendricks, left, and Dr. Louis Povinelli reflect on their work with the Apollo Program as they walk through the "Apollo and the Next Giant Leap" exhibit. Both worked in research related to liquid hydrogen fuel during the Apollo era.*

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# Lunar Power System Team Earns Award

*Gibson*

*Mason*

The NASA Kilopower team of **Marc Gibson** and **Lee Mason**, Glenn principal technologists for power and energy storage, and team members from the Department of Energy's National Nuclear Security Administration, received a Gears of Government President's Award in May. They won for demonstrating how Kilopower Reactor Using Stirling Technology (KRUSTY) could be used as a power system to establish a sustainable presence on the Moon by 2028. The award recognizes the best individual/team performances, across the entire federal workforce, that can make a profound difference in the lives of the American people.

# Unite Our Mission by Engaging Each Other

GRC-2019-C-03094 Photo by Bridget Caswell

During Glenn's 2019 Asian American and Pacific Islander Heritage Event, May 22, Olivia Adrian, pictured, shared highlights of her journey from a GS–1, Administrative Clerk, to GS–15, Chief of Contract Support Section, U.S. Department of Interior, and president of the Federal Asian Pacific American Council. Adrian demonstrated this year's theme, "Unite Our Mission by Engaging Each Other," by explaining the benefits of participating in mentorship and professional development programs, volunteering, networking and improving presentation and leadership skills to position yourself for future success. The Office of Diversity and Equal Opportunity and the Asian Pacific Islander Advisory Group sponsored the event.

GRC-2019-CN-00035 Photo by Angela Pierce

Glenn's Human Resource Council selected Stephen Helland, Aeronautics Mission Office, to attend the Federal Asian Pacific American Council's (FAPAC) 2019 National Leadership Training Program (NLTP), May 13 to 16, in Huntsville, Alabama. The program theme "Unite Our Mission by Engaging Each Other" was heard throughout the training. Several NASA officials gave presentations on diversity and inclusion; career and personal development; and leadership. The NLTP provides awareness, and helps develop skills in leadership, diversity, inclusion, career advancement and management for federal employees.

*At left: Helland, left, with Olivia Adrian, president of the FAPAC.*

# NEWS AND EVENTS

GRC-2019-C-02881 Photo by Rami Daud

## A Tribute to Our Fallen Heroes

Special guest Maria Daniels sings the National Anthem and "Wind Beneath My Wings" during the Memorial Day Observance on May 22 at the Lewis Field flag pole. The annual event is sponsored by Glenn's Veterans Awareness Committee (VAC) to pay tribute to the service men and women who have given their lives in the line of duty. The VAC committee members participate in the flag presentation, flag raising and wreath laying.

# HAZMAT Exercise Tests Emergency Procedures

On May 16, Glenn's Emergency Management team led a hazardous materials (HAZMAT) emergency exercise in the West Area at Lewis Field that tested the center's emergency, mass casualty and crisis communications plans. More than 80 responders, evaluators and controllers from local, state and federal government agencies participated in the exercise. Glenn's safety, security, facilities and research and engineering directorate personnel were instrumental in developing, planning and participating in this exercise.


*Glenn Emergency Management Specialist, Janelle Hood, center, works with internal and external emergency response agencies in the field during the exercise.*

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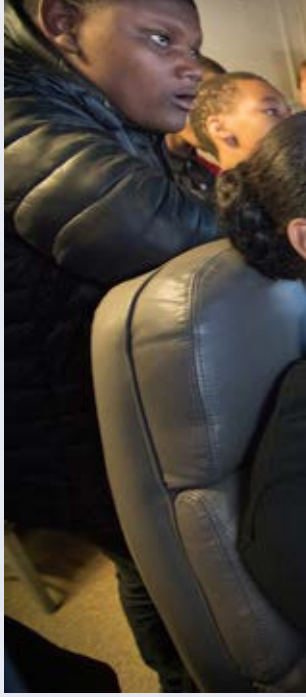
# Harvest for Hunger Campaign Helps Take Bite Out of Hunger

Employees at Lewis Field and Plum Brook Station reached out to help feed the needy through the 2019 Harvest for Hunger (H4H) campaign. The center collected a total of 2,373 pounds of food—about 400 pounds more than last year—during the campaign, which ran March 10 through May 10.


*Pictured serving are, front to back, Falcon, Thompson and Acquaviva.*

In addition to drop-off boxes throughout both Glenn campuses, a H4H Chili Cook-Off at Lewis Field, held April 17, beefed up the collection total. Employees who donated a nonperishable food item were able to sample all the recipes and vote for their favorite. Christina Koleno received the Wooden Spoon Award for her chili recipe (served by Anna Falcon). Sarah Deroche's chili (served by Amanda Thompson) took second place; and third place went to Dawn Pottinger's chili (served by Cindy Acquaviva). The Exchange Store stocked canned goods specifically for purchase during the Chili Cook-Off.

*NASA Glenn's donations were distributed to the Greater Cleveland Food Bank and the Victory Kitchen in Sandusky.*



# NASA Glenn Connects With the Next Generation

Glenn's Office of Education (OE) is always looking for dynamic ways to support the agency's mission of STEM (science, technology, engineering and math) engagement that inspires and prepares a future workforce. Before school let out in the spring, OE provided several realistic learning experiences that connected students to NASA people, content and facilities. Here are just a few:

## Shadowing Day

During the fall Shadowing Day in November, students experienced firsthand a workday in the life of a NASA Glenn scientist, technician, engineer or business professional. They spent 6 hours at the center in activities that included: observing their mentor in the work environment; listening to a diverse panel of Glenn subject matter experts on career opportunities; touring several facilities; and receiving counseling on NASA's various educational resources and programs. *Pictured, top left: Dr. Tiffany Williams, right, a research chemical engineer, shows students samples of electrically conductive polymer films used to fabricate electrically conductive textiles. (Photo by Rami Daud; GRC-2018-C-09873)*

## True2U Out-of-School Experience

On April 18, Glenn hosted a True2U Out-of-School Experience as one of the agency partners of Cleveland's Neighborhood Leadership Institute program, which serves eighth-graders across the Cleveland Metropolitan School District. Glenn engaged 100 middle school students and chaperones from three schools (Benjamin Franklin, Warner Girls' Leadership Academy and Willow School). *Pictured, top center: Willow School students experience the thrill of mastering a flight simulator. (Photo by Rami Daud; GRC-2019-C-01363)*

## High School Capstone for Simulated Lunar Operations

OE staff, along with subject matter experts across the center, collaborated to conduct innovative capstones, such as the High School Capstone for Simulated Lunar Operations. These projects related directly to Glenn research while generally adhering to a realistic timeline. *Pictured, top right: Students videotaped the demonstrations of their final rover designs in the Simulated Lunar Operations (SLOPE) Laboratory on May 13. (Photo by Marvin Smith; GRC-2019-C-02484)*

## TECH Day at NASA Glenn

TECH Day at NASA Glenn, previously known as National Lab Day, featured a variety of facility tours, an engineering design challenge, career exploration stations and hands-on educational activities at Lewis Field, May 15. The daylong events captured the imagination and encouraged more than 200 middle school students, grades 6 to 8, to pursue careers in STEM. *Pictured, bottom left: Michael Herlacher, an electronics test engineer, points to a transmitting log-periodic antenna inside the Electromagnetic Interference Lab, and explains how we generate and transmit information, without interference, to keep astronauts and missions safe. (Photo by Marvin Smith; GRC-2019-C-02786)*

## Girls in Information and Communication Technologies Day

While not one of the OE's events, approximately 80 young women participated in the Girls in Information and Communication Technologies (ICT) Day, April 27. Glenn's Space Communications and Navigation (SCaN) Program hosted ICT with Hyland Software Inc. at their campus in Westlake, Ohio. WKYC-TV 3 Chief Meteorologist, Betsy Kling welcomed the students participating from all over Northeast Ohio. Attendees learned basic programming skills, created a simple Python application and explored exhibits that showcased cryptography, virtual reality and Arduino hardware. *Pictured, bottom right: Students gain user experience in 3D printing, design and other software platforms. (Photo by Marvin Smith; GRC-2019-C-01920)*

By S. Jenise Veris

# We Are Going

*Bridenstine takes a selfie with summer interns and faculty.*

**Photo by Bridget Caswell**
**GRC-2019-C-03454**

## Administrator Bridenstine Maps Out Return to the Moon and Why

On July 20, America celebrates the 50th anniversary of the Apollo 11 landing in 1969, when Neil Armstrong and Buzz Aldrin became the first people to set foot on the Moon. Today, activities are underway on the Artemis Program—named after Apollo's twin sister—to lead humans back to the Moon by 2024.

"We're going quickly, and we're going to stay," said NASA Administrator Jim Bridenstine during his visit to NASA Glenn on June 10. In his all hands address to employees, Bridenstine mapped out Phase 1 (landing on the Moon) and Phase 2 (sustainable missions with commercial and international partners on the Moon) of the Artemis program. He stressed that in going to the Moon, NASA is laying the foundation that will eventually enable human exploration of Mars. The Moon will provide a proving ground to test technologies and resources that will take humans to Mars and beyond.

NASA is building a sustainable, reusable architecture for expanding human exploration into the solar system, with the Space Launch System (SLS) and Orion spacecraft as the backbone of that plan. By 2024, NASA will launch SLS and Orion on Artemis 3 to the Gateway in lunar orbit for a mission to the surface of the Moon. The SLS rocket will fly the first woman and the next man to the Moon.

Bridenstine identified several technological areas where Glenn research will play key roles in the program, such as Kilopower and in-situ resource utilization. He cited the significance of the development of the power and propulsion element for Gateway, which Glenn manages, and Orion testing in the Space Environments Facility at Plum Brook Station.

"Glenn is very instrumental in helping us achieve these goals in a sustainable way," he said.

Bridenstine stressed that exploring the Moon will help create a vibrant future that establishes American leadership and strategic presence, expands U.S. global economic impact, and encourages careers in STEM, to name a few. He said the "science" is the most important part of the mission.

He addressed the fiscal year 2020 presidential budget amendment, which provides an increase of $1.6 billion above the original request of $21 billion. This is the down payment on humans landing at the Moon's South Pole by 2024 and is required to achieve this bold goal. "The timing was off when we submitted the amendment to Congress," he said. Bridenstine explained that the amendment was sent too far along in the budget process for it to be considered at that time. He is confident that there will be other opportunities for the amendment to be considered, both by the Senate and the House, as the budget process moves along.

"Fifty years ago, Apollo changed the course of history," Bridenstine said. "We now have a new generation—50 years after Apollo. This is our generation, the Artemis generation. We will learn how to live and work on another world—and go on to Mars."

His visit included a meeting with Glenn's 200-plus summer student interns and faculty, a media roundtable in the Simulated Lunar Operations laboratory and a meeting with university presidents.

By Doreen B. Zudell

# NASA Associate Administrator and Deputy Visit Lewis Field

NASA Associate Administrator Steve Jurczyk and Deputy Associate Administrator Melanie Saunders visited Lewis Field on May 23. The day included an all hands meeting with employees, lunch with early career/new employees and facility tours.

After a welcome from Center Director Dr. Janet Kavandi at the all hands event, Jurczyk and Saunders acknowledged the efforts of several employees who played key roles during the 35-day furlough. Saunders presented Silver Achievement Awards to nine employees.

Jurczyk reinforced NASA's commitment to the Artemis program—returning to the Moon by 2024 with a sustained presence by 2028. He highlighted Glenn's role in managing the development of the power propulsion element (PPE) for the Gateway and congratulated the Glenn team that led the PPE procurement and acquisition strategy.

He noted several other important missions that are in various stages of production. "Keep up the good work," he said. "We must continue to deliver on our commitments."

The all hands presentation touched on the Agency Operating Model with management initiatives continuing. Saunders stressed the importance of the agency's Mission Support Architecture and its objective "to clarify center roles and create a more integrated, cross-functional model across the agency." She reported several accomplishments under the Mission Support Future Architecture Program.

Saunders asked employees to spread the word about Artemis and other NASA activities to the public. She also encouraged employees to share their opinions as the Artemis Program progresses.

"Headquarters needs your feedback," she said. "Speak up if you think something isn't going to work. Tell us where things are working and where they're not."

By Doreen B. Zudell


*Saunders, left, and Jurczyuk, far right, with Silver Achievement Award winners: David Kunath, Dominic Giordano, David Brandeburg, Larry Sivic, Edward Brewster, Robyn Gordon and Duane Schaft. Not pictured: Sean Gallagher and Christi Tomaro.*


# Apollo Program Reflections

*From October 2018 through December 2022, NASA will mark the 50th anniversary of the Apollo Program that landed a dozen astronauts on the Moon between July 1969 and December 1972.*

Here's a snapshot of the Apollo missions that flew during the month of July:


## Apollo 11

**DATE:** July 16 to 24, 1969

**MISSION:** First to land on the Moon

**CREW:** Armstrong, Aldrin, Collins


## Apollo 15

**DATE:** July 26 to Aug. 7, 1971

**MISSION:** Landed on the Moon

**CREW:** Scott, Irwin, Worden

To learn more about the Apollo Program, visit **https://www.nasa.gov/mission_pages/apollo/index.html**

## PROMOTIONS

*Bittner*

*Kershaw*

**David Bittner** has been selected Mission Assurance Manager in the Program and Project Assurance Division, Safety and Mission Assurance (SMA) Directorate. Bittner previously served as the chief SMA officer for Glenn's International Space Station and Human Research Program projects.

**Bradley Kershaw** has been selected Architectural ad Structural Systems manager for the Systems Management and Operations Branch in the Facilities Infrastructure Division, Facilities, Test and Manufacturing Directorate. Kershaw previously led development of Glenn's Test Facilities Master Plan.

## RETIREMENTS

*Plachta*

*Stokley*

**David Plachta**, Fluid and Cryogenic Systems Branch, Propulsion Division, retired May 31, 2019, with 34 years of service.

**Laura Stokley**, Aeronautics Mission Office, Aeronautics Directorate, retired May 25, 2019, with 36 years of service.

## AWARDS

GRC-2019-CN-00016 Photo by AIAA

*Dr. Blankson, left, accepts a certificate from Dr. John Langford, President of AIAA*

# AIAA Inducts Blankson to Fellow

The American Institute of Aeronautics and Astronautics (AIAA) officially inducted **Dr. Isaiah Blankson** to the rank of Fellow at the AIAA Fellows Dinner and Aerospace Spotlight Gala, May 14 to 15, in Crystal City, Virginia. Blankson, who is a NASA Glenn Senior Technologist, was bestowed the honor due to his notable research in hypersonics, aerodynamics and propulsion and other contributions to the aeronautics and astronautics community.

## AWARDS

*Dominguez*

*Dr. McDonald*

NASA Associate Director for the Office of Safety and Mission Assurance, Terry Wilcutt, recently presented a "Yes If" award to **Manny Dominguez**, Senior Safety Engineer in the Management Integration Office. Dominguez was recognized for his contributions to management and implementation of the NASA Safety Culture Program. He also helped develop the safety culture model, survey, SATERN training and handbook.

**Dr. Candice McDonald**, Office of Protective Services, was honored during the Girl Scouts of North East Ohio's 2019 Women of Distinction Luncheon on May 10. The event recognizes women, who through their roles as business, community, academic and civic leaders, demonstrate dedication to supporting opportunities for women and girls.

*Benavage Sommers*

## MORE THAN A MEMORY

**Emye L. (Benavage) Sommers**, 67, a 2006 retiree with 24 years of service, died Dec. 20, 2018. Benavage was a skilled technician who graduated from the Apprentice Program as an electronic systems mechanic. She served primarily in the Test Installations Division and contributed to several organizations' Group Achievement awards. She also played a critical role monitoring test equipment for research and development of Digital Audio Radio. Benavage was an active member of Glenn's Women's Advisory Group and Native American Advisory Council.

# Upcoming Center Events


## 2019 Center Picnic

**Wednesday, Aug. 7**

(Rain date: Thursday, Aug. 8)

11 a.m. to 2 p.m. • Lewis Field Picnic Grounds

**Employee Registration** closes July 26.

**Retiree Registration:** Jill Noble, 216–433–3711.

## Glenn Centerwide Golf Outing

**Friday, Aug. 9**

Mallard Creek
Golf Course

**$65** per person (includes golf, cart, range balls, prizes, donuts, dinner and beverages)

**$20** per person (dinner and beverages only)

Sign up as individual or team. Register at **http://ndgrcfo1.ndc.nasa.gov/golf19**

POCs: John Leone (216–433–5722) or Shelly Doehne (216–433–8636)

### GSEL MOBILE LIBRARIAN

The Glenn Science and Engineering Library (GSEL) Mobile Librarian will be visiting building 86 through July 18, and building 110 from July 30 to Aug. 8, from 1 to 3 p.m. A Glenn reference librarian will be ready to assist employees with subject searches, finding specific books and articles and other information needs on the spot.

POC: Robin Pertz, 3–5776

### NASA GLENN 100-YEAR RELAY RACE

Register for the 50th Running of the 100-Year Relay Race, set for Wednesday, July 31, at 4:30 p.m. at the Lewis Field Picnic Grounds. Food and beverages will follow the race. Entry forms and flyers are available on Today@Glenn and by contacting Paul Ferkul, 216–433–8107.

### OUTDOOR SIREN TESTING

The Emergency Management Office staff will conduct an audible siren test on the "lock-down" tone on Saturday, Aug. 3 at Lewis Field. A mass notification "voice" test will be conducted at building 6 on Wednesday, Aug. 7.

POC: Allen Turner, 3–6826

### IFPTE LOCAL 28, LESA MEETING

LESA will hold its next membership meeting, Wednesday, Aug. 14, noon, in the Glenn Employee Center's Small Dining Room.

### NASA RETIRED WOMEN'S LUNCHEON

The next luncheon will be on Thursday, Aug. 15, at 1 p.m. at Michael Angelo's Winery, 5515 Broadview Road, Richfield. Please reserve your place by calling Gerry Ziemba, 330–273–4850 or email gto64gerry@yahoo.com

Deadline for next calendar section is **July 17, noon**. News and feature stories require additional time.

NASA Glenn Employees: For more calendar information, visit **https://wing.grc.nasa.gov/event-calendar/**.

**National Aeronautics and Space Administration**

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**www.nasa.gov**

Read AeroSpace Frontiers online at http://www.nasa.gov/centers/glenn/news/AF/index.html.

# NASA Awards Artemis Contract for Lunar Gateway Power, Propulsion

## *Glenn Manages Development of Power and Propulsion Element*

In one of the first steps of the agency's Artemis lunar exploration plans, NASA selected Maxar Technologies, formerly SSL, on May 23 to develop and demonstrate power, propulsion and communications capabilities for NASA's lunar Gateway.

"The power and propulsion element is the foundation of Gateway and a fine example of how partnerships with U.S. companies can help expedite NASA's return to the Moon with the first woman and next man by 2024," said NASA Administrator Jim Bridenstine. "It will be the key component upon which we will build our lunar Gateway outpost, the cornerstone of NASA's sustainable and reusable Artemis exploration architecture on and around the Moon."

The power and propulsion element is a high-power, 50-kilowatt solar electric propulsion spacecraft that will operate at three times the power of current capabilities. The power and propulsion element will also allow the Gateway to act as a mobile command and service module by providing a communications relay for human and robotic expeditions to the lunar surface, starting at the Moon's South Pole.

A team of employees, under the newly formed Power and Propulsion Office, is led by Project Manager Mike Barrett. They will manage a multicenter effort on the design, development, launch and in-space flight demonstration of the power and propulsion element, as well as integration of the power and propulsion element to Gateway.

"We're excited to demonstrate our newest technology on the power and propulsion element. Solar electric propulsion is extremely efficient, making it perfect for the Gateway," said Barrett. "This system requires much less propellant than traditional chemical systems, which will allow the Gateway to move more mass around the Moon, like a human landing system and large modules for living and working in orbit."

Photo by NASA

The power and propulsion element design will be completed during the initial base period, after which the exercise of options will provide for the development, launch and in-space flight demonstration. NASA is targeting launch of the power and propulsion element on a commercial rocket in late 2022.

The flight demonstration will last as long as 1 year, during which the spacecraft will be fully owned and operated by Maxar. Following a successful demonstration, NASA will have the option to acquire the spacecraft for use as the first element of the Gateway.