National Aeronautics and Space Administration

AEROSPACE Frontiers

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John Glenn: Beloved Friend and Advocate of NASA Glenn

GRC-1999-C-01196

Glenn and his wife, Annie, visit Lewis Little Folks Child Development Center students in 1999.

Former astronaut and U.S. Senator John H. Glenn Jr., who died Dec. 8, 2016, was a dear friend and supporter of NASA's Glenn Research Center. In tribute to Glenn's extraordinary contributions to the nation and dedication to improving the space program, NASA renamed the Lewis Research Center as the John H. Glenn Research Center at Lewis Field on March 1, 1999.

One of Glenn's earliest visits to the center was in 1960 when he trained on the Multiple-Axis Space Test Inertia Facility ("gimbal rig"), as part of his Mercury Project training. Through the years, including four terms as a U.S. Senator from Ohio, Glenn remained a loyal supporter to NASA Glenn's Lewis Field and Plum Brook Station.

"John Glenn was an inspiration to me and so many others," said Center Director Dr. Janet Kavandi. "When you met him you saw what a great human being he was, and you wanted to be like him. I cannot think of a better hero that we would name our center after."

Turn to page 4 for pictorial highlights of John Glenn's support to the center and the Cleveland area over the years.

"Hidden Figures" Events Heighten STEM Awareness

NASA Glenn partnered with Cuyahoga Community College (Tri-C) and the Cleveland Public Library to create an educational and inspirational experience the weekend of Jan. 13–14. They leveraged the nationwide release of the movie, *Hidden Figures*, to engage students, educators and the general public in STEM-related activities and programming.

The film, *Hidden Figures*, is based on the book by Margot Lee Shetterly. It chronicles the lives of Dorothy Vaughan, Mary Jackson and Katherine Johnson, African American women trained as mathematicians who served as NASA "human computers." Their contributions proved critical to the space race and the success of our own John Glenn's *Friendship 7* mission.

Continued on page 3

GRC-2017-C-000398 Photo by Bridget Caswell

Students explore the STEM activity, Liquid Cooling Ventilation Garment, one of several led by Glenn subject matter experts at the Tri-C event.

In This Issue

Time of Remembrance

As we forge ahead in meeting exciting challenges in the new year, this is also the time of year that we, as a NASA family, pause to remember the heroes who sacrificed their lives for exploration. The lessons learned from the Apollo 1, Challenger and Columbia missions remain a vivid reminder of the value of a strong safety culture. These lessons were brought to the forefront during former Administrator Bolden's Executive Safety Leadership discussion last month. As we continue our quest to explore the universe, I encourage everyone to learn from our mishaps, incorporate human factors in our daily work, and foster an environment where differences of opinion are heard and valued.

Join me in remembering the sacrifices of our beloved heroes.

—Janet

NASA Ranked Best Place to Work—Again!

For the fifth consecutive year, the Partnership for Public Service has ranked NASA The Best Place to Work among large agencies (15,000 or more employees) in government. The 2016 rankings include the views of more than 421,000 civil servants from 379 federal organizations on a wide range of workplace topics. NASA's 2016 index score was 2.5 points higher than in 2015. The survey revealed that federal employees at NASA who participated in the survey believe the agency's leaders have sought to enhance job satisfaction by stepping up their focus on effective leadership, employee skills, pay, strategic management, teamwork, innovation, training and development, work-life balance, support for diversity and performance-based rewards and advancement. The annual Best Places to Work in the Federal Government® rankings are produced by the nonprofit, nonpartisan Partnership for Public Service and Deloitte.

NASA Runs First-Ever Test of New Jet Engine Technology

NASA is helping the aircraft industry increase fuel efficiency by working to create new aircraft engine designs. Glenn engineers are testing a new fan and inlet design, commonly called a propulsor, which could increase fuel efficiency by 4 to 8 percent more than the advanced engine designs airlines are beginning to use.

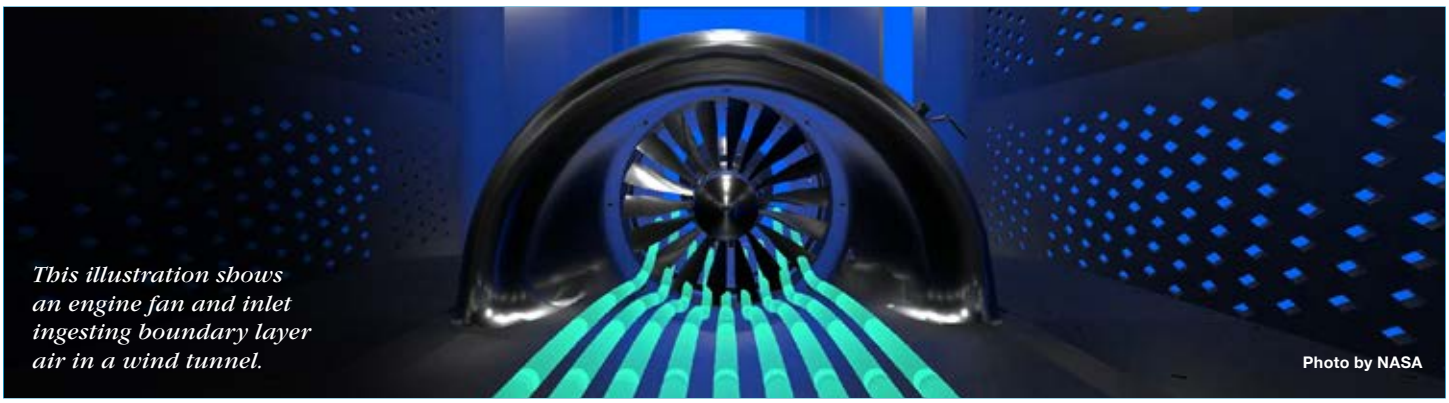
On today's jet aircraft, the engines are typically located away from the aircraft's body to avoid ingesting the layer of slower flowing air that develops along the aircraft's surfaces called boundary layer. Aerospace engineers believe they can reduce fuel burn by embedding an aircraft's engine into these surfaces and ingesting the boundary layer airflow to propel the aircraft through its flight.

But this can be challenging because boundary layer airflow is highly distorted, and that distortion affects the way the fan performs and operates. These new designs require a stronger fan. Glenn is testing a new propulsor in its 8- by 6-foot wind tunnel. Designed by United Technologies Research Center with research conducted by Virginia Polytechnic and State University, the rugged boundary-layer-ingesting (BLI) inlet-fan combination is the first of its kind ever to be tested.

The highly experimental tests required years of preparation. Many industry, NASA and academic experts contributed to the design and analysis of the propulsor. Glenn engineers also modified the wind tunnel to accept a larger model, a boundary-layer control system and a way to power the experiment.

To learn more about this testing, visit https://www.nasa.gov/feature/nasa-runs-first-ever-test-of-new-jet-engine-tech.

By Jan Wittry



This illustration shows an engine fan and inlet ingesting boundary layer air in a wind tunnel.

Photo by NASA

Hidden Figures

Continued from page 1

More than 300 mostly female students from 14 schools in the Cleveland Metropolitan School District and nearby schools, along with educators, viewed *Hidden Figures*, Friday, Jan. 13. After the movie, everyone traveled to Tri-C's metro campus event to have lunch and participate in a variety of STEM activities. The program featured three of NASA Glenn's Modern Figures—Quynhgiao Nguyen, Lizalyn Smith and Carol Tolbert—current female leaders in their fields.

"We talked about their favorite character in the movie and how their story inspired the students," Tolbert said "We also talked about different types of STEM careers and the necessary preparation and resources available to achieve it."

A panel discussion with STEM professionals stressed the importance of a learning environment that encourages student curiosity and discovery for potential careers. Panelists included Dr. Christine Darden, a former NASA aeronautical design engineer and expert on sonic boom research; Dr. Carolyn Williams, director of Education at the non-profit foundation, From One Hand to Another; and Jon Nichols, director of Analytics for the NBA's Cleveland Cavaliers.

On Saturday, Jan. 14, the public engaged in several STEM activities at the Cleveland Public Library. Glenn's Director of Center Operations Robyn Gordon emceed the main event, the STEM Leadership Program. It included videotaped messages from NASA Administrator Charlie Bolden, Glenn Center Director Dr. Janet Kavandi and former Center Director Dr. Julian Earls, and a panel discussion. Dr. Carolyn Williams moderated the panel, featuring Glenn's Deputy Director Dr. Marla Pérez-Davis, former Center Director Dr. Woodrow Whitlow, Jr. and Dr. Christine Darden. They discussed the impact of the movie, sources of inspiration and experiences that have been beneficial to their careers.

"You should not allow labels, preconceived notions or ability to limit your opportunities," Dr. Pérez-Davis said, responding to a female millennial's question related to the movie's impact. "All employees need to work harder at being open to diverse ideas to safely achieve our missions."

Rounding out the festivities, the Great Lakes Science Center, which houses NASA Glenn's Visitor Center, invited the public to participate in STEM activities related to *Hidden Figures* on Monday, Jan. 16.

By S. Jenise Veris

GRC-2017-C-00196 Photo by Marvin Smith

STEM leadership panelists, left to right, Dr. Pérez-Davis, Dr. Whitlow and Dr. Darden. Dr. Williams, at the podium, served as moderator.

GRC-2017-C-00156 Photo by Marvin Smith

Tolbert, one of Glenn's Modern Figures, explains the potential for space applications at the 3-D manufacturing exhibit in the library.

GRC-2017-C-00153 Photo by Marvin Smith

Glenn Associate Director for Strategy Therese Griebel, right, participated in a group discussion on the book "Hidden Figures."

GRC-2017-C-000346 Photo by Bridget Caswell

Tri-C panelist Dr. Darden, who was also a human computer profiled in the book "Hidden Figures," shared her perspective on readiness to meet opportunity.

John Glenn: Beloved Friend and Advocate of NASA Glenn

GRC-1960-C-52742

Glenn trains in the Multiple-Axis Space Test Inertia Facility (gimbal rig) as part of Mercury Project training in 1960.

GRC-1991-C-08673

Dr. Howard Ross and Dr. Sandra Olsen show Senator Glenn the Solid Surface Combustion Experiment in 1991, the center's first combustion experiment on the space shuttle.

GRC-1999-C-01164

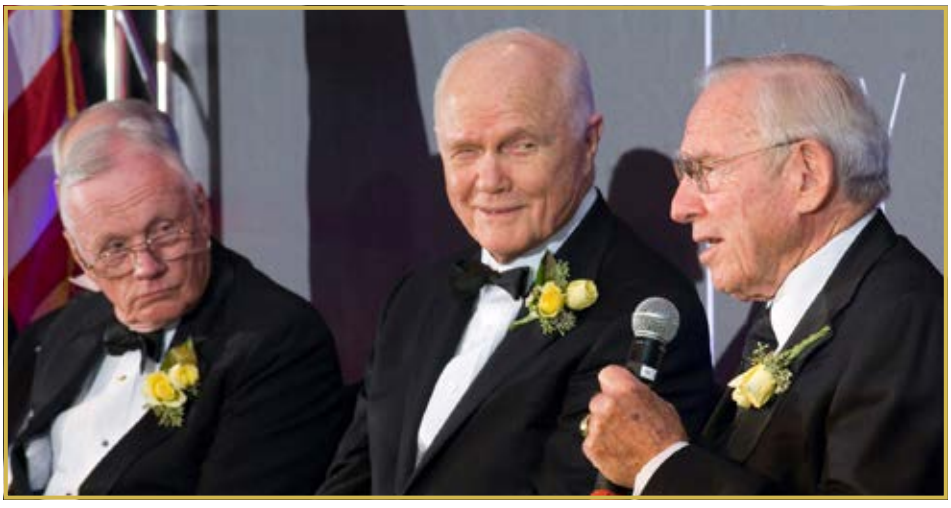
Glenn and his wife, Annie, on a float in the parade, part of the center renaming festivities in 1999.

GRC-2001-C-01587

Glenn cuts the cake in celebration of NASA Glenn's 60th Anniversary in 2001. U.S. Congressman Dennis Kucinich and Annie Glenn look on.

GRC-2006-C-00353

Center Director Dr. Woodrow Whitlow Jr., left, and Deputy Director Rich Christiansen toured the center with Glenn during a strategic partnership meeting with Ohio State University in 2006. This was Glenn's last visit to the center.



GRC-2008-C-02455

Glenn, flanked by astronauts Neil Armstrong, left, and Jim Lovell, during the 2008 Ohio Astronauts Reunion, at Cleveland's Gala Celebration of NASA's 50th Anniversary.

C-2012-03840

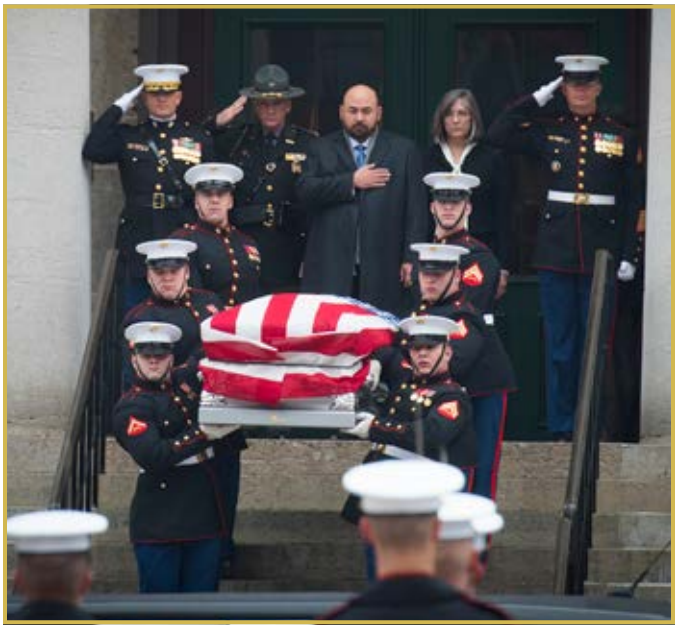
Glenn with Cleveland Indians' mascot, Slider, after Glenn threw out the first pitch at Progressive Field in 2012.

The center and Cleveland celebrate the 50th anniversary of Glenn's first orbital flight around the Earth as the first American, held at Cleveland State University in 2012.

Photos courtesy of NASA Glenn's Image Archives

GRC_2016_CN_00221

Glenn lies in repose, under U.S. Marine Corps honor guard, in the rotunda at The Ohio State University in Columbus, Dec. 16, 2016.



GRC-2016-C-09742

Glenn is moved from the Ohio Statehouse to The Ohio State University for a Celebration of Life Service, Dec. 16, 2016.

Godspeed, John Glenn. Ad Astra.

For more information on John Glenn's life and contributions, visit https://www.nasa.gov/centers/glenn/about/bios/john_glenn.html.

NASA Glenn Propels Energy Conversion Evolution

NASA Glenn recently acquired a large-scale planar flow caster capable of producing customized soft alloy magnetic ribbons measuring 1 mile long and up to 50 mm wide. The caster is considered the largest in the nation for conducting magnetic material research.

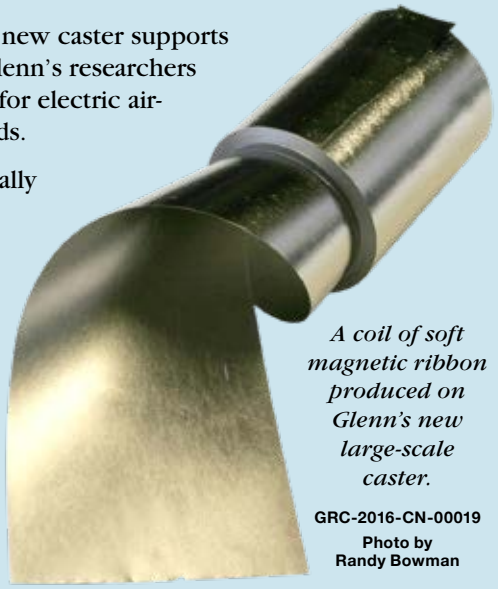
Located in Glenn's Magnetic Material Fabrication and Characterization Lab, the new caster supports NASA's hybrid electric aircraft propulsion and power management. It affords Glenn's researchers and partners the ability to improve and advance energy conversion technology for electric aircraft as well as conduct large-scale testing for commercial use in a variety of fields.

"This is important when you want to move away from basic research and actually make a realistically sized component," said Randy Bowman, head of Glenn's Magnetic Material lab. "Few labs have the diverse suite of instruments we have."

The lab offers fundamental alloy design, can produce large quantities of customized material and is able to fabricate actual components—making it a one-stop-shop with a cradle-to-grave production capability.

Glenn welcomes collaboration with other federal entities, industry, academia and other interested groups. For more information on Glenn's Magnetic Material Fabrication and Characterization Lab visit http://go.nasa.gov/2kkK4H7. Those interested in collaborating should contact Bowman at Randy.R.Bowman@nasa.gov.

By Deborah Lockhart



A coil of soft magnetic ribbon produced on Glenn's new large-scale caster.

GRC-2016-CN-00019
Photo by Randy Bowman

News and Events

Bolden and Dr. Newman Bid Farewell

NASA Administrator Charlie Bolden and Deputy Administrator Dr. Dava Newman gave an uplifting, heartfelt farewell to the NASA family during an agencywide town hall hosted at Headquarters, Jan. 12. Both thanked the entire workforce—the NASA family—for the consistent excellence and passionate support to the agency. The town hall featured a video of well-wishes to Bolden and Newman from personnel across the agency, and another narrated by notable actor/director/producer LeVar Burton. Burton chronicled Bolden's legacy of service as a marine and an astronaut and showed highlights of agency accomplishments under his leadership as NASA administrator.

GRC-2017-CN-00001 Photo by Andrea Bonesteel

Senator Receives Update on Plum Brook

Glenn's Deputy Center Director Dr. Marla Pérez-Davis, Plum Brook Director David Stringer, and Space Flight Systems Director Bryan Smith, accompanied U.S. Senator Sherrod Brown on a recent visit to Plum Brook Station. Brown, along with members of his staff and the local Friends of NASA's Plum Brook, an Ohio organization, toured the campus to better understand the full capabilities of Plum Brook's world-class test facilities. They received overviews and viewed test articles in three of the four test facilities.

Photo by Rami Daud

Sen. Brown, second from the right, on a tour of the high bay area of the Space Environmental Complex inside the Plum Brook Space Power Facility.

Emergency and Inclement Weather Lines
Lewis Field: 216–433–9328 (WEAT)
Plum Brook Station: 419–621–3333

Connect With Glenn

Awards

Dr. Kankam Named IEEE Fellow

The Institute of Electrical and Electronics Engineers (IEEE) has bestowed the rank of fellow on Glenn's **Dr. Mark David Kankam**, in honor of his contributions to space and terrestrial power systems control. The IEEE fellow is one of the most prestigious honors bestowed upon a very limited number of senior members who have contributed significantly to the advancement or application of electrical, electronic or computing fields and related areas of science, engineering and technology. Kankam currently serves as Glenn's University Affairs Officer in the Office of Education.

Dr. Kankam

Retirements

Guo

Ten-Huei Guo, Intelligent Control and Autonomy Branch, Communications and Intelligent Systems Division, retired Dec. 31, 2016, with 27 years of service.

Gary G. Kelm, Systems Engineering and Architecture Division, Research and Engineering Directorate, retired Jan. 3, 2017, with 40 years of service.

Damaris Klanac, Logistics and Technical Information Division, Center Operations Directorate, retired Dec. 30, 2016, with 31 years of service.

Hugh McLaughlin, Logistics and Technical Information Division, Center Operations Directorate, retired Dec. 28, 2016, with 50 years of service.

Jeffrey Wilson, Advanced High Frequency Branch, Communications and Intelligent Systems Division, retired Jan. 3, 2017, with 34 years of service.

Glenn's "Meet the Makers" web series introduces employees who developed tools to optimize their work processes. Follow this link, go.nasa.gov/2j6o3Ln, for a look at how Glenn employees are pushing the boundaries and using out-of-the-box thinking to move research forward. To nominate a maker, contact Nikki.D.Welch@nasa.gov.

Calendar

NASA RETIRED WOMEN'S LUNCHEON:

The NASA Retired Women's Luncheon is Thursday, Feb. 16, at 1 p.m. at Miss Hickory's Tea Room, 14217 Mill Hollow Lane (off of Route 82) in Strongsville. Please confirm your place by calling Gerry Ziemba at 330-273-4850 or email gto64gerry@yahoo.com.

MARCH SIREN TESTING:

The Emergency Management Office staff will conduct the Lewis Field outdoor "voice" test at Building 15 on Wednesday, March 1. An audible siren test focusing on the "all clear" tone will be held at Lewis Field on Saturday, March 4. POC: Allen Turner, 3-6826

WOMEN IGNITE:

The theme of the 2017 Women IGNITE is "Readiness, Resilience, Results." The event takes place on March 8, from 9 a.m. to 12:30 p.m., MIC Auditorium. POC: Marlena Hudson, 3-8928. Visit the new website at https://www.grc.nasa.gov/ohcm/jc/employee-development/women-ignite/.

IFPTE LOCAL 28, LESA MEETING:

LESA will hold its next membership meeting, Wednesday, March 8, noon, in the Glenn Employee Center's Small Dining Room.

OUTREACH HELP: GIRLS TAKE FLIGHT

Looking for staffing for Girl Scouts Girls Take Flight event for grades 2 to 5 (Brownies and Juniors) on Saturday, March 25, at Case Western Reserve University. POC: Dennis Stocker, 3-2166

NASA SPINOFF ONLINE:

The 2017 *NASA Spinoff* publication and an iPad application are now available and feature how NASA is "Bringing Technology Down to Earth." Visit https://spinoff.nasa.gov/Spinoff2017/.

National Aeronautics and Space Administration

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March 2017 Calendar section deadline: Feb. 17
News and feature stories require additional time

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Managing Editor: **Kelly R. DiFrancesco**

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

55 Years: Continuing a Legacy of Giving

Thanks to the generosity of Glenn employees, the center exceeded its Combined Federal Campaign (CFC) goal in 2016, contributing more than $426,000 to those in need! The 2016 CFC included several events—both committee- and directorate-sponsored—that provided opportunities for employees at Lewis Field and Plum Brook Station to support a vast network of deserving nonprofit organizations. Fifty-two organizations reached 55 percent participation and received homemade baked goods, while 16 organizations reached 90 percent participation. Chair Mary Jo Long-Davis and Co-Chair Dale Hopkins hosted an appreciation event, Feb. 2, to thank the many volunteers who dedicated their time to this worthy cause and the staff for their continued support of the campaign.

GRC-2016-C-08863 Photo by Rami Daud

GRC-2016-CN-00016 Photo by Doreen Zudell

GRC-2016-C-09441 Photo by Rami Daud

GRC-2016-C-09539 Photo by Bridget Caswell

GRC-2016-CN-00017 Photo by Doreen Zudell