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National Aeronautics and
Space Administration

AeroSpace Frontiers

CREATING CLOUDS

Safety Culture Survey

A strong safety culture is vital to the principles of mission first, people always, and team success.

I want to express my sincere thanks to the members of the Glenn Research Center community who participated in the recent Safety Culture Survey.

The results show continued improvements across all five areas of the NASA Safety Culture since we began the assessments in 2010, and the feedback received is vital to identify areas for further improvement.

Actions, such as improving visibility and awareness for reporting, will be incorporated into an overall action plan to address your feedback. The results will be shared with the Glenn community soon.

AeroSpace Frontiers
is an official publication of NASA's Glenn Research Center. It is published the second Friday of each month by the Office of Communications in the interest of the Glenn workforce, retirees, government officials, business leaders, and the general public.

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

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Meteorologist Turned Engineer Creates Clouds for Icing Research

Emily Timko, Aviation Test Branch (JSV), has the power to control the temperature, form wispy clouds, create ice crystals, and produce powerful gusts of wind. She has a lot in common with Queen Elsa from the movie "Frozen," but she is much cooler.

Timko is an icing cloud calibration engineer at NASA Glenn and works with a team of 14 other engineers and technicians to characterize and produce clouds in the Icing Research Tunnel (IRT). This wind tunnel is used to simulate natural conditions that can cause ice to form on aircraft during flight and test the effects of these conditions on components such as wings, tails, and engine inlets.

"I calibrate the clouds we simulate in the IRT," said Timko. "We can produce a light cloud or a heavy cloud so dense you can't see the other side of the tunnel. We're also able to vary the size of the cloud droplets from as small as 15 microns—smaller than the thickness of a hair—to about 300 microns."

Since 1944, aircraft companies have come to the IRT to test flight components in a simulated flying environment before taking to the skies.

"The FAA [Federal Aviation Administration] has requirements for aircraft to be certified to fly in different atmospheric conditions," said Timko. "We ensure that when companies come here and take their data, the cloud that they want is as close to nature as possible."

Timko has been working in Glenn's icing tunnel since 2017 and is an internationally known cloud scientist. But she did not always dream of becoming an engineer.

"In second grade, we'd sit on the carpet, and we'd talk about what day of the week it was and the date," said Timko. "I'd talk about the weather, and I always knew what it was supposed to be that day. My teacher said I'd grow up to be the 'weather girl,' and it just clicked."

On the cover:
Engineer Emily Timko studies how ice builds up on airplane wing sections and other components in the Icing Research Tunnel.
GRC-2022-C-11460 *Photo by Bridget Caswell*

Timko studied meteorology at California University of Pennsylvania. Upon finishing her degree, she interned as a meteorologist with WTAE–TV Pittsburgh Action News and as a severe weather forecaster with First Energy.

"It wasn't stimulating enough. There just wasn't enough science for me," said Timko. "But through my college career, I did a lot of the same courses as engineers, like math, physics, heat transfer, and thermodynamics."

Eventually, Timko went back to school for a mechanical engineering degree. The combination of her meteorology and engineering degrees gave Timko the exact background and skills needed to fill the role of an icing cloud calibration engineer.

"I use a lot of my meteorology degree for cloud physics, the behavior of water droplets, and cloud growth," said Timko. "It's helpful understanding the physics and heat transfer of the process of a supercooled droplet impinging on surfaces of an aircraft and the damage that it does."

Over the years, Timko's career has taken her far outside the walls of the wind tunnel. She has traveled to Canada to complete studies with the National Research Council of Canada as well as Vienna to review a new capability at the Rail Tec Arsenal icing facility on behalf of the FAA.

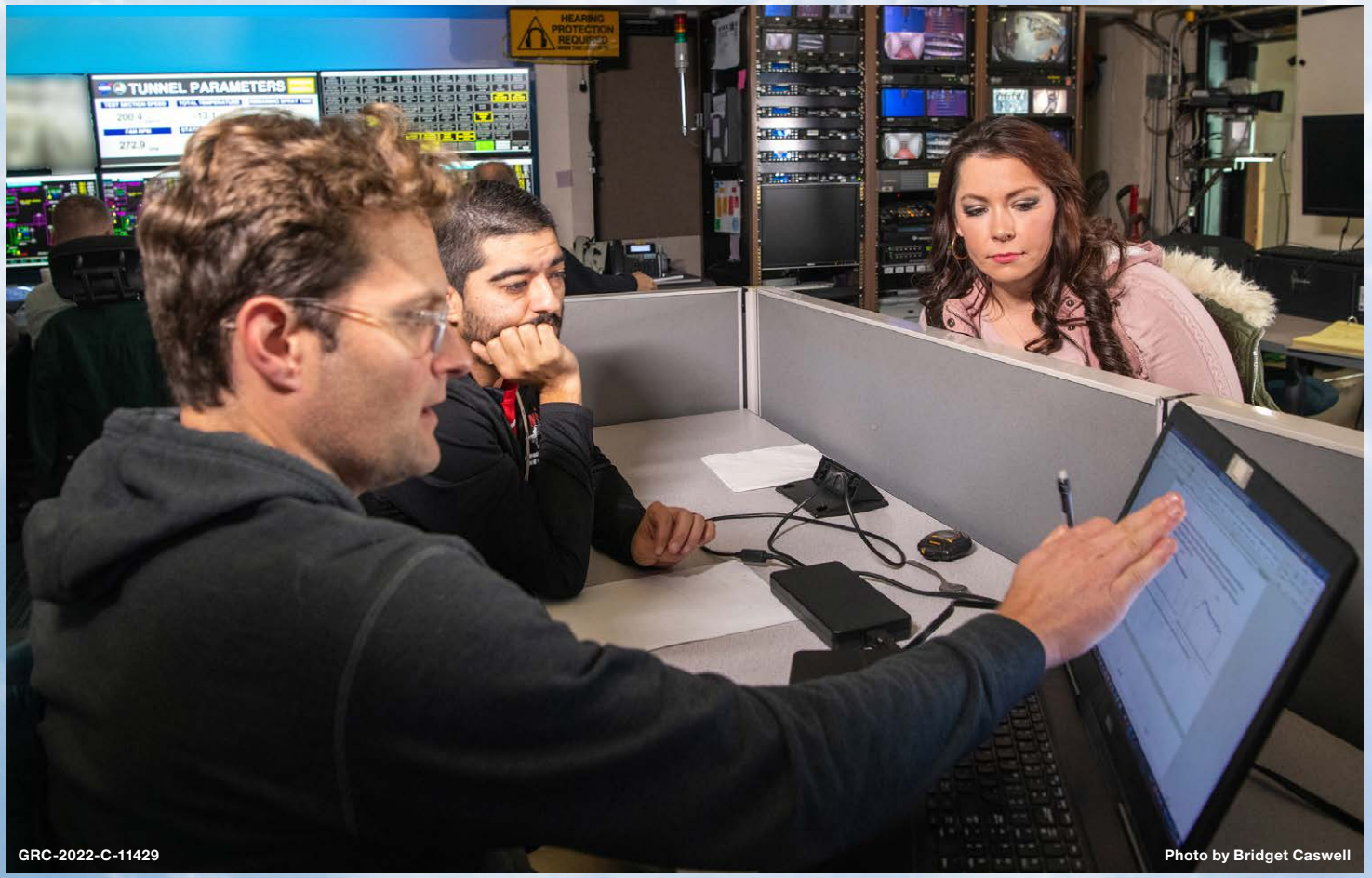
Timko especially enjoys sharing her story and her knowledge with the younger generation. She loves giving tours of the IRT to Great Lakes Science Center's Camp Curiosity campers.

"I would tell them, I'm like Elsa," said Timko. "I can also make frozen particles and clouds. That helps get them excited about it."

NASA's real-life Elsa has a passion for what she does and knows she has already made an impact on the aeronautics industry.

"I feel that there's so much responsibility in ensuring the safety of air transit," said Timko. "So, next time you go on an airplane, think of the IRT."

By Jacqueline Minerd



GRC-2022-C-11429

Photo by Bridget Caswell

Left to right: Aerospace Engineer Tadas Bartkus (OAI) and Lead Facility Engineer Waldo Acosta work with Timko in evaluating tests.

Turn Up the Heat

Research Could Spur Next Generation of Functional Materials

NASA Glenn researchers have dedicated many years to developing shape memory alloys (SMAs) that withstand temperatures as high as 500°C. When looking toward future applications, however, some devices and structures will need to perform at much higher temperatures. Jet engine applications, hypersonic systems, and Venus landers are a few examples where SMAs are not currently an option due to their limited temperature range. This impediment may soon change.

"We set out to revisit a decade-long question: 'Can shape memory alloys survive temperatures above 500°C?" said Dr. Othmane Benafan, SMA team lead in Glenn's High Temperature and Smart Alloys Branch. "This time, however, we are better equipped with knowledge and tools."

The team began by accessing NASA's Shape Memory Materials Analysis and Research Tool (SM^2ART) Database, which helps researchers learn what has been formerly attempted. This avoids duplication and focuses on advancing the technology.

"There are several ultra-high-temperature SMA compositions known, but at the end of the day, they must be able to produce work outputs at extreme temperatures to be viable," said Materials Researcher Glen Bigelow.

The team decided to work primarily with at least three SMA (NiHf, RuTaNb, and HfPd) candidates that have shown very promising results at temperatures above 500°C. The team is also building the necessary infrastructure to test these materials.

Bigelow, left, and Dr. Benafan observe a RuTa-based shape memory alloy undergoing thermomechanical testing at 900°C. The specimen and grips glow red at high temperatures.

Research team members, front row, left to right: Dr. Benafan and Bigelow. Back row, left to right: Adrienne Veverka, Alyssa Stubbers, and Grant Feichter in the material processing laboratory.

Preliminary data show that these alloys can produce actuation work output and stabilize at temperatures near 700°C.

While undergoing testing at Glenn, these alloys are also being evaluated by the Computational Materials Group at NASA's Ames Research Center and university partners at the Georgia Institute of Technology.

This work is funded by the NASA Aeronautics Research Mission Directorate's Transformational Tools and Technologies project.

GRC-2023-C-00730
Photo by Jef Janis

Honoring Their Legacies

Amanda Shalkhauser plays "Taps" during Glenn's Day of Remembrance observance, Jan. 26, to recognize the lives of the brave men and women who were lost in the pursuit of NASA missions. Feb. 1 marked the 20th anniversary of the Columbia mishap. The observance featured Associate Director Larry Sivic, who stressed the lessons learned from the tragedies and the importance of supporting a culture of dialogue where everyone feels safe speaking up. Space Flight Systems Directorate Deputy Director Kathy Schubert, and Aircraft Operations Chief James "JD" Demers answered questions from employees relating to balancing risk and safety.

Sharing Leadership Lessons

Jeresha Nixon, Office of STEM Engagement, center, talks with Lt. Col. LaTia Wickliffe, Cleveland's Defense Contract Management Agency commander, left, and other Cleveland Federal Community Leadership Institute (CFCLI) members at the Guerin House, Feb. 2. NASA Glenn hosted CFCLI for its class on federal leadership and mentorship. CFCLI is administered through the Cleveland Federal Executive Board. Three NASA employees are participating in this year's program—Nixon; Jimi Russell, Office of Communications; and Chris Morris, AST Aerospace Experimental Facilities and Test Technologies.

GRC-2023-C-00836
Photo by Marvin Smith

GRC-2023-CN-00001
Photo by Chris Hartenstine

Reaching Out to All

Glenn's Jack Fortner-Monegan, Graphic Visualization Lab, helps a student explore zero-gravity virtual reality during a demonstration at Great Lakes Science Center's free Martin Luther King Jr. Day event, Jan. 16. The demo was one of several immersive technologies Glenn showcased during the event. While youngsters explored technologies, members of Glenn's Office of Diversity and Equal Opportunity talked with teens and adults to discover ways to help NASA reach more diverse audiences.

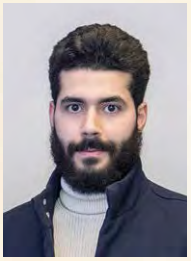
Three Named Trailblazers

Three Glenn employees recently received a Space Flight Awareness Trailblazer Award. These awards recognize exemplary performance within an employee's first seven years of service.

Issam Boukabou, Avionics Branch, for contributions to the electrical design and integration effort to the Thruster Probe Assembly avionics electronics for the Plasma Diagnostics Package Project's Main Electronics Package flight redesign.

Christopher Heldman, Avionics Branch, for electrical design and integration efforts to the Main Electronics Package avionics flight redesign for the Plasma Diagnostics Project.

Dr. Lyndsey McMillon-Brown, Photovoltaic and Electrochemical Systems Branch, for support of low-cost, lightweight solar cell technologies to enable high powered human exploration of the lunar surface. McMillon-Brown has also led efforts to increase diversity and inclusion in the solar cell community.



Boukabou

Heldman

Dr. McMillon-Brown

More Than a Memory

Loftus

McLaughlin

William F. Loftus, 86, a 1995 retiree with 36 years of service, died Sept. 5, 2022. Loftus began his NASA career in 1967 as an electronics technician. He was part of a team that tested the 200-watt Transmitter Experiment Package aboard the Communications Technology Satellite spacecraft in 1976. In 1979 and 1980, Loftus maintained continuous communication with the SERT II spacecraft as it completed its 10th year of operation. Later, he worked in the Microwave Systems Laboratory testing an advanced antenna. He received several special achievement awards. For his online obituary, visit https://go.nasa.gov/3HLA99X.

Glen E. McDonald, 106, a 1986 retiree with 37 years of service, died Jan. 30. McDonald was a researcher who studied flame and smoke propagation of fuels, the design of nuclear fuel elements, and coatings for solar cells. He authored dozens of technical reports. He received several awards and honors including Tech Brief publications, a cost reduction award for "Salvaging Capsules With Failed Blowers," a group award for thermal barrier coating materials optimization, and an Inventors Award for a black chrome coating for solar panels. For his online obituary, visit https://go.nasa.gov/3RM3QMw.

Hugh M. McLaughlin, 90, a 2016 retiree with 50 years of service, died Feb. 4. He worked as a supply management specialist throughout his career, overseeing equipment and supply purchases. He earned two NASA Group Achievement Awards (1998 and 2014) and a Space Flight Awareness Award (1983). He was part of a White House Closing the Circle Award for energy efficiency in transportation (2005). He retired from the Logistics and Technical Information Division. For his online obituary, visit https://go.nasa.gov/3lwLq6F.

Leonard J. Westfall, 83, a 1995 retiree with 28 years of service, died Jan. 16. Westfall joined NASA in 1966 as a materials research engineer. He earned an IR–100 Award for his work in developing a process that produced the highest strength ceramic fibers ever made. Westfall invented a metal composite monotype process that was used by Westinghouse, earning an IR–100 Award and a Federal Laboratory Consortium Special Award. He received an R&D 100 Award for a system that allowed researchers to evaluate fibers for high-composite applications. For his online obituary, visit https://go.nasa.gov/3la5V1W.

FIRST Robotics Buckeye Regional Competition

Mark your calendar for the FIRST Robotics Competition Buckeye Regional from **March 29 to April 1,** at Cleveland State University's Wolstein Center. The event is an exciting challenge where teams (including those sponsored by NASA) work together to design, build, and program robots to compete in thrilling, fast-paced matches!

MARCH IS WOMEN'S HISTORY MONTH

Protect Your Technology

Protect your technology for future patent or licensing by filing it through NASA's New Technology Reporting System (e-NTR). The process captures information about technical discoveries, improvement, innovations, software, and inventions so that NASA can disseminate it properly.

To file a New Technology Report, go to the e-NTR system at https://invention.nasa.gov. It's vital to the future of your technology.

Attention Employees and Retirees!

GRC-2016-C-03581

GRC-1990-C-13805

Do You Know This Person?

Glenn's Logistics and Technical Information Division needs your help identifying people, places, and research from archived images. If you recognize a photo placed here, email GRC-ITC@mail.nasa.gov.

To ensure your email reaches the right individuals, please enter "DYKTP" into the subject line. Although we cannot respond to individual emails, please know your participation is appreciated!

THANK YOU FOR BEING THE FACE OF CHANGE

CFC Combined Federal Campaign

Glenn raised $250,102 during its 2022 Combined Federal Campaign!

Deadline for small items in the April issue is **Wednesday, March 22,** noon.
News and feature stories require additional time.

Twin Otter's Most Important Mission Begins

After 40-plus years of service to the country, the Twin Otter's most important mission begins now—sharpening the next generation's technical proficiency before they head off to address America's shortage of skilled aircraft technicians.

NASA Glenn's Flight Operations Office operates a small fleet of aircraft to conduct scientific research and test new aviation technologies. While pilots and researchers are essential to these missions, the flights only happen after hours of intensive ground maintenance conducted by highly skilled Airframe and Powerplant-certified (A&P) technicians.

"Getting your A&P is a rigorous process. For me, aviation is a second career, so when I started with Glenn's flight operations, I spent the first 36 months—18 months on airframes and then another 18 months on powerplant—learning how to work on aircraft properly," said Phil Beck, who spent 15 years as crew chief for Glenn's recently retired Twin Otter. "All that training prepared me to not only pass the written and the practical portions, but it gave me the confidence to jump right in as crew chief."

No matter how strong a maintenance team may be, however, an aging aircraft like the Twin Otter requires a lot of upkeep and scarce parts. When an aircraft's useful flying life comes to an end, the team in Flight Operations works with the General Services Administration to find a second life for the aircraft. Fortunately, many of Glenn's aircraft have become training aids for students working on their A&P certificates, which is a career path currently in high demand among airlines, private operators, and maintenance and repair facilities.

The Twin Otter, which was retired last fall, has made its way to Middle Tennessee State University (MTSU), where it is helping maintenance management students gain crucial hands-on experience and confidence to pass the A&P tests and begin working on multimillion-dollar aircraft right out of school.

"What you hope to achieve in training is that you learn not only how the book says to do it, but also how the guy who has been teaching you does it," said Beck. "So, by the time you sit for the test and the practical portion, you have seen or done whatever they assign you enough times that it's just like any other day in the shop."

By Jimi Russell

GRC-2022-C-06846

Photo by Jef Janis

National Aerotech technicians Jaime Lujano, left, and Carl Dalrymple prepare to remove one of the DHC–6 Twin Otter's engines before its trip to MTSU.

National Aeronautics and Space Administration

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