National Aeronautics and Space Administration

AeroSpace FRONTIERS

VOLUME 23 • ISSUE 4 • APRIL 2021

Glenn's Perseverance Connection

Pages 6–7

Lean Six Sigma's Virtual Success

Pages 2–3

NASA, Industry Partner Up, Power Up

Page 5

Women Unite, Ignite

Page 9

Staying Vigilant

Recently we marked the 1-year point of the pandemic. I am hopeful with increasing vaccinations, continuing to practice the COVID–19 protocols, and the resulting decrease in new cases, that we are approaching a turning point. We are beginning to see changes to guidelines nationally as well as within the state of Ohio. I would like to remind you that we need to continue to follow agency and center guidelines as a federal facility. Please continue to frequently monitor guidance at the agency website (https://nasapeople.nasa.gov/coronavirus/), the Glenn website (https://www.grc.nasa.gov/smad/rtow-covid/), and Today@Glenn for any new information.

Thank you for your continued commitment to our mission.

AeroSpace Frontiers
is an official publication of Glenn Research Center, National Aeronautics and Space Administration. 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.

Editor: **Doreen B. Zudell**, ATS, 216–433–5317

Assistant Editor: **Adam Schabel,** ATS, 216-433-2888

Design: **Rhys Sampson**, ATS

Managing Editor: **Kelly R. DiFrancesco**

Circulation: **Angela Williams**, ATS, 216–433–8921

Can We Work Effectively in a Virtual Environment?

Can a process that relies on interactive classroom training survive in a virtual environment? For NASA's Lean Six Sigma (LSS) program—operating exclusively online for over a year— the answer is yes. Not only is the program surviving, it is thriving.

"Lean Six Sigma principles and methodologies have helped hundreds of employees improve efficiencies and decrease waste since 2005," said Program Manager Peggy Raines who took over the program in 2018. The LSS Program Office, which has resided at Glenn in the Center Operations Directorate since 2011, is responsible for planning, developing, evaluating, and deploying LSS activities agencywide.

When centers transitioned to Stage 4 under the NASA Response Framework in March 2020, Raines knew it was vital to adapt LSS processes to a virtual platform. She, along with Master Black Belt Mark Adrian of Adrian Technologies, reviewed, revised, and deployed unified training methods to adjust to an electronic platform. Establishing this capability will help to accomplish a major program goal to establish in-house process-improvement experts at each NASA center.

The transition to a virtual environment dovetailed with the needs of a workforce adjusting to a telework environment. "Although employees across the agency are experiencing increased workloads in a virtual environment, there are still opportunities for process improvements in

their organizations," Raines said. "These organizations can benefit from implementing LSS methodologies for process improvement."

The LSS team's new electronic platform enables class access across the agency, with larger class sizes and increased course availability. Raines has seen a tremendous response in agencywide participation, which has resulted in increases in employee certification levels.

Want to learn more about how the LSS program could help you implement process improvements? Contact the program office to learn how LSS can help your organization. Training is open to civil servant and support contract employees.

Contact Peggy Raines or Erin Bukach via email or through Microsoft Teams.

By Doreen B. Zudell

Goals of Lean Six Sigma Program

Apply Lean principles and Six Sigma methodology to respective projects and work areas to:

- Remove non-value-added activities from existing processes.
- Reduce costs and increase quality.
- Reduces variability and "downtime."
- Deliver consistent high-quality products and services.
- Design new processes.
- Develop in-house LSS Green Belts and Black Belts to serve as facilitators and part-time leaders of process improvement team activities to help NASA improve NASA.

Lean Six Sigma Classes

(Virtual and Offered Agencywide)

- White Belt: Introduction to LSS
- Champions and Sponsors Training: Targeted audience—managers and leads
- Green Belt: Certification
- Black Belt: Certification
- Master Black Belt: Certification

Agencywide Certifications to Date

- 1,750 Green Belts
- 180 Black Belts
- 14 Master Black Belts

Have You Filed Any Records Lately?

Thinking of Retiring? You Can't Take It With You

Before you retire, check out this brief video from Records Management on your records management responsibilities. It is important to pass along all of your records before you go, not just records you feel are important. Questions? Records Management staff are happy to provide guidance on how to best manage your records in preparation for retirement. **https://ltidportal.grc.nasa.gov/Resources/Records/WhenYouGo.mov**

Over the past year, you may have mastered Microsoft Teams, uncovered the secret to intermittent virtual private network (VPN) connection, and discovered how to deter your dog from barking during meetings, but have you once thought about filing your records?

April is Records Management Month—a great time to review your papers and electronic files to determine their potential value for years to come.

Like it or not, every civil servant and contractor who works for NASA Glenn is responsible for preserving agency records. In addition to those monthly reports to your supervisor, you need to schedule time for creating and managing the records necessary to document your official activities.

What is a record? Records are defined as recorded information, regardless of physical form or characteristics, made or received by an agency of the U.S. government, and needed to document agency activities or actions.

Electronic Records Are Here To Stay

Under the requirements in the Office of Management and Budget's M–19–21 memo, federal agencies must make a full transition to electronic recordkeeping by the end of 2022. The National Archives and Records Administration will stop accepting new paper records at that time.

Here are some important points to remember when storing your electronic records:

- Records should always be stored in an accessible location (with appropriate permissions, if applicable) like SharePoint, a content management system, or the database where they are created. Shared drives are also an option, but the agency is working to move away from those in favor of SharePoint.
- Only personal working notes and reference copies should be kept on your hard drive, MyDocs, or OneDrive. Although MyDocs and OneDrive are backed up, they are personal spaces. When you leave the agency, they will be wiped shortly after your departure. If items stored there are the only documentation or evidence of a process or event, then you are at risk of losing records.
- Speaking of OneDrive, have you noticed when you go to save a Word document, Excel spreadsheet, or other Microsoft Office product that the default "save" is to your OneDrive space? If you are simply creating a few notes, a job aid, or a reference just for yourself, OneDrive is fair game. If you are creating meeting minutes, a memo, or the like—those are records. Get that stuff to a SharePoint location!

Still not sure what to do? You do not have to go it alone. Glenn's records management specialists, Deborah Demaline and Suzanne Kelley, can do this stuff with their eyes closed. Contact them via email or Microsoft Teams. Additionally, each organization has a records liaison officer (RLO) who can help. Visit Glenn's Records website, https://ltidportal.grc.nasa.gov/Records.aspx, for a list of RLOs and to learn about services provided, training and education, and NASA's records retention schedule.

By Doreen B. Zudell

NASA, Industry Partner Up To Power Up

NASA envisions a future where supersonic airliners and highly efficient aircraft all fly in the same ultrasafe skies. The agency is already sprinting toward that end goal by developing the X–59 Quiet Supersonic Technology (QueSST) jet and exploring alternative aircraft propulsion systems that can reduce costs, noise, and emissions.

"Our program develops technologies that help NASA and industry change the paradigm of aviation by opening the way to everyday supersonic flight, environmentally sustainable transport-class aircraft, and widespread advanced air mobility vehicles," said James Kenyon, NASA's Advanced Air Vehicles Program (AAVP) director.

GRC-2021-CN-00016

An artist's rendering of NASA's truss-braced wing concept aircraft called the Subsonic Ultra Green Aircraft Research (SUGAR).

NASA cannot change the future of flight alone, so the agency has teamed up with two industry partners to transform its approach to aircraft propulsion. These agreements are aimed at designing more efficient aircraft engines, while also addressing several technical challenges: weight, power extraction and storage, and thermal management.

The power extraction challenge is especially important for future hybrid-electric aircraft concepts where the energy requirement becomes even greater, as extra power is needed to drive electric fans used for additional in-flight thrust.

Through its Hybrid Thermally Efficient Core (HyTEC) project, NASA is aggressively pursuing next-generation aircraft engines that use less fuel and produce more power, by increasing the bypass ratio. This means making the fan—the one on the front of the engine—bigger, thereby increasing airflow, while shrinking the engine's core, which reduces fuel consumption.

"The question becomes how do we shrink the core of the engine, while maintaining performance and increasing the electric power available?" said Tony Nerone, HyTEC project manager at Glenn. "As aircraft become more electric, we'll need to address the traditional power needs—running subsystems like flight controls, air conditioning, and so on—but we also need to tap more power for the newer electric systems that we'll be adding to the aircraft. Current state-of-the-art engines can extract about 5% of power and we'll need to jump up to 10% to 20% in the future."

Through a Space Act Agreement with Honeywell, NASA engineers will work with a Honeywell team, to perform technology development and testing on an advanced low-pressure turbine. The data from the test will allow the combined engineering team to establish a turbofan power extraction baseline while also developing computational prediction tools. Ultimately, this test will provide essential data for the HyTEC project and advance Honeywell's technology development of higher efficiency turbines that could impact its future gas turbine product line.

NASA has also entered into a contract with General Electric to demonstrate and assess turbofan power extraction and integrating electric machines like motors and generators. The goal is to significantly increase power extraction at relevant commercial engine operating conditions from a thrust, weight, efficiency, operability, and durability for future electric propulsion systems.

These efforts aim to introduce cleaner, more efficient and cost-effective aircraft in the near future. Core power systems technology development and testing are just the start. NASA will need to demonstrate the benefits in flight before eventual commercial aircraft integration.

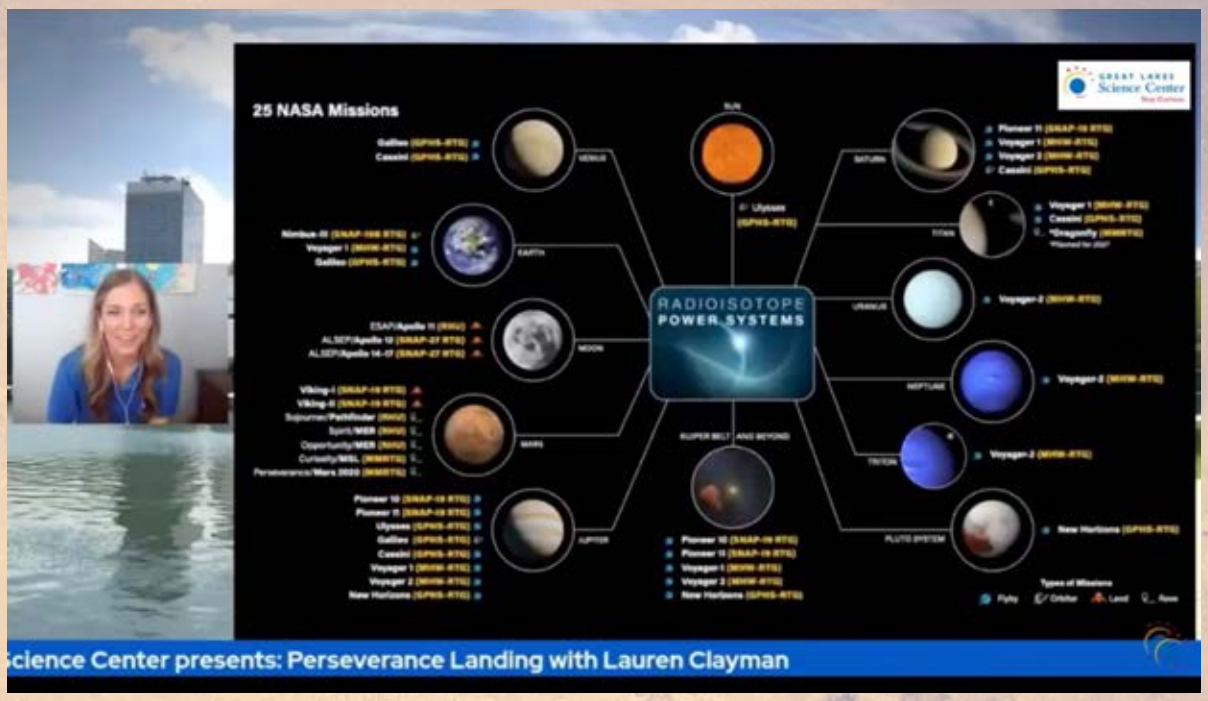
"Once HyTEC and its partners demonstrate power extraction, these new engines can be combined with other megawatt-class components we're developing for electrified aircraft propulsion," said Barbara Esker, AAVP's deputy program director. "Together with advances in high-rate composite aircraft manufacturing and innovative configurations like the transonic truss-based wing, NASA can transform the long-term sustainability of commercial aircraft."

By Jimi Russell

GRC-2017-C-09976 **Photo by Bridget Caswell**

The NASA Electric Aircraft Testbed at NASA's Neil A. Armstrong Test Facility is a world-class, reconfigurable facility that can accommodate power systems for large passenger airplanes with megawatts of power.

Glenn, Community Celebrate Perseverance Rover's Landing



GRC-2021-C-00255 Photo by Bridget Caswell

Clayman shares details on NASA's Radioisotope Power Systems program.

After a 203-day journey traversing 293 million miles, NASA's Perseverance rover—the largest, most advanced rover NASA has sent to another world—successfully touched down on Mars Feb. 18. NASA's live broadcast of the landing, shared across 14 streaming platforms, garnered over 4.2 million viewers.

In anticipation of the landing, cities across the United States—including Cleveland and its iconic Terminal Tower—lit up the night in "Mars red" on Feb. 17 and 18.

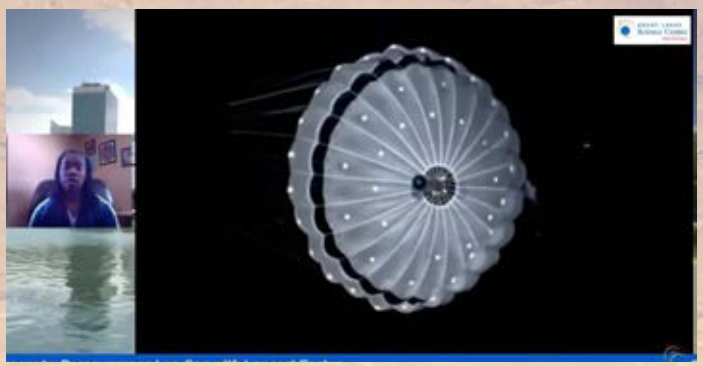
On the day of the landing, Glenn shared the excitement with local audiences through a virtual event hosted in collaboration with Great Lakes Science Center. The event featured discussions with experts and a hands-on challenge activity for teachers and families to conduct from their classrooms or homes during the virtual broadcast.

Glenn staff highlighted several rover technologies during the virtual celebration.

Dr. Daniel Raible, electronics engineer and co-principal investigator of the Integrated Radio and Optical Communications project of NASA's Space Communications and Navigation program, shared how NASA communicates with Mars and described the challenges of sending and receiving messages through the solar system.

Lauren Clayman, chief safety and mission assurance officer for the Radioisotope Power Systems program, shared details on the system that powers both the Curiosity and Perseverance rovers.

Lancert Foster, the research aerospace engineer who oversaw rover parachute testing several years ago in Glenn's 10- by 10-Foot Supersonic Wind Tunnel, described Glenn's role in testing and validating models for the parachute decelerator system used on both Curiosity and Perseverance.



GRC-2021-C-00257 Photo by Bridget Caswell

Foster oversaw rover parachute testing several years ago in Glenn's 10- by 10-Foot Supersonic Wind Tunnel.

After the presentations, Roger Storm (Paragon TEC), STEM educator supporting Glenn's Office of STEM Engagement, facilitated a parachute design activity that aligned to the research and testing work performed at Glenn. Students went live as they built and tested a model parachute drag device to slow the descent of a simulated rover. Designs created by the broadcast audience were shared via social media platforms.

"The first photos from a new rover on Mars and all the shared photos of aspiring explorers are a great reminder of the important work we do at Glenn," said Chris Hartenstine, Public Engagement Team lead, Office of Communications.

Glenn's virtual event transitioned directly into the live NASA broadcast of Perseverance's landing and culminated with the rover's breathtaking touchdown in the Jezero Crater on Mars.

By Doreen B. Zudell

GRC-2021-C-00262 Photo by Bridget Caswell

Storm facilitates a parachute design activity that aligns to the research and testing work performed at Glenn.

The Glenn Connection

When NASA's Mars Perseverance rover made its successful descent to the Red Planet, it took Glenn contributions along for the ride!

Entry–Descent System

In 2008, Glenn tested a scaled-down version of the parachute that helped the Curiosity rover land on Mars. Testing in Glenn's 10- by 10-Foot Supersonic Wind Tunnel captured high-speed video of the parachute's release and deployment and measured the parachute's drag (pulling force on the capsule). The same type of parachute was used for the Perseverance landing.

GRC-2008-C-04252 Photo by Marvin Smith

Christine Pastor-Barsi prepares a small-scale parachute for testing in Glenn's 10- by 10-Foot Supersonic Wind Tunnel in 2008 in preparation for the Curiosity rover landing system. The same type of parachute was used for the Perseverance rover.

GRC-2020-CN-00023 Photo by Colin Creager

Glenn's shape memory alloy spring tires will be used on the proposed Mars Sample Return Mission, which will bring back the samples that Perseverance collects.

Radioisotope Power System

The Perseverance rover is powered by a multimission radioisotope thermoelectric generator (MMRTG) provided by the Department of Energy (DOE). The MMRTG, a type of radioisotope power system, is the same system the Curiosity rover has been using successfully since its launch in 2001. Glenn manages the Radioisotope Power Systems (RPS) program for the agency and also manages NASA's relationship with the DOE. The team in Glenn's RPS Program Office has been helping to plan this mission for years. The Perseverance MMRTG is expected to operate for at least 14 years.

Tires

Was there ever ancient life on Mars? To answer that question, the Perseverance rover will collect and store the most compelling rock and soil samples for return to Earth by a future mission. Plans for the Mars Sample Return Mission include the use of incredibly durable and flexible new tires developed at NASA Glenn. These shape memory alloy spring tires are ideal for the rugged, rocky Martian terrain.

On the Cover:

Sherri Mohn, left, and John Ingram make final adjustments to a small-scale parachute model for testing in Glenn's 10- by 10-Foot Supersonic Wind Tunnel in 2008. The tests were connected with the Curiosity rover landing system. The same type of parachute was used for the Perseverance rover.

Photo by Marvin Smith
GRC-2008-C-04245

Do You Know, 2.0

The "Do You Know This Person?" (DYKTP) project, which began appearing on Today@Glenn (T@G) in November 2019, has had a major makeover. The Logistics and Technical Information Division (LTID), Center Operations, oversees the data collection program in which Glenn employees help to identify people, places, and research in photos dating back as far as 1942.

Due to the popularity of the project and participant feedback, DYKTP 2.0 has many new functions and features. While looking at the images, you can provide immediate feedback by clicking on the link, "Hey, I know that person!" The pictures will be populated in a new tab with a form you can directly edit, adding as much or as little information as you would like. The site will still be posted on T@G as a reminder to check back weekly for new pictures.

Now you can also visit previous editions and submit your suggestions to help fill in the gaps. As a bonus, LTID has a monthly group photo! There are many images that still need your input, so keep an eye out on T@G for the new SharePoint site! LTID staff is looking forward to your participation and hopes you enjoy helping them update Glenn's records.

https://nasa.sharepoint.com/sites/doyouknowthisperson/SitePages/Do-You-Know-This-Person.aspx

Technology Transfer License Highlight: Research License

Glenn's Technology Transfer Office (TTO) offers a variety of ways to license a NASA technology. TTO identifies the ideal license and technology that fits a company based on criteria under four different licenses: commercial, research, government use, and the Startup NASA license.

The research license is an option that allows short-term permission to explore the potential of a technology and learn if it will fit into a potential licensee's business development goals. It allows licensees to "test drive" the commercial viability of NASA technologies with minimal risk.

Glenn signed a research license with JVEX Systems in 2019 for the Double-Acting Extremely Light Thermo-Acoustic (DELTA) convertor. JVEX Systems plans on using the technology to create a portable and low-maintenance generator that can run on a variety of heat sources, from fossil fuels to solar thermal. Because of the generator's flexible nature, it could be used in remote locations for efforts such as disaster relief and could eventually have space applications.

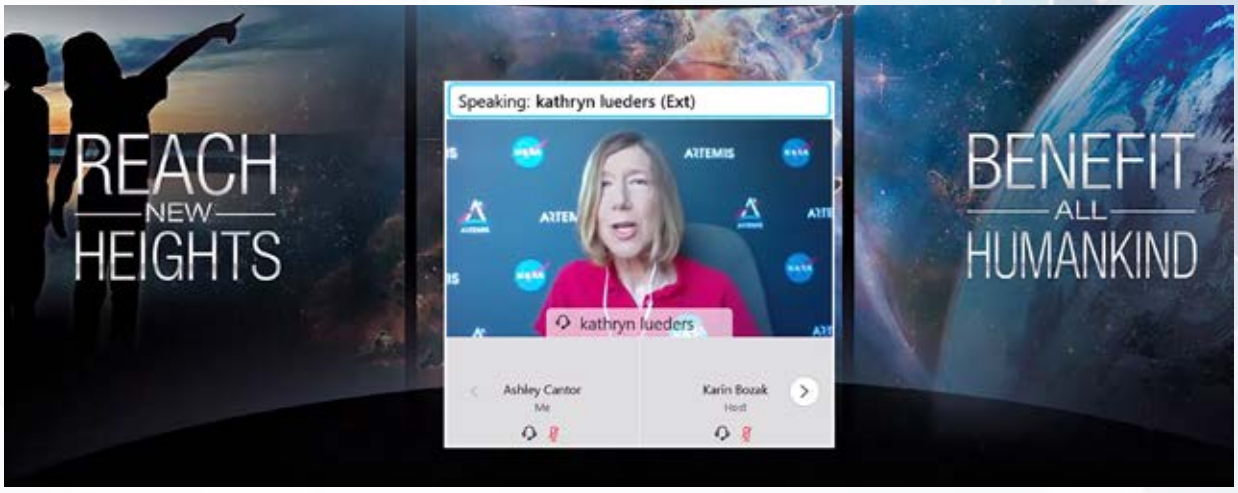
TTO aims to connect businesses with NASA technologies through the right licensing options by working with the company and making sure the license fits their needs. "Working with Glenn's Technology Transfer Office for the DELTA convertor licensing was easy. They were friendly and informative every step of the way," said Dennis Ragsdale, JVEX Systems president.

TTO will be sharing more information about the different types of licenses in future issues of AeroSpace Frontiers. For more information on NASA Glenn's technologies available for licensing, visit https://technology.grc.nasa.gov.

JVEX SYSTEMS

Collaboratively Reaching New Heights

Kathryn Lueders, the first female associate administrator of the Human Exploration and Operations Mission Directorate, has embraced a philosophy throughout her NASA career: Find a problem and try to solve it. Lueders discussed her proactive approach on March 11 in NASA's first-ever agencywide collaborative virtual event for Women's History Month. Women's employee resource groups (ERGs) from seven NASA centers and NASA Headquarters coordinated the event, including the Glenn Women's Advisory Group. Lueders described some of her NASA experiences as well as exciting work ahead, all tied to the event's theme, "Making History and Reaching New Heights."



GRC-2021-C-00909 Photo by Ashley Cantor

During the virtual event, Lueders shares her NASA experiences and highlights exciting work ahead for the agency.

NEWS AND EVENTS

Workshop Connects and Ignites Women's Power

GRC-CN-2021-00017 Photo by Jo Byrne

An illustrator captures highlights of the 2021 Women IGNITE Workshop.

Glenn's 2021 Women IGNITE Workshop, March 3, focused on the theme "IGNITE the Power Within." Keynote speaker Michelle Reugebrink, a mindfulness and resilience coach at the U.S. Department of Agriculture, Forest Service, discussed several important topics women face in today's environment. The event encouraged participants to reflect, rejuvenate, and connect with other women on topics such as finding purpose, stress management, work/life balance, self-care, fitness, nutrition, health education, and mindfulness/meditation.

Thank You For Your CFC Contributions

NASA Glenn's Combined Federal Campaign (CFC) 2020 has come to a successful conclusion. Although the goal was $300,000, Glenn donors raised a respectable $252,520, despite this challenging year.

"I am so proud to be a part of GRC," said CFC Chair Mark Sorrells. "Employees stepped up, showed some love, and gave during a pandemic. Other organizations claimed they were lucky to only get half of the donations collected from last year. On behalf of the CFC, thank you so very much!"

IN APPRECIATION

I would like to thank everyone at Glenn for the cards, flowers, and expressions of sympathy shown to me and my daughter following the passing of my husband Luis Gomez. There are not enough words to express my gratitude during this time.

—Diana Centeno-Gomez

I would like to express my sincere thanks to my GRC co-workers for their support after the passing of my father. Your cards, words of encouragement, and flowers were greatly appreciated.

—Darlene Walker

RETIREMENTS

Romero

Robert Romero, Innovation and Integration Office chief, Office of Technology Incubation and Innovation, retired March 31, 2021, with 37 years of federal service, including 31 with NASA.

Dr. Robert M. Manning, System Architectures and Analytical Studies Branch, Communications and Intelligent Systems Division, retired March 31, 2021, with 34 ½ years of NASA service.

MORE THAN A MEMORY

Finkelstein

C. Robert Finkelstein, 92, a 1998 retiree with 35 years of service, died Jan. 20. He was on the launch team for several Atlas–Agena launches, including Orbiting Astronomical Observatory–1, Mariner Venus '67, and Lunar Orbiter IV. Finkelstein worked on the Titan/Centaur program and Space Station Freedom. He received a Cost Reduction Award (1972) and two Special Achievement Awards (group and individual, 1983). He retired from the Space Experiments Division, where he worked with the application of the Space Acceleration Measurement System for the Mir space station.

Hoffman

Lyle A. Hoffman, 84, a 1994 retiree with 32 years of service, died Feb. 12. He began his NASA career in the Machine Shop and later worked as a model maker in the Fabrication Division's Experimental Models Branch. He served as an advisor in the Apprentice Program and earned a Sustained Superior Performance Award in 1988. He retired as a senior production controller in the Fabrication Procurement Branch of the Fabrication Support Division.

Earth Day 2021

Greening Your Space One Event at a Time: Earth Day Photos From Home

In celebration of Earth Day on April 22, Glenn's Sustainability Working Group will highlight pictures of employees doing great things for the planet—planting a tree, recycling or composting, or riding a bike.

The group encourages all employees to continue to focus on waste reduction in 2021. Stay tuned all year long for Earth Day event announcements that will help you reduce the environmental footprint wherever your "space" may be!

Glenn's 80th Anniversary Merchandise Has Arrived!

Celebrate NASA Glenn's 80th Anniversary with new merchandise available at NASAShop.com! Shop at the URL below to add specialty t-shirts and polos to your NASA apparel collection.

www.NASAShop.com

INFORMATION CAFÉ

On Wednesday, April 21, from 11:00 to 11:45 a.m., the library will host a mini lesson about "Filing Your New Technology Report (NTR) With Tech Transfer." Check Today@Glenn for the link.

POC: Robin Pertz, 3–5776

VIRTUAL TOURS

Glenn is hosting a virtual public tour season, featuring seven world-class facilities, from April to October. To learn more about the featured facilities, visit https://www.nasa.gov/nasaglenntours. The next two tours include—April 21: 8- by 6-Foot Supersonic Wind Tunnel, May 19: Ballistics Impact Laboratory. Registration opens 1 month before the tour date. Space is limited. Tell your friends and family!

OUTDOOR SIREN TESTING

Emergency Management Office staff will conduct an audible siren test on the "shelter and aid stations" on Saturday, May 1, at Lewis Field. A mass notification voice test will be conducted at Building 87 on Wednesday, May 5.

POC: Allen Turner, 3–6826

CALLING ALL ARTISTS!

This month, Glenn's 80th Anniversary planning team invites you to join in some virtual fun by participating in the GRC Historic Photo Recreation Contest! Staff are encouraged to enter an artistic creation, and/or vote for your favorite entries in both categories. Watch Today@Glenn for details.

Deadline for next calendar section is **Wednesday, April 21, noon**. News and feature stories require additional time.

National Aeronautics and Space Administration

John H. Glenn Research Center

Lewis Field
21000 Brookpark Road
Cleveland, Ohio 44135

Neil A. Armstrong Test Facility
3597 E. Scheid Road
Sandusky, Ohio 44870

www.nasa.gov

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

Celebrating 80 Years
Looking Back Through the Decades

NASA Glenn was originally established in 1941 as the Aircraft Engine Research Laboratory (AERL), part of the National Advisory Committee for Aeronautics (NACA). The laboratory became a national resource for innovations in aircraft engine technology that transformed commercial and military propulsion systems.

Over the decades, NASA's Cleveland-based scientists and engineers advanced technology in both aviation and space exploration, propelling the U.S. into a leading role in the aerospace industry. These innovations have given the U.S. a leading role in the aerospace industry.

GRC-1957-C-45019

A General Precision Laboratory television camera system filmed the firing of a 1,000-pound thrust in the Rocket Laboratory in 1957. The center tested a variety of high-energy propellants in the 1950s, including liquid hydrogen.

New Types of Propulsion: 1950s

The laboratory's research activities are reorganized to focus on high-energy rocket propellants and nuclear propulsion. The launch of Sputnik in the fall of 1957 leads to the laboratory's incorporation into the new NASA space agency.

Emergency and Inclement Weather Lines

Lewis Field: 216–433–9328 (WEAT)
Neil A. Armstrong Test Facility: 419–621–3333

Connect With Glenn