



Glenn Extends Its Legacy of Flight Electronics to MISSE

MARS Lab Partners with Navy on MISSE-8 ISS Hardware

With the launch of STS-134, the Mobile And Remote Sensing (MARS) Laboratory extended its legacy of flight electronics within the Materials on International Space Station Experiments (MISSE). This latest endeavor further reinforces the unique capabilities and expertise that exist in Glenn's first-rate facilities.

The MARS Lab's legacy took root in the design of three circuit boards developed to support Mars surface science. The first was the Materials Adherence

Experiment electronics board that flew on the Pathfinder Sojourner Rover and landed on Mars in the summer of 1997. Since then, the Lab has built and flown over 35 circuit boards in support of U.S. Department of Defense experiments, including the MISSE-5 and MISSE-7, which flew in 2005 and 2009, respectively; and more recently MISSE-8.

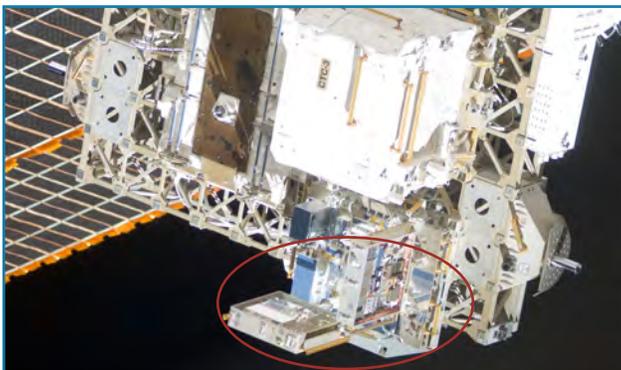
The Space Shuttle Endeavour delivered MISSE-8 to the International Space Station last month. MISSE-8 includes a MARS Lab designed circuit board set that supports the new Forward Technology Solar Cell Experiment (FTSCE), number III. FTSCE III was developed in partnership with the Naval Research Lab (NRL).

MISSE-8 will connect FTSCE III to the space

station via the Communications Interface Board (CIB), also designed and built by the MARS Lab and installed with MISSE-7. Researchers can use the CIB to control and communicate with all the active experiments in the MISSE series.

The CIB represents the MARS Lab's latest innovative effort to transition MISSE missions from totally passive experiments to active experiments," said Dr. George Baaklini, chief of Optical Instrumentation and NDE Branch.

Continued on page 2



MISSE-7 suitcase (outlined in red) taken from the space shuttle flight deck window.

Five Glenn Employees Among Government's Best 2011 FEB Wings of Excellence Awards

The Cleveland Federal Executive Board (FEB) recognized five Glenn employees among a group of Federal employees whose example of professionalism and contributions to the community exemplify the best in government service. The employees were honored during the 25th Annual Wings of Excellence Awards Luncheon Program, May 6. They include:

Seth Harbaugh, Office of Protective Services, for leadership and exceptional effort to advance NASA's emergency preparedness and response program to significantly improve the overall safety of Glenn personnel and the surrounding communities. Harbaugh also was recognized for coordinating, coaching and instructing the Incident Command System while deployed with the Coast Guard Reserve to aid the Deepwater Horizon Oil Spill.

Continued on page 2

Main Gate Opening Celebrations at Lewis Field

SAVE THE DATES!

June 6: New Main Gate Ribbon Cutting and Speakers
9:30 to 10:30 a.m.

Lunch Specials and Free Cake Displays and Videos
Main Cafeteria
11:30 a.m. to 1 p.m.

June 13: Official Main Gate and NASA Parkway Opening
Encore Lunch Specials in Cafeteria
11:30 a.m. to 1 p.m.

In This Issue

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Even the Boss Asks Why

I've given some thought regarding the topic for this month and I am finding that it's not coming easy. I think I may be suffering from "too close to the screen" syndrome, which may explain why my energy level is lower than it should be. I suspect I am not alone in feeling this way. The last few weeks have been particularly difficult and mentally taxing. The threat of a government shutdown, I am sure, has taken the wind out of a lot of our sails and I am particularly grateful that it is behind us.

In addition, there is still a lot of uncertainty in NASA's budget, and for that matter, the economy in this country. I can remember when it only took \$30 to fill up the tank of my Mini Cooper. Today I spent \$56! The price of gas, along with everything else,

has gone up in price without an increase in salary.

It's easy to become depressed and mired in self-pity when life's challenges get in our way. And while our tendency may be to think negatively, we need to still count our blessings and come to work each day to make a difference.

So you may be asking yourself, "Why is he writing all of this?" Because, just like everyone else, there are days that I ask myself "Why?" It's an important question to ask yourself from time to time. But more importantly, I still believe in what we stand for as an organization and that I believe the world is a better place because of what we do. I hope that the answer to your "Why?" is as compelling as mine.



Center Director Lugo

MARS Lab

Continued from page 1

When designing the CIB, the MARS Lab staff created an open architecture that allows for future experiment integration while incorporating all the elements a customer desires and minimizing set up to a "plug and play" operation. The staff has also designed and built two circuit boards for the Navy's new joint tactical communications satellite, TacSat-4's Solar Cell Experiment, which is scheduled for launch sometime in May or June 2011.

The MARS Lab team is confident that Glenn will continue to enjoy an innovative and successful relationship with NRL. "They (NRL) keep coming back to us because whenever we've been asked to help solve a problem, we've responded quickly using innovative designs mixes of radiation hardened materials and simple commercial off the shelf electronics," said Mike Krasowski, MARS Lab lead.

—Edited by S. Jenise Veris

Wings of Excellence Awards

Continued from page 1

Michelle Kenzig, Safety, Health and Environmental Division, for initiative and energy far exceeding expectations to create awareness of the value of a recycling and sustainability program at Glenn and beyond its gates to other government agencies and local organizations, thus impacting the local community for a more sustainable future.

Dovie Lacy, Educational Programs Office, for leadership and professionalism managing and exceeding program participation goals during the inaugural year of NASA's Summer of Innovation (SoI), a national multiyear project targeting middle school students who are underrepresented in science, technology, engineering, and mathematics (STEM) fields.

Dr. Jinho Lee, Aeropropulsion Division, for significant contributions in high-speed, high-performance fuel injection system development, and countless

hours devoted to professional and educational activities that promote student mentoring, including the American Institute of Aeronautics and Astronautics and Glenn's Aeronautics Explorer Scout Post.

Dennis Stocker, Combustion and Reacting Systems Branch, for exceptional performance in combining four different space flight experiments into a unified project that saved taxpayers millions of dollars, while simultaneously leading and maintaining an active role in various Glenn outreach efforts, including the DIME/WING educational program, the American Indian Science and Engineering Society and the Boy Scouts and Girl Scouts of America.

The Cleveland Federal Executive Board assists federal agencies and their employees by providing information, leadership and emergency response to member agencies.

—Edited by S. Jenise Veris



Harbaugh



Kenzig



Lacy



Lee



Stocker

Community Outreach Partnership Hosts Summer Activities

Glenn/Cleveland Clinic Join to Inspire Youth

When you meet another organization whose passion for reaching out to students is equal to your own, the enthusiasm is contagious, the synergy undeniable.

This is the case for the Community Outreach Committee, one of four committees under the Glenn/Cleveland Clinic Partnership established last fall. The Community Outreach Committee is comprised of a group of Glenn and Cleveland Clinic employees who are working to show students that careers in the fields of math and science are not only interesting, but also within their reach.

“When the committee began meeting early this year, we immediately realized how similar our individual organization’s outreach efforts were,” said committee member Kaprice Harris, acting deputy chief in Glenn’s External Programs Division. “We knew that we could be more powerful as a unit than as individuals in meeting our goals.”

Through a series of meetings, and with approval by the Glenn/Cleveland Clinic Governance Council, the committee established the following outreach projects that will be conducted over the next few months:

National Lab Day: A nationwide initiative underway this month brings discovery-based science experiments to students. Glenn and Cleveland Clinic technical experts will visit schools in Northeast Ohio with a focus on Cleveland Metropolitan and East Cleveland school districts. Students will come to Glenn on May 19 for a culminating activity.

Internships: This initiative will help attract, retain and broaden students’ exposure in STEM-related disciplines jointly through the Cleveland Clinic’s Northeast Ohio Research Engineering Medicine Alliance (NEOREMA) and NASA Glenn’s Lewis Educational and Research Collaborative Internship Project (LERCIP). Students who

participate in this program will gain exposure to both NASA and Cleveland Clinic technologies.

Summer Camps: Through a summer camp collaboration, Glenn and the Cleveland Clinic will share health, wellness and informal science instruction with children, who are underrepresented and underserved in these areas, and are attending camps within the Northeast Ohio region.

Harris said the strength, and ultimately the effectiveness, of these three projects lies in the people who will perform the outreach. “We’re working to ensure that we match up the right technical experts with the individual projects,” she explained. “Many employees from both organizations will have opportunities to participate in these exciting activities.”

—By Doreen B. Zudell

Hit the Road With Summer Outreach Events

Air shows. Festivals. Parades. Museums. NASA Glenn’s Community and Media Relations Office (CMRO) is getting ready to hit the road again with its exciting summer outreach program—and you’re invited to come along!

CMRO is looking for civil servant and support service contract employees and retirees to share the NASA story with the public at various venues locally and out of state. Events typically have an exhibit comprising artifacts, models and interactive workstations that help tell NASA’s role in the past, present and future of air and space exploration. You can be part of this outreach by answering questions, conducting demonstrations or describing artifacts—and you don’t need an engineering degree to be part of the team!

“Talking with the public—especially children—and helping them understand what great work we’re doing at NASA is an overwhelmingly positive experience,” explained Lisa O’Connor, an administrative assistant in the Radioisotope Power Systems Program Office. “You’ll love it and learn a lot about NASA along the way.” With support from her managers, O’Connor has made outreach an integral part of her performance plan since 2006.

CMRO has added several new stops to its summer outreach tour, so there are more opportunities than ever to get out, have some fun and share the excitement of this great agency.

To learn more about upcoming events and locations, visit <http://outreach.grc.nasa.gov> or contact David DeFelice at 216-433-6186.

—By Doreen B. Zudell



C-2010-3481

Pictured left: O’Connor with astronaut Gregory C. Johnson at an air show in Rockford, Ill. Above: Heidi Moore and Manam Vyas (Kristin Bury in background) at the City of Independence Home Days last August.

Upcoming Outreach Events

AirFest 2011, Rockford, Ill., June 4 & 5
 • Troy Strawberry Festival, Troy, Mich. June 4 & 5
 • Cleveland Gladiators Event, Cleveland, June 11
 • Kids Cultural Festival, Cincinnati, July 20
 • Dayton Air Show, Dayton, July 23 & 24
 • Ohio State Fair, Columbus, July 27 to Aug. 7



Glenn Earns "Big" CFC Awards >

On behalf of the North Coast Combined Federal Campaign (CFC), Francine McWhorter, Glenn's 2010 CFC chairperson, recently presented the center with well-earned awards from the 2010 campaign. Glenn was honored to receive the "Big 11" award for the second year in a row. This award is given to the agency that had the most activities/efforts and a major impact towards the 2010 campaign. The Glenn community also received a certificate for participating as a Pacesetter, and achieving the center's goal of \$400,000. Congratulations Glenn for being a part of the "Winning Recipe" by donating your time and over \$455,000! Pictured, left to right: Center Director Ray Lugo, McWhorter, Tonya Merriweather (loaned executive), Frederic Holland (co-chairperson), and Thomas Hartline (senior advisor).



C-2011-753

Photo by Marvin Smith

Hockey Club Wins Tournament >



For the first time in the club's 20-year history, NASA's (Glenn) Hockey Club took first place in the annual Batzel Hockey Classic held at the Winterhurst Ice Arena, March 20. A heavy underdog, the path to the team's "miracle on ice," included winning both the semi-final and championship games in overtime. Pictured is the championship team composed of center employees, family members and friends.

Women of Yesterday and Today >

The extraordinary accomplishments of women who shaped the course of our nation's history was explored in vignette and dance at this year's Women's History Month Celebration held March 31. Local actress Georgia "Jo" Swanson showcased the life and politics of Victoria Woodhull, the first woman to run for President of the United States (pictured), followed by the The Master's Touch Professional Christian Ballet Company, who performed to a video of women of note across various fields. The event, sponsored by the Women's Advisory Group, also featured the Federal Women's Program Awards presentation. (See page 6.)



C-2011-714

Photo by Marvin Smith



< Girl Scouts Learn the Sky is Not the Limit

Approximately 250 Brownie and Junior Girl Scouts (grades 2 to 5) participated in numerous hands-on activities relating to science, technology, engineering and mathematics (STEM) during the Girls Take Flight event at Case Western Reserve University (CWRU) on April 9. NASA, CWRU and the Girl Scouts of North East Ohio partnered to offer the event, with assistance from other local universities and organizations. The event focused on aviation and spaceflight and featured female pilots and astronaut Mike Foreman. Pictured are CWRU students showing Brownie Girl Scouts how to create a comet using aluminum foil and ribbon.

Glenn Employees Recognized for Scientific and Technical Contributions

Inventions & Contributions Board Grants Monetary Awards

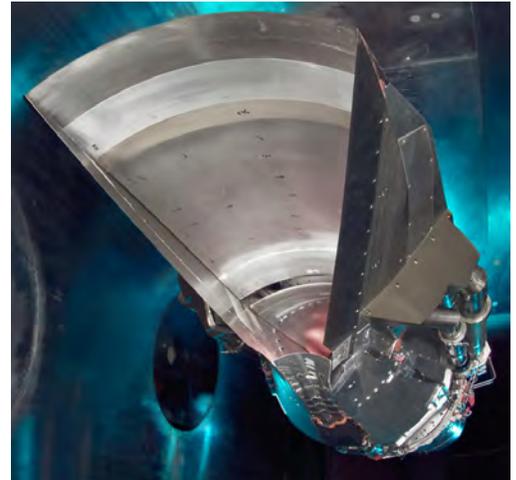
NASA Glenn has been a consistent standout among field centers participating in the agency's Invention Awards Program—and 2010 was no exception. The NASA Inventions & Contributions Board (ICB) granted Glenn a total of 244 awards—second only to the Jet Propulsion Laboratory. These awards are presented, in accordance with the National Aeronautics and Space Act of 1958, to civil servant and contractor employees who have made significant scientific or technical contributions to new knowledge or advancements benefiting NASA missions and the nation.

Monetary awards are given for Tech Brief articles, software releases, patents applications and board actions. Space Act awards, including NASA's Invention of the Year (IOY) and Software of the Year (SOY) awards, are covered under the umbrella of Board Action Awards. The following 12 Glenn-developed technologies merited a variety of the ICB monetary awards:

- Glenn's "LEWICE (LEWICE accretion program), Version 3.2.2," the most extensively tested and reliable ice accretion prediction tool available, was the 2010 NASA Software of the Year Award runner-up. Contributors include Mark Patapczuk, Colin Bidwell, Harold Addy and William B. Wright (ASRC), Icing Branch; and Laurie Levinson, Mechanics and Life Prediction Branch.
- The "Miniaturized Metal (Metal Alloy)/PdOx/SiC Schottky Diode

Gas Sensors for Hydrogen and Hydrocarbons Detection at High Temperatures" was Glenn's nominee for Government Invention of the Year. Contributors include Dr. Gary Hunter, Dr. Jennifer Xu and Dorothy Lukco (QSS Group) of the Communications, Instrumentation and Controls Division.

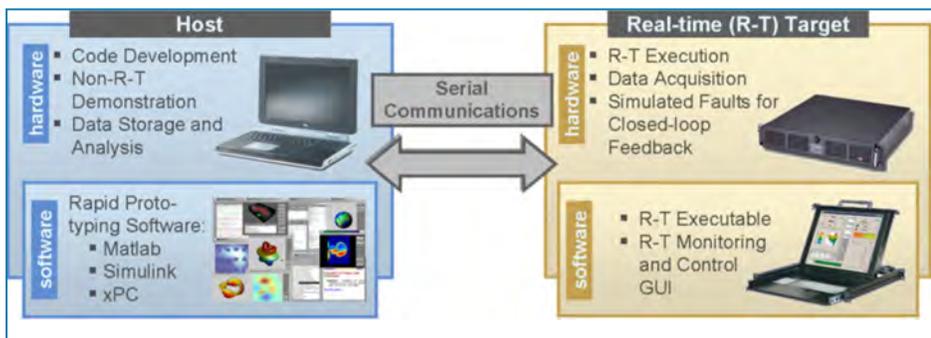
- "Time-Accurate Sectored-One Dimensional Reactive Code for Simulation, Prediction and Control of Combustion Instabilities," by Dr. Daniel Paxson, Communications, Instrumentation and Controls Division.
- "Atomic Oxygen Treatment of Seals for Reduced Adhesion in NASA's Low Impact Docking System," by Sharon Miller and NASA retiree Bruce Banks (Alphaport), Space Processes and Experiments Division.
- "Development of Halbach Magnetic Bearings for Aerospace Applications," by Dennis Eichenberg, Christopher Galloway and William Thompson, Avionics and Electrical Systems Division
- "Grid-Tied Photovoltaic Power System," by Dennis Eichenberg, Avionics and Electrical Systems Division.
- "High-Temperature Free-Space Dielectric Permittivity and Magnetic Permeability Measurement Test Bed," by Dr. Felix Miranda, Qinetiq's



The Parametric Inlet in Glenn's 10- by 10-Foot Supersonic Wind Tunnel.

Dr. Kevin Lambert and Carl Mueller, Antenna and Optical Systems Branch; and Charles Sheehe, Flight Communications Branch.

- "Microscale Particulate Classifier," by Dr. Paul Greenberg, Combustion and Reacting Systems Branch; and D-Ren Chen & Chalong Qi, Washington University.
- "Optimal Tuner Selection for Kalman Filter-Based Aircraft Engine Performance Estimation," by Dr. Sanjay Garg and Dr. Donald Simon, Controls and Dynamics Branch.
- "Parametric Inlet," by Paul Solano, Paul Trimarchi and David R. Root (Zin), Mechanical & Fluids Systems Division.
- "Portable Health Algorithms Test (PHALT) System," by Kevin Melcher, Edmond Wong, and Qinetiq's Christopher Fulton, William Maul and Thomas Sowers, Controls and Dynamics Branch.
- "Process for Preparing Polymer Reinforced Silica Aerogels in a One Pot Process," by Dr. MaryAnn Meador, Durability and Protective Coatings Branch; and Dr. Lynn Capadona, Systems Definition and Communications Branch.



A schematic of the integrated hardware-software platform for the Portable Health Algorithms Test System developed to assess the health of aerospace systems.

—Edited by S. Jenise Veris



Promotions, Honors and Awards

Federal Women's Program Award Honorees

Linda Elonen-Wright and Gloria Richards received Glenn's 2011 Federal Women's Program Awards, which honor significant contributions and mentorship to inspire and advance women. Center Director Ray Lugo joined Christi Tomaro, Office of Protective Services, in presenting the awards during Glenn's Women's History Month Observance on March 31.



C-2011-735

Photo by Marvin Smith

Left to right: Tomaro, McMillen, Richards, Center Director Ray Lugo, Haas and Elonen-Wright.

Supervisory Award: Elonen-Wright, chief of the Facility Management and Planning Office, was nominated by Jeff Haas, Testing Division, for her demonstrated leadership, goal setting, initiative and outreach, all combined to share insight and knowledge with young women she mentors and to inspire staff professional development.

Nonsupervisory Award: Richards, administrative officer for Power and In-Space Propulsion Division, was nominated by Linda McMillen, IT Operations Office, for her professionalism, creativity, resourcefulness and initiative, which has enabled excellent rapport with co-workers and customers and opportunities to successfully serve in leadership roles and a variety of Glenn activities.

Ansari Celebrates HHS Innovation Award



Left to right: Dr. Sam Zigler, PhD, John Hopkins U.; Dr. Laurence Tabak, PhD, NIH; Dr. Manuel Datiles, MD, NEI/NIH; HHS Secretary Kathleen Cebeliuss, Dr. Ansari, PhD, NASA; and HHS Deputy Secretary Bill Corr

Awards, which recognize examples of cross-agency innovation and resource sharing to improve community health.

Glenn's Dr. Rafat Ansari, Bio Science and Technology Branch, is a key contributor of a team representing NASA, the National Eye Institute (NEI), and part of the National Institutes of Health (NIH), that received an HHS Innovates Honorable Mention Award for developing a clinical device for earlier detection of cataracts. The U.S. Health and Human Services (HHS) Department sponsors the Healthy Living Innovation

Olson Wins Combustion Art Contest

Dr. Sandra Olson, Combustion and Reacting Systems Branch, won first place in the Combustion Art Competition at the 7th U.S. National Combustion Meeting held March 20 to 23 in Atlanta. Her winning entry entitled "Flaming Star," captures microgravity flames converging toward the center of the starburst as it implodes against an outflow of wind to create a diffusion flame supernova. Olson took first place in 2009 as well for "Fire's Ribbons and Lace," co-authored



by Fletcher Miller, San Diego State University and Indrek Wichman, Michigan State University. Entries are judged on the basis of creativity and innovation, display and presentation and scientific and/or aesthetic value. Visit <http://www.cssci.org/> to view Olson's winning entries and several other Glenn entries since the inaugural competition in 2004.



Dr. Olson



DeJesus

Brunilda "Brunie" DeJesus has been selected for the position of Protocol Officer, Office of the Director. Since joining NASA in 1994, DeJesus brings to the position knowledge gained

through education and work experience in external relations, protocol, legislative affairs and technology transfer. Most recently, DeJesus supported the Aeronautics Test Program as a budget analyst for the High-Ice Water Content Project.

Susan Ritter has been selected Executive Support Assistant to the Director of the Space Flight Systems Directorate (Code M). Ritter previously served as division secretary for the Power and In-Space Propulsion Division. More recently, she served as division secretary for the Systems Engineering and Analysis Division.



Ritter



In Appreciation

I offer my sincere thanks to all my NASA friends and colleagues who expressed their sympathy on the passing of my mom. Your thoughtfulness and kind words have given me strength during this difficult time.
—Don Jaworske



Calendar

RETIRED NASA WOMEN'S LUNCHEON: Thursday, May 19 at 11:30 a.m. (NOTE time change) at the Colony Dining Room, 120 E. Grand St., Berea (located in the Baldwin-Wallace University Student Union Building). Please call Gerry Ziemba 330-273-4850 or e-mail gto64gerry@yahoo.com for reservations (no credit cards).

IFPTE LOCAL 28, LESA MEETING: LESA will hold its next membership meeting on Wednesday, June 8 at noon in the Small Dining Room of the Employee Center.

GEORGE M. LOW (GML) AWARD: The GML Award is NASA's premier quality performance award for NASA's prime and subcontractors. Candidates for nomination should review the GML brochure for nomination guidelines located on Today@Glenn. All contractor nomination packages should be vetted through their Directorate Office by June 17. Glenn's point of contact is Frank Robinson, 216-433-2340. For questions, contact Mary Cuevas, 216-433-3039.

LEWIS LITTLE FOLKS (LLF) GOLF OUTING: LLF's 11th annual Benefit Golf Outing will be Friday, June 17 at the Bob-O-Link in Avon, Ohio. All are welcome. For information, call 216-433-5264.

Check out the NASA Glenn Exchange On-Line Gift Shop at www.nasagiftshop.com.

Deadlines

News items and brief announcements for publication in the June issue is noon, May 20. Larger articles require at least one month notice.

READ US ON THE INTERNET:
<http://aerospacefrontiers.grc.nasa.gov>

Hermes Award 2009-2010



In Memory



Gallovic

Albert J. Gallovic, 93, who retired in 1977 with 35 years of NACA/NASA service, died Feb. 3. Gallovic joined the NACA/NASA workforce in 1942 with his brother John and also retired with him. Albert began his career as a metal model maker in the General Machine Section but eventually joined John, a tool and die maker, in the Instrument Shop. Employees may recall Albert and co-worker Ralph Youngman's successful campaign to collect a penny per employee for postage to mail the center newsletter, "Wing Tips," to employees serving in the armed forces.

Clyde J. "Jim" Greer, 87, who retired from NASA in 1974 with 21 years of federal service, died Sept. 22, 2010. Greer, who was a U.S. Army Air Corps veteran of WWII



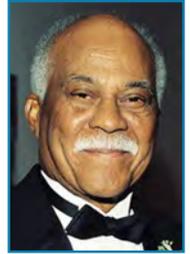
Greer

and certified steam engineer, came to NASA in 1959 when the Plum Brook Reactor Facility was still under construction. He was responsible for the cooling and wastewater handling system. Greer became the senior reactor operator by 1968, but was reassigned following the closure of reactor facility in 1973. Greer led a musical group of NASA employees called The Mach 4's.

Frank M. Kubancik, 88, who retired from NASA in 1983 with 35 years of federal service, died March 5. Kubancik was a U.S. Army veteran of WWII who began his NACA/NASA career in 1949 working as a mechanical engineering technician. He primarily supported various sections at the Rocket Lab, but in later years supported projects in the Combustion and Electric Propulsion labs. Kubancik participated in a wide variety of center activities, including the

Latin Dance Club, Lewis Choral Group and the men's bowling and golf leagues.

Cleveland O'Neal, 86, who retired from NASA in 1971 with 25 years of federal service, died April 6. A U.S. Marine veteran of WWII, O'Neal began his NACA/NASA career after graduating from



O'Neal

the Tuskegee Institute with a degree in chemistry. He was selected for a 6-month Aeronautical Research Intern and Engineer Training Program in 1952, and subsequently earned a master's degree from Western Reserve University in 1954. O'Neal spent the bulk of his career in various branches of the Chemistry Division, primarily the Kinetics Branch. He wrote several technical reports and was a member of a 1964 Group Achievement Award for "striving either as individuals or a group to erase existing barriers against women and minority groups." O'Neal served as an Equal Employment Opportunity counselor and was a long-time member of the Speaker's Bureau and mentor to youth groups.

Leo Sienkiewicz, 92, who retired from NASA in 1979 with 38 years of federal service, died March 11. Sienkiewicz began his NACA/NASA career in 1944, while serving in the U.S. Army Air Corps during WWII. He was an aerospace mechanic in the Icing Tunnel supporting research to keep ice out of the engines of high-altitude airplanes. He remained in the tunnel area until its shutdown in 1960, and later spent the balance of his career in the Service Section for the Energy Conversion Laboratory. Sienkiewicz was the state chairman of the Pearl Harbor Survivors Association.

Glenn's Emergency and Inclement Weather Line:
Lewis Field: 216-433-9328 (WEAT)
Plum Brook Station: 419-621-3333

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VOLUME 13 ISSUE 5 MAY 2011

Earth Week 2011

Photo Highlights from Plum Brook Station and Lewis Field Celebrations, April 12 and 14

1 PBS Security Officer Halle Queen with Northeast Ohio Collie Rescue animals. 2 Environmentalist John Blackman with Bald Eagle at Plum Brook. 3 Pete Kennedy and Laura Scott participate in the Clean the Creek event at Lewis Field. 4 Exhibitors talk with employees at Lewis Field. 5 Reem, Jed and Farah Abumeri listen to Glenn's Jerimiah McNatt as he explains the Transparent Conducting Oxide Solar Cells for Smart Window Applications during the Earth Day Celebration at the Cleveland Zoo. 6 Students in the Green Science Academy program at Ehone Joint Vocational School, Milan, Ohio. 7 Environmental Management System Coordinator Mike Quintin shares information with employees.



2011 Earth Week Slogan Contest Winner Alan Hewston. "A Healthy Earth Makes for a Healthy You."



Photos by Eli Abumeri, John Hickley and Doreen Zudell