



Taking Out Space Station Trash

Glenn Works on Repurposing Space Trash

If trash disposal/recycling on Earth is challenging, imagine what it is like for the International Space Station crew. So NASA is looking into ways to reduce and repurpose trash generated on the space station.

Glenn is one of six centers involved in NASA's Advanced Exploration Systems (AES) Logistics Reduction and Repurposing (LRR) project focused on identifying the most effective systems for recycling waste to support the space station for 10 more years and for future deep space missions. By repurposing trash, overall launch mass generated by dedicated crew items will be decreased translating to a reduction in mission costs and amount of trash for disposal.

“Currently, astronauts on the space station sort wet and dry trash that’s stored until other space vehicles bring supplies. The supplies are unloaded, and the waste, wrapped in the shape of a little football in transparent plastic with duct tape, is loaded

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Photo courtesy of NASA

Astronaut John Phillips loads assorted items in the storage bin on the space station.

University Capstone Projects: Small Investments, Big Rewards

Crews on long-duration missions beyond low-Earth orbit will need medical capabilities to maintain health as well as diagnose and treat disease. Providing this care will necessitate new medical requirements and the development of technologies to ensure the safety and success of these missions.

Glenn’s Exploration Medical Capability (ExMC) Element team develops medical technologies for different levels of care during long-duration space missions. Two years ago, the ExMC and NASA’s Human Research Program initiated an extensive “technology watch” to address the need for medical

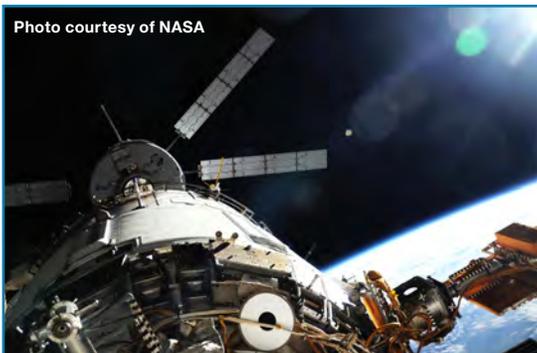
knowledge where the agency has limited expertise.

“Frequently, other agencies, industry or academia have the expertise to help develop these technologies, but are unaware of a need because little has been published about it,” explained

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Seven Glenn Payloads Arrive on Space Station

Photo courtesy of NASA



Hardware components for seven microgravity experiments originating from NASA Glenn demonstrates our scientists and engineers’ diverse contributions to several physical science disciplines. Pictured is the ATV-4 successfully docking to the International Space Station. Learn more about the payloads on page 5.

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Pulling Earns NASA SFA Recognition

Douglas Pulling, Space Flight Branch, received the prestigious Space Flight Awareness (SFA) Honoree Award during the Director's Senior Management (DSM) Meeting on May 28.

Associate Center Director Janet Watkins and Acting Deputy Director of Space Flight Systems Randy Furnas presented the award to Pulling for "sustained performance as the Space Communications and Navigation (SCaN) program—first as the Communications, Navigation, and Networking Reconfigurable Testbed (CoNNect) project scheduler and then as the SCaN program master scheduler."

The SFA Honoree Award is one of the highest presented to NASA and industry employees in first-level management and below, for their dedication to quality work and flight safety.



Left to right: Furnas, Pulling and Watkins pose for a group photo during the DSM meeting.

Capstone Projects

Continued from page 1

ExMC Project Manager Dr. DeVon Griffin, ISS (International Space Station) and Human Health Office. "So finding partners who can fill these areas is crucial to the success of these missions."

ExMC developed a task for a Tech Watch Agent to identify potential partners that could fill "gap" areas where the agency has limited expertise. The search focused on industry associates and universities in the Midwest that have a biomedical or biomechanical engineering department and areas of specialization compatible with Glenn.

Initially, they made little progress, since industry found no commercial appeal in the work. However, universities are clamoring for the opportunity to create meaningful senior engineering projects—commonly referred to as "capstones"—where students perform an assignment as a team effort culminating a final report as a curriculum requirement for graduation.

Glenn initially sponsored three student capstone projects, completed in 2012. Six additional student capstone projects have been carried out in 2013. Dr. Aaron Weaver, Bioscience and Technology Branch, mentored the University of Michigan team in 2012, whose goal was to create a "Wrist Fracture Stabilization Device for Microgravity." The device had to immobilize the wrist, protect the fracture from external perturbations, maintain hand function for daily work, and hold low mass and volume.

"I felt it was important for the students to guide their own development. They were not just responsible for developing the product but also for developing the requirements—how it would be developed, verified and tested," Weaver said. "This gave them a feel for the entire design process and led to a great learning experience and final product."

Due to the high demand for capstone work, projects are now limited to one per university per school year. Funding and mentor availability are limited. Costs associated with the ExMC capstone

ExMC Capstone Project Partners

Students from the following universities pursued capstone projects that provided the agency low cost, relatively quick results in the form of a final report, and a fresh perspective to some serious technology gap challenges. They include:

- University of Akron - 2012, 2013
- University of Michigan - 2012, 2013
- Northwestern University - 2013
- The Ohio State University - 2013
- Wright State University - 2013
- University of Illinois at Chicago - 2013

projects ranges from zero to \$2000 per project with a short turnaround time—they begin in the fall semester, then at the close of their senior year, they present a final report of their findings with the goal of providing ExMC pivotal information to a gap closure. In return, Ohio State University professor Dr. Mark Ruegsegger cited how students gain valuable skills in working with NASA professionals as project consultants on an open-ended, real-world problem that has application beyond medicine in space.

"The capstones provide an inexpensive mechanism to obtain first-rate research results," said Griffin. "Given the high quality work produced by teams mentored by Glenn, the Element is now working to provide targeted research options and archiving all results. This activity has become a key part of the Element's technical work."

—By Laurel J. Stauber



Courtesy of University of Michigan

University of Michigan engineering student, Geoff Burns, works on the Wrist Fracture Stabilization device.

Ideas Count Through Suggestion Program

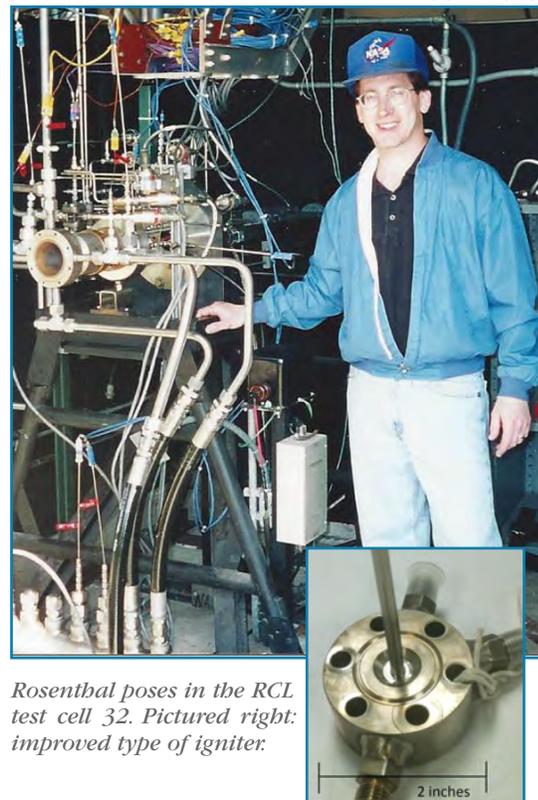
A hydrogen-oxygen torch-style igniter used in rocket engine tests at Glenn for more than two decades, typically performed well when incorporated into numerous chemical rocket engine hardware systems. However, the igniter design prevented Glenn technicians/operators from pressure checking a critical assembled joint prior to use in a rocket engine test.

Bruce Rosenthal, Facility Management & Planning Office, who worked as a test cell operator for years and now works as facility manager, suggested a modification in the fabrication process so operators could perform an inert gas leak check of the braze joint prior to putting the igniter into operation. This would reduce the chance of damaging hardware due to a bad braze. Glenn operators successfully used the new igniter fabrication process prior to recent tests in the Research Combustion Laboratory (RCL).

“I think George Repas, my mentor and former employee who designed the original igniter and manufacturing process, would be pleased with the change I made in the manufacturing process,” Rosenthal said.

Rosenthal is one of several employees whose ideas were recently adopted under the Employee Suggestion Program. The program allows cash awards, up to \$7,500, paid to employees who submit suggestions that directly improve efficiency, economy and/or effective execution of government operations.

—By Doreen Zudell



Rosenthal poses in the RCL test cell 32. Pictured right: improved type of igniter.

Taking Out the Trash

Continued from page 1

into the vehicle and burned up during reentry,” explained Dr. John Lytle, Space Technology Project Office.

Glenn is supporting two tasks under the LLR project: conversion of trash to usable products via heat melt compactor (HMC) processing; and conversion of trash to supply gas (TTSG) to make rocket propellant.



Photo by S. Jenise Veris

Determining the best use of different categories of waste and recycling water are important components of the LRR project to reduce volume and mass. For example, the carbon, hydrogen and water in the organic waste could be used to make more methane for propulsion or more water for life support.

The HMC recovers water from compacted waste materials to produce dry, sterilized plastic tiles that may be used for radiation protection, building materials or disposal. The goal is to advance the design to be compatible with life support elements to support multiple mission applications.

“We’re working with NASA Ames on the Heat Melt Compactor (HMC) task to ensure the device meets performance requirements in a low-g environment,” Lytle said. “Glenn conducted a zero-g flight experiment in October to support this work. The completion of HMC Gen 2 (ground test unit) is

Dr. Mike Kulis injects a syringe of gases, created in a catalytic reactor, into the Gas Chromatic graph to characterize the purity of the gases.

expected at the end of the year. The Gen 3 flight-like unit to eventually be tested on the space station is targeted for fiscal year 2014.”

Glenn is also responsible for two of six waste conversion technologies being evaluated for repurposing trash to supply gas (TTSG)—methane gas— as propellant to space. One is a steam reformer developed by Pioneer Aeronautics under an NASA Glenn SBIR Phase II grant. The other is a catalytic wet air oxidation technology that already exist at Glenn and requires minimal heat for activation. The LRR review and down-selection of the conversion technologies for future development occurs at the end of July with the ground demonstration of a test unit expected at the end of the year.

The data and analysis of these technologies developed for LRR will be critical not only for identifying future logistics systems to support multiple exploration missions, but also for innovative waste management and energy alternatives here on Earth.

—By S. Jenise Veris

News and Events

Ohio Aerospace Day at the State House

Center Director Jim Free touted NASA Glenn as an “indispensable technology asset to Ohio and the aerospace industry” in his remarks before members of the Ohio Aerospace Caucus during the 4th Annual Ohio Aerospace Day event on June 5. The Ohio Aerospace & Aviation Council hosted the event that featured a keynote address by former astronaut Dr. Ronald Sega, vice president and enterprise executive for Energy and Environment for The Ohio State University and Colorado State University.



Photo by Traci Spencer
Sega gives the keynote.



Photo by Nick Gattozzi
Free, seated third from left, serves as a government panelist.



C-2013-2086

Photo by Bridget Caswell

Cleveland Mayor Jackson Gets Up Close with Glenn

Deputy Center Director Greg Robinson welcomed Cleveland Mayor Frank Jackson and his Chief of Government & International Affairs Valarie McCall to NASA Glenn for a briefing and tour on May 29. Robinson gave an overview of the center’s current research and development and Robyn Gordon, director of Center Operations, briefed the visitors on Glenn’s K-12 educational programs and initiatives that currently serve the Cleveland Metropolitan School District. Pictured, on tour in the Electric Propulsion Laboratory, left to right: Robinson, Jackson and Dan Herman, Propulsion and Propellants Branch.

Library's Caped Crusader Named "Staxx"

The NASA Glenn Science & Engineering Library’s cape crusading mascot now has a name—Staxx! Congratulations to Lisa Liuzzo, Logistics and Technical Information Division, for submitting the winning entry to the library mascot-naming contest held during the Library Commons Open House, April 23. Coincidentally, Liuzzo is the graphic artist who designed the mascot last year. In May, the library staff narrowed the list to their top 5 before the Glenn community weighed in on Staxx as their #1 choice. Next time you see the superhero battling misinformation at the Mobile Library Desk, flying around the center on library postings or using his Herculean research powers in the library, you can greet him by name. Pictured is Staxx with the library staff.



C-2013-2397

Photo by Bridget Caswell



AeroSpace Frontiers Earns Gold

The Association of Marketing and Communication Professionals has awarded a 2013 “Gold” Hermes Creative Award to NASA Glenn’s *AeroSpace Frontiers* newsletter. The staff of Kelly DiFrancesco, Doreen Zudell (SGT) and S. Jenise Veris (SGT) earned the award in the category of “Design/Publication Overall.” Hermes Creative Awards is an international competition for creative professionals involved in concept, writing and design of traditional or emerging media. The Gold Award is presented to those entries judged to exceed the high standards of the industry norm. Nineteen percent of the 5,600 entries earned this award.

Glenn Experiments Take Residence on Space Station

Scientists and Engineers Contribute to Microgravity Research

Hardware components for seven microgravity experiments originating from NASA Glenn are settling into their new home on the International Space Station (ISS). The payloads arrived last month via Europe's Automated Transfer Vehicle (ATV-4) or "Albert Einstein," which successfully launched aboard an Ariane 5 rocket, from Kourou, French Guiana, on June 5.

"The fact that we launched hardware for seven different experiments highlights Glenn's microgravity scientists and engineers' diverse contributions to several of the physical science disciplines that carry out research on the ISS: combustion science, fluid physics, complex fluids and acceleration environment characterization," said Fred Kohl, Glenn's ISS Physical Sciences Research project manager.

For more information on these experiments, visit <http://ISSResearchProject.nasa.gov>.

New Payloads

- Constrained Vapor Bubble-2 (CVB-2) 30-mm Sample Module in the Equipment Transfer Module and a CVB accessory kit
- Advanced Colloids Experiment (ACE) magnetic mixer and a drill kit to mix the samples for future ACE experiments
- Capillary Flow Experiment-2 (CFE-2) modules: five units launched to fill out the set of 11 that comprise CFE-2
- Space Acceleration Measurement System (SAMS) triaxial sensor head and cable
- For the Flame Extinguishment Experiment Italian Combustion Experiment for Green Air (FLEX-ICE-GA), two fuel reservoirs with surrogate biofuels and two fuel deployment needles
- For the Combustion Integrated Rack (CIR), an Illumination Control Module and four 2.25-liter gas bottles
- For the Dispositif d'Etude de la Croissance et des Liquides Critiques (DECLIC), the new High-Temperature Inert-Reflight (HTI-R) sample cell provided by the Glenn principal investigators



News and Events continued



Photo by Doreen B. Zudell

Memorial Day Reflection

Employees took time to honor America's fallen war heroes during Glenn's Memorial Day Observance Ceremony, May 24. Sponsored by the Veterans Awareness Committee (VAC), the observance featured Plum Brook Management Office Chief and Retired Brigadier General David Stringer, who shared his thoughts on how to remember fallen heroes and their families. Center Director Jim Free, accompanied by VAC members Jim Fleet and Peggy Cornell, presented the memorial wreath. Flag bearers, left to right, are: Samantha Brinkman, Jim Blankschaen, Francine McWhorter, Sgt. Jonathan Vazquez, Mike Kulis, Don Pulac and Les Carmean.

Captain America Crew on Glenn Set

On a day off from filming in downtown Cleveland, several members of the *Captain America: Winter Soldier* production crew visited Lewis Field on June 10. Coordinated through NASA Glenn's Community and Media Relations Office, the visit included an informational briefing from Deputy Director Greg Robinson and tours of three research facilities. Pictured, right, is Julius Giriunas, Facility Management & Planning Office, briefing visiting crew members on a test in the 10- by 10-Foot Supersonic Wind Tunnel.



C-2013-2299

Photo by Bridget Caswell

Awards and Honors

For the past 22 years, Allen Loew performed countless outreach events for NASA Glenn, including public tours and presentations at the former onsite Visitor Center. On May 4, after supporting the center's monthly public tour in the Altitude Combustion Stand, Loew retired as a volunteer. External Programs Division Chief Steve Sanderson was on hand to thank Loew for his dedication and service and to present him with an Ohio astronauts' plaque as a remembrance of his commitment as a NASA ambassador.



Stauber

On May 18, Laurel Stauber received Baldwin Wallace University's Alumni Merit Award, the highest recognition bestowed upon an alumnus. Stauber, who is currently detailed to the Program/Project Integration Office in the Space Fights Systems Directorate as a Tech Watch Agent, was recognized "for her powerful influence on research, innovation and the application of technology to benefit society."

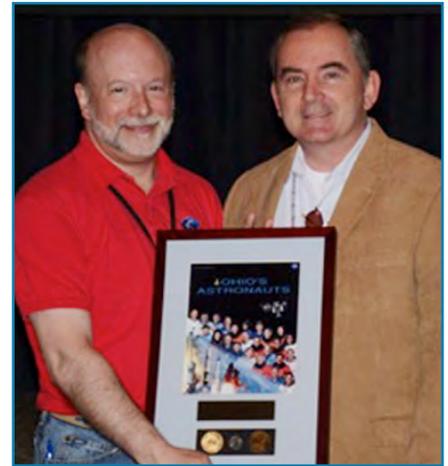


Photo by Robert Tome

Loew, left, holding plaque with Sanderson.



Photos by NTA/ Mark Sorrells

Above: Thomas, center, accepts Lifetime Achievement plaque presented by left, NTA's Vice-president Dr. Bilal Bomani, Bioscience and Technology Branch, and President Dr. Lateef Saffore.



Suárez



Doxley

The Cleveland Chapter of the National Technical Association (NTA) honored three Glenn employees during the annual Nsoroma Technical Symposium and Awards Dinner, June 7, at the Ohio Aerospace Institute.

Former Center Director Dr. Julian Earls delivered the keynote address highlighting the characteristics of the Nsoroma honorees—men and women of color in the fields of science, technology and education, who exude strong leadership, academic achievement and community activism.

Charles Doxley, an electronics engineer in the Flight Communications Branch who designs and develops software programs to test spacecraft, received the Nsoroma Prince Award. Vicente Suárez a mechanical engineer and authority on vibration testing in the Structural Systems Dynamics Branch, received the Nsoroma Award for Technology. Mack Thomas, a community outreach specialist in the Community and Media Relations Office whose NASA career spans over 40 years, received the Nsoroma Lifetime Achievement Award. For more information on the honorees and the event visit <http://ntacleveland.com>.

Welcome to the NASA Family

Welcome to the following Pathway Interns who joined the NASA Glenn workforce in May! Pictured, left front row, left to right: Matthew Muscatello, Flight Software Branch; Amy McNelis, Procurement Division; and Rocco Viggiano, Polymers Branch. Back row: Roy Kucia, Mission Support Office; Daniel Ingraham, Acoustics Branch; and John Maroli, Flight Software Branch. Pictured, right, front row, left to right: Elizabeth Turnbull, Cost & Economic Analysis Office; Valerie Weisner, Ceramics Branch; Steven West, Systems Verification and Operations Branch; Corrine Sackett, Energy and Environmental Management Office; and Aaron Maness, Power Systems Development Branch. Back row: Matthew Fakler, Mission Support Office; Logan Larson, Space Propulsion Branch; Jonathan Kratz, Controls and Dynamics Branch; and Alexander James, Networks and Architectures Branch.



C-2013-1643



C-2013-1781

Photos by Bridget Caswell

More than a Memory

Carmen R. Coletta, 95, who retired in 1978 with 34 years of federal service, died May 9. Coletta was a U.S. Air Force Veteran of World War II, who also served in the Air National Guard during the Korean conflict. Upon discharge, Coletta joined the Cleveland NACA/NASA workforce where his father, Orazio, also worked until retirement in 1958. Coletta honed his aircraft mechanic skills in the Test Installations Division throughout his 26-year NASA career supporting tests and development of aircraft in a variety of facilities including the Altitude Wind Tunnel, the Electric Propulsion Research Building/Lab and the Engine Research Building.

Joseph DeFazio, 86, who retired in 1987 after 30 years of federal service, died April 30. DeFazio was an Army Air Corp veteran of World War II, who later joined NASA Lewis in 1960. DeFazio supported tests and development of aircraft engines primarily at Plum Brook Station. Prior to retiring, DeFazio worked in the Aeropropulsion Facilities and Experiments Division, where he earned a 1983 NASA Group Achievement Award as a mem-

ber of the Energy Efficient Engine (E3) Project Team. DeFazio was also a founding member of the Great Circle Flying Club formed to promote piloting aircraft among fellow employees and friends.

Myron E. Hill, 59, who retired from NASA in 2009 with 24 years of NASA service, died April 27. Hill was a project scientist in the Microgravity Science Division, whose expertise was fluid physics. He was a 1994 Silver Snoopy award winner for support to the European Space Agency-developed Bubble Droplet Particle Unit experiments that flew on the second International Microgravity Laboratory (IML-2) Space Lab module. However, his legacy lies in contributions to the Fluids Integrated Rack for the NASA Lewis-developed Fluids and Combustion Facility (FCF). The FCF is one of the first facilities installed onboard the International Space Station (2002) in support of NASA's Human Exploration Program.

John H. Povolny, 90, who retired in 1974 with 31 years of NASA service,



Coletta



Povolny

died May 7. Povolny was a pioneering engineer, who specialized in propulsion systems. Among his career highlights was a NASA citation for outstanding management and engineering contributions to the Atlas-Centaur Project while serving as chief of the Test Engineering Branch in Lewis' Centaur Project Office. He was responsible for the full-scale in-house testing of flight hardware for the Centaur rocket, which became the workhorse of the nation's launch vehicles. Prior to retirement, Povolny served as chief of the Engine Research Branch, Airbreathing Engines Division, responsible for full-scale engine test programs in support of the nation's commercial and military aircraft programs.

Calendar

GRC CONNECTIONS: The next GRC CONNECTIONS forum is Thursday, July 18, from 10 to 10:45 a.m. in the Briefing Center Auditorium. Panelists will address the topic: "Counterespionage and Intellectual Property Protections: What You Don't Know Can Hurt You."

LUNCH WITH THE DIRECTOR OF: The next Lunch with the Director Of will be Wednesday, July 24, noon to 1 p.m., Small Dining Room, building 15.

AUGUST PUBLIC TOUR: The next Saturday tour, Aug. 3, will highlight the Flight Research Building. See the S-3B Viking and other NASA planes. Tours are open to U.S. citizens and lawful permanent residents. Space is limited and reservations are required. To register, call 216-433-9653 or send an e-mail to sheila.d.reese@nasa.gov. For more information and a complete schedule of Glenn's tours, visit <http://www.nasa.gov/centers/glenn/events/tours.html>.

IFPTELOCAL28, LESA MEETING: LESA will host its next membership meeting on Wednesday, Aug. 14, noon, Employee Center's Small Dining Room.

RETIRED WOMEN'S LUNCHEON: The next luncheon will be held Thursday, Aug. 15, 1 p.m., Orchid Café Restaurant, Miller Nature Preserve, 2739 Center Road (Rt. 83), Avon. For reservations, call Gerry Ziemba, 330-273-4850. Luncheons are held the third Thursday of February, May, August and November.



Offers NASA Employees Many Benefits

As a member of Century Federal Credit Union (CFCU), NASA Glenn civil servant and contractor employees and their family members have access to low loan rates, sensible services and wide-ranging discounts. Members have access to seven branch locations, ATMs and 24/7 secure banking courtesy of services like online banking and mobile banking. Contact Sue Sliman and the CFCU NASA Branch staff at 216-535-3400, NASA@CenFedCU.org, or stop by the credit union in building 15 (Monday to Friday, 8 a.m. to 3:30 p.m.). Explore the CFCU website at www.CenFedCU.org/aboutus and get immediate access to current rates and discounts.

Retirements

Sandy Clay, Space Processes and Experiments Division, retired Jan. 3, 2013, with 37 ½ years of government service, including 31 at NASA.



Clay

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Read *AeroSpace Frontiers* online at <http://aerospacefrontiers.nasa.gov>

Construction Strategy From Ground Up

Replacing Glenn's Aging Support Systems

Most people give little thought to pipes and wires snaking under buildings and roads, but the quality of underground infrastructure can limit the center's ability to operate facilities and conduct research. NASA Glenn is in the midst of a 20-year, \$200 million multiphase construction plan to replace the center's aging support systems.

"Glenn has the oldest underground infrastructure in the agency, with some systems dating back 70 years," said Gene Stygles, Facilities Division (FD) chief. "It's vital we update these systems to accommodate not only existing facilities but also future construction."

Glenn recently completed construction, initiated in 1999, to upgrade its sanitary sewer and natural gas systems at Lewis Field (LF). Current and future projects—expected to continue through 2020—focus on domestic water, electrical, steam, storm sewer and communications systems.

The work, which began with rigorous design and planning stages, is part of the center's Facility Master Plan. Many

of these projects have been identified to meet regulatory mandates—such as federal energy and water reduction goals or regional requirements for reducing rainwater runoff. In some cases, the equipment has surpassed its useful life and is in need of replacement.

"In the case of the communications systems, by replacing copper cables with fiber optic cables we're reducing the number of underground cables six to one, and the fiber optic cable is a small fraction of the copper cable size," said John Selby, FD Project Management Branch chief.

Stygles said construction schedules are set to minimize impact on facilities and employees, but sometimes the scope of a project makes it challenging. For example, it is hard to miss work on the steam trench in front of buildings 15 and 21. This project will replace piping from the Steam Plant south along Taylor Road to building

50 and from the Steam Plant east across Ames Road to building 5. Phase I will wind down in



Phase I of the steam system replacement on Taylor Road.

November so steam can be supplied during the winter months, and Phase 2 will resume farther down Taylor Road in spring 2015. Projects centering on communications, electrical and water systems will continue through the winter months.

For more information on these and other construction projects at Lewis Field and Plum Brook, visit the FD website at <http://fd.grc.nasa.gov/>.

—By Doreen B. Zudell

Construction on the Horizon

- Demolition of Underpass Road Bridges at LF
- Security Improvements for New PBS Main Gate
- Repair Institutional Systems at Space Power Facility

