



Space Technology

Game Changing Development Highlights



January-February 2015



GCD Image Contest Winners

Congratulations to the Next Generation Life Support (NGLS) project for taking first place in the Game Changing Development Program’s image contest.

Photographers Robert Markowitz and Bill Stafford took the winning photo (on the cover) in the Water Analysis Laboratory at NASA’s Johnson Space Center. The image depicts the NGLS Alternative Water Processor at “Buildup Complete” with engineer Stuart Pensinger performing system checkouts prior to inoculation.

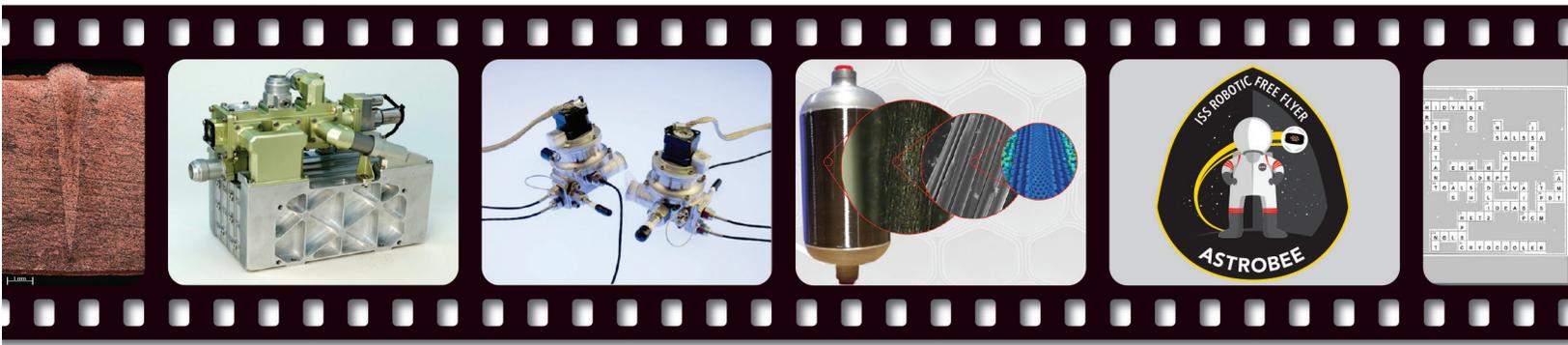
Just like the image conveys, the Alternative Water Processing technology is a “green” choice for spacecraft water recycling. The project’s goal was to build and test an integrated water recovery system that is capable of treating a complex wastewater stream that includes urine, condensate, hygiene water (including hand wash and shower), and laundry, as well as improve on the state of the art water recovery rate.

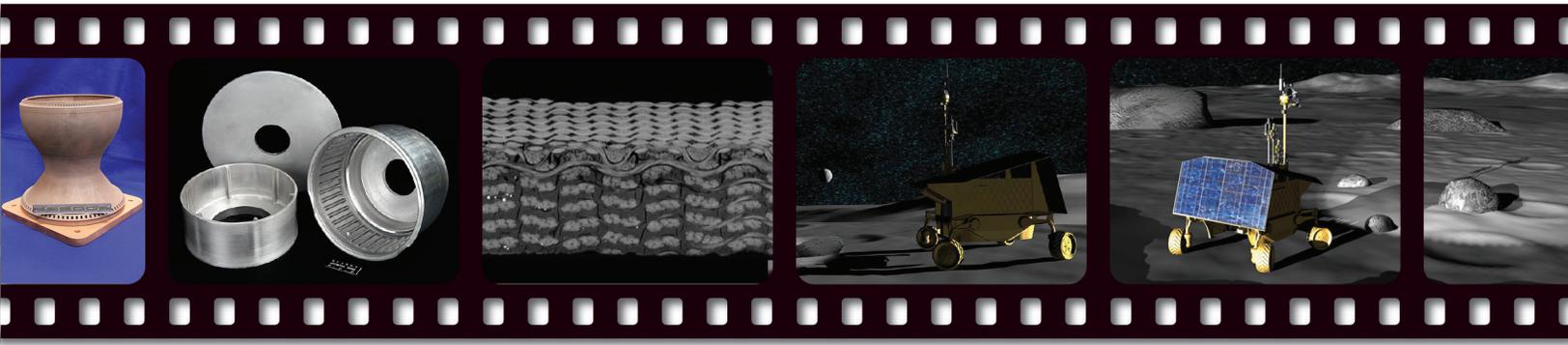
GCD Program Manager Steve Gaddis explained why he voted for the image:

“We have been developing the AWP for more than 3 years, and this is an amazing image showing the culmination of that technology. The AWP will influence life support systems for astronauts, the ISS, and the human journey to Mars.



In second place (above), also from the NGLS project, is a picture of the AES Portable Life Support System (PLSS) 2.0 “Human in the Loop Test” with Lindsay Aitchison in the Mark III prototype suit walking on a treadmill. The NGLS Rapid Cycle Amine v2.0 and two NGLS Variable Oxygen Regulators v2.0 were being used in the PLSS to provide carbon dioxide removal and oxygen regulation.





GCDPO graphic artist Anne Rhodes voted for this image because she liked “the way the image was framed.”

“It’s human interest, and I think it would make an engaging poster.”

In third place is the “Selective Laser Melting—Low Cost Upper Stage Project chamber segment build” (right) submitted by Additive Manufacturing Technologies.

And because there were so many deserving entries, the Program Office decided to give an Honorable Men-



and unique camera angles really added a lot to the image.”

A fun project manager-themed crossword puzzle (below) submitted by Anupa Bajwa with Autonomous Systems received “Most Creative.”

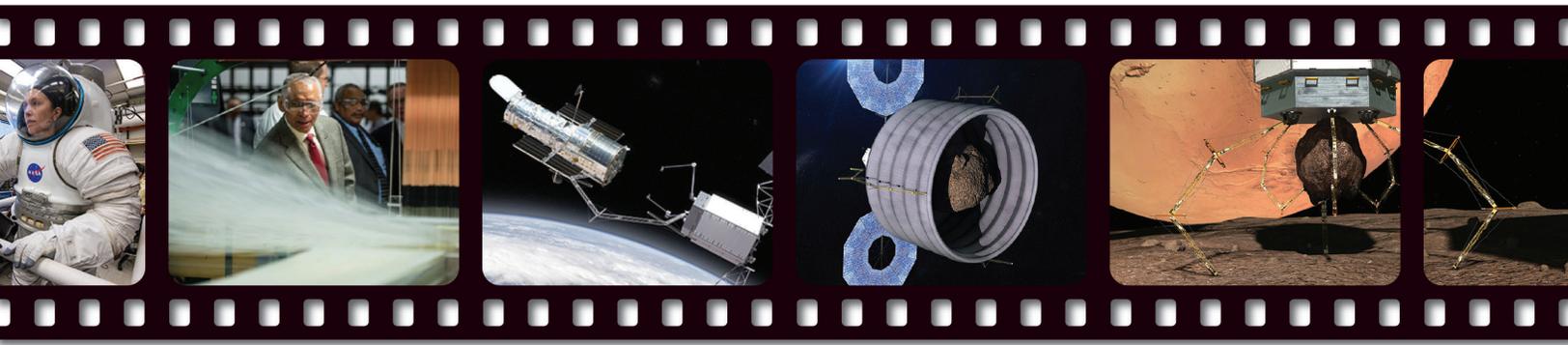
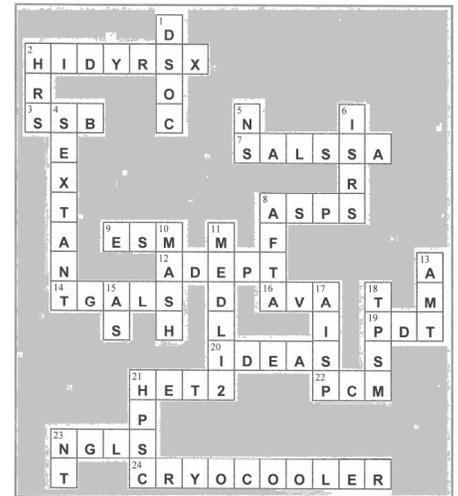
“I have always enjoyed solving crossword puzzles and now, with software, I enjoy creating puzzles, too,” said Bajwa.

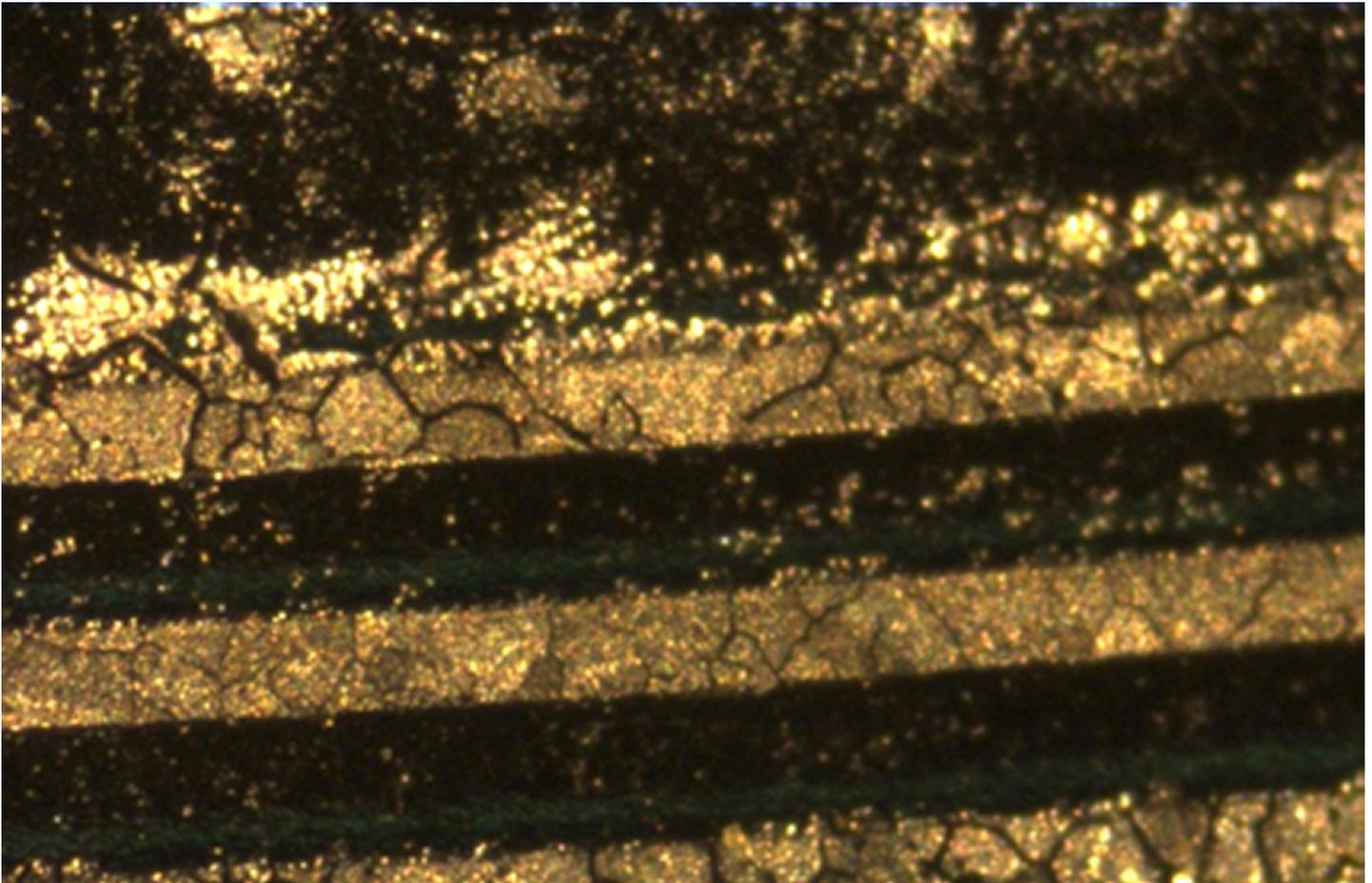
Thanks again to everyone who participated and submitted photos!



tion award to another entry (left) from the AMT/Low Cost Upper Stage-Class Propulsion Development showing material testing of a sample build specimen.

“Photographing hardware can be difficult,” said Amy McCluskey, GCD Communication Manager. “Both images from the AMT/LCUSP were recognized because they found interesting ways to photograph a tough subject. Using colorful backgrounds





RFC System Demonstration Achieves a Technology First

—by Denise M. Stefula

The Advanced Space Power Systems (ASPS) project successfully completed milestone testing of a 100-W, benchtop regenerative fuel cell (RFC) on December 11, 2014. This is the first demonstration of an RFC system with passive fluid management technologies to significantly improve system reliability while reducing mass, volume and parasitic power, a loss occurring in a system when components draw power even though turned off.

“This is just a beginning,” said Mark Hoberecht of NASA Glenn Research Center’s Electrochemistry Branch.

Anode-side sealing ridges (above) show grain dissolution after 5 days of operation. Manifold surfaces around proton exchange membrane trap water, leach acids from the membrane, and produce high corrosion rates in stainless steel bipolar plates. Pitting and grain dissolution were observed on anode-side surfaces in early, stainless-steel electrolyzer stacks. Methods to address corrosion (surface coatings, alternative seal designs) are under evaluation.

“The demonstration in late 2014 combined components in a conceptual RFC. Further development of fuel cell and electrolysis stacks remains, along with autonomous system integration.”

ASPS’s approach to achieve its RFC “technology first” was to design, build, and test the 100-W non-flow-through fuel cell and passive, static-feed electrolyzer components, integrating these elements into an RFC system.

Robotic and human space exploration inherently requires safe, reliable, abundant power generation and energy storage capabilities that are both compact and lightweight. To meet this need, ASPS, a Space Technology Game Changing Development Program project, developed advanced batteries, fuel cells, and solar arrays with paths toward infusing those technologies to enable future space missions.

Bill Bennett, also with Glenn's Electrochemistry Branch, said, "This accomplishment merely offers a glimpse of what could be achieved with further development and system integration. Such systems were considered essential for lunar base operations at one time. Mars exploration opportunities may also exist."

Numerous advances in the fuel cell and electrolyzer technologies were developed over the life of the project. Funding and schedule limitations required that advances be implemented quickly, without the luxury of incremental improvement and development. Sealing, corrosion protection, and shunt current issues all had to be addressed during the rapid scale-up from 100 W to 1 kW to 3 kW-size of fuel cells.

Electrolysis technology for an RFC is presently less mature than fuel cell technology. A technical interchange meeting was held at NASA's Johnson Space Flight Center in February to discuss the potential for commonality across

water electrolysis systems for various NASA stakeholders. These stakeholders included representatives from the power and energy storage community (RFC applications), life support community, and in-situ resource utilization community. Summary presentations from the stakeholders covered existing and future technology needs, along with technology gaps.

Meeting conclusions were that there is significant commonality in potential for water electrolysis amongst stakeholders, and that the life-support community has the most stringent requirement (3,600 psi oxygen over hydrogen, for recharging EVA tanks). The next step for the representatives is to develop an architecture for each stakeholder electrolysis application, and then compare these architectures in order to prioritize technology development paths moving forward.

Along with RFCs, other technologies under research and development with ASPS include advanced battery cells.



Bill Bennett has applied the last 10 years of his career supporting a variety of material and battery development projects at the NASA Glenn Research Center (GRC). A research paper, co-authored with the GRC Materials Division, received the NASA Glenn Research Center Distinguished Publication Award for 2003. Bill served as Team Lead for anode development for advanced lithium-ion batteries under the Exploration Technology Development Program (ETDP). Bill is currently participating in the development of advanced proton-exchange-membrane (PEM) fuel cell and electrolysis technology for future NASA missions. Current engineering interests include system analysis and water management strategies for PEM fuel cells.



During his career, Mark Hoberecht has received several superior accomplishment awards, seven group achievement awards, and has been recognized for two invention disclosures. He presently serves as the Principal Investigator for the regenerative fuel cell portion of the Space Power Systems (SPS) project. In this role he leads a team of three NASA centers and multiple contractors developing proton-exchange-membrane (PEM) fuel cell and electrolysis system technology for future NASA missions.



Jay Feldman poses with the recovered Orion capsule after splashdown.

SFA Program Recognizes Game Changer for TPS Development

—by Denise M. Stefula

Jay Feldman, senior research scientist with ERC, Inc., received the Space Flight Awareness (SFA) Program Honoree Award for his work supporting the 3D Multifunctional Ablative Thermal Protection System (3DMAT) material development, a project that advanced in technology readiness through Space Technology's Game Changing Development Program.

The SFA Program is managed by NASA Headquarters' Human Exploration and Operations Mission Directorate. The program recognizes employees involved in human space flight activities and their importance in promoting astronaut safety and mission success in the critical, challenging task of flying humans in the hostile environment of space.

"I was very excited to win the SFA award in recognition of my technical and project leadership in taking the 3DMAT material from TRL 2 to TRL 4/5 with mission infusion being implemented within 3 years of the project's beginning," said Jay.

Jay has worked with the Thermal Protection Materials Branch (in the Entry Systems and Technologies Division) at NASA's Ames Research Center for 13 years. The new quartz/cyanate ester composite the team developed is an enabling material with significantly enhanced structural and thermal performance relative to the 2D laminated composite used on Orion's first flight.



Senior Research Scientist Dr. Jay Feldman holds his SFA Honoree Award. Standing with him are Astronaut James Kelley and SFA Program Manager Alotta Taylor.

“Along the development pathway we overcame some significant technical hurdles to produce the first composite of its kind. It is the most exciting thing I’ve ever worked on,” said Jay. “It is not often that one has the opportunity to dream up a new material that would solve problems and then have it developed so quickly. It’s a real testament to the capability of the material and especially the team that made the development a success!”

The technology plan calls for a possible flight test of 3DMAT on Orion’s next flight in 2018.

The mood on the causeway, Jay said, was incredible and that everyone was beaming. “Folks were very excited to see the historic maiden launch of Orion and what it represents—the return of America’s ability to send Astronauts into space to explore using American-built spacecraft.”

“I thought about the many folks I knew who had contributed to the mission and so many that I didn’t know, and that this one moment was tying it all together,” Jay continued. “I then started thinking about the fact that the heat shield, which is what I worked on, still had to do its job, and I wanted to get to the KSC Visitor’s Complex so I could listen to the mission unfold.”

Jay and a number of his closest team mates began working on this project 9 years ago.

“NASA missions like this are infrequent but so significant,” Jay said. “I really hold this experience as motivation to do my best for NASA. I savor the moment of seeing this application of all our work and it will keep me going for the next mission with its own challenges to overcome.”

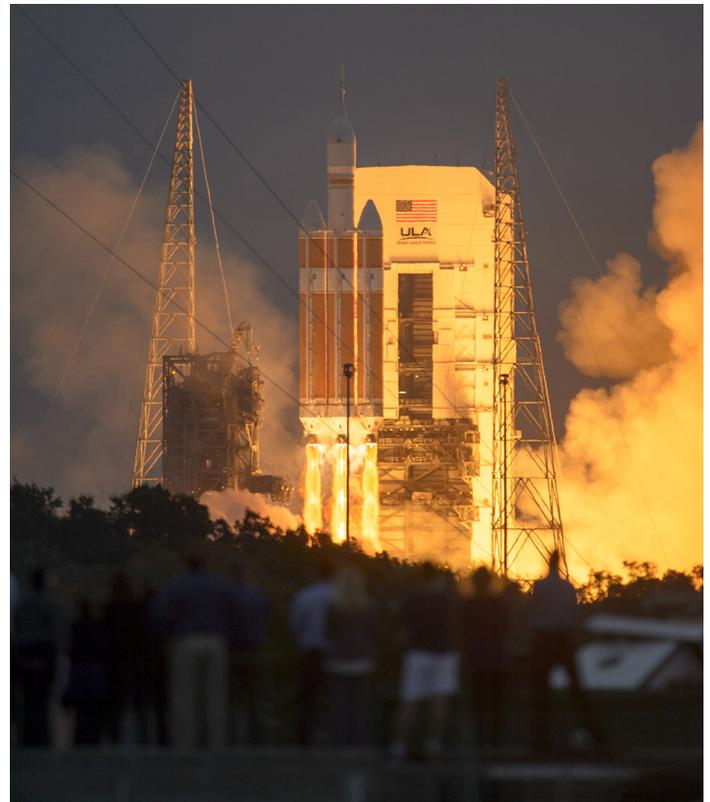


Image credit: NASA/Bill Ingalls
On Dec. 5, 2014, Orion launched atop United Launch Alliance’s Delta IV Heavy rocket from Cape Canaveral on the Orion Flight Test: a two-orbit, 4.5-hour flight that tested many of the systems most critical to safety. Jay Feldman attended the launch. “The moment of the launch was fantastic! It occurred right at sunrise, and the sky was beautiful,” Jay said. “The triple booster of the Delta IV Heavy rocket lit up an enormous fireball and shortly after there was a crackling sound and you could feel pressure waves rumbling your body. It was quite an experience!”

ECI Pilot Program Technologies Included in GCD's 2015 New Starts

—Denise M. Stefula

The Game Changing Development (GCD) Program's new starts for FY 2015 include two of the four technologies selected in 2014 for the Early Career Initiative (ECI) pilot program. The program encourages creativity and innovation among early career NASA technologists by engaging them in hands-on technology development opportunities needed for future missions.

NASA's Space Technology Mission Directorate (STMD) created the ECI to enable a highly collaborative, joint-partnering work environment between the best and brightest NASA early career innovators and leading innovators in industry, academia and other government organizations.

"We are extremely excited about the Early Career Initiative. Supporting young career professionals is a high priority in STMD," said GCD Program Manager Steve Gaddis. "James Reuther, STMD Deputy AA for Programs, championed this initiative and we are very happy to have two of the four efforts in GCD. The individual efforts are very exciting and went through a rigorous selection process. We look forward to their results."

The ECI new start projects are the Integrated Display and Environmental Awareness System, or IDEAS, and Revolutionize Propulsion Test Facility High-Speed Video Imaging with Disruptive Computational Photography Enabling Technology, or HiDyRS-X. IDEAS is being led out of NASA's Kennedy Space Center (KSC) and HiDyRS-X out of NASA's Stennis Space Center (SSC).

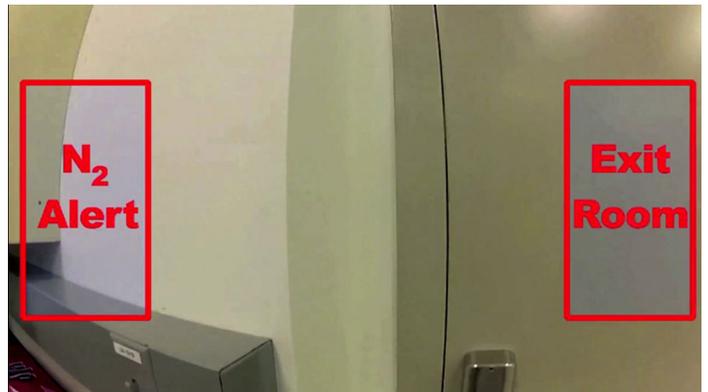
IDEAS

The IDEAS project combines the concepts of design visualization and wearable technology. As part of the Revolutionary Robotics and Autonomous systems theme, the goal is to complete an advanced prototype demonstration in a relevant ground operations environment of the integrated package of tools developed for the project, both hardware and software.

David Miranda, IDEAS project manager at KSC, describes the outcome as integrating wearable technology into the critical work of a NASA engineer. "This project is about ex-



IDEAS Project Manager David Miranda sports prototype glasses of the wearable technology.



Example of visual communications displaying a safety alert and instructions for the engineer/technician wearing the technology.

panding the world from your finger tips to the tip of your tongue and beyond," he says.

A wearable technology—including a head mounted display that can be used on Earth or in space—would provide visual communication and augmented reality information to its user. Operating "hands free" means engineers and technicians can call up user manuals and procedures as well as record activities and progress for safety and quality assurance. Improving situational awareness of NASA engineers and technicians in the field can improve both the efficiency and safety of a worker.

IDEAS team partners include Abacus Technology Corporation, Florida Institute of Technology's Human-Centered Design Institute, and local small business Purple Rock Scissors, which specializes in Web and application development. The wearable technology has potential for use in launch ground operations, human operations on the Mars surface, and space station operations.

HiDyRS-X

The HiDyRS-X project combines high dynamic range (HDR) imaging—traditionally performed using multiple cameras or a single camera set to multiple exposure sequencing—with advances in computational photography to achieve a transformative approach in producing high-speed 3D HDR imagery. This Affordable Destinations Systems and Instruments theme project will build upon SSC's imaging capabilities to develop a complementary, novel HDR imagery capability to use beyond rocket engine propulsion testing.

Never before attainable using standard digital imaging techniques, HiDyRS-X will enable one high-speed video camera that incorporates HDR imaging to record fast-moving objects or events. Merging HDR imaging coupled with high-speed video capture on a single camera significantly reduces costs and implementation complexities for propulsion testing data acquisition.

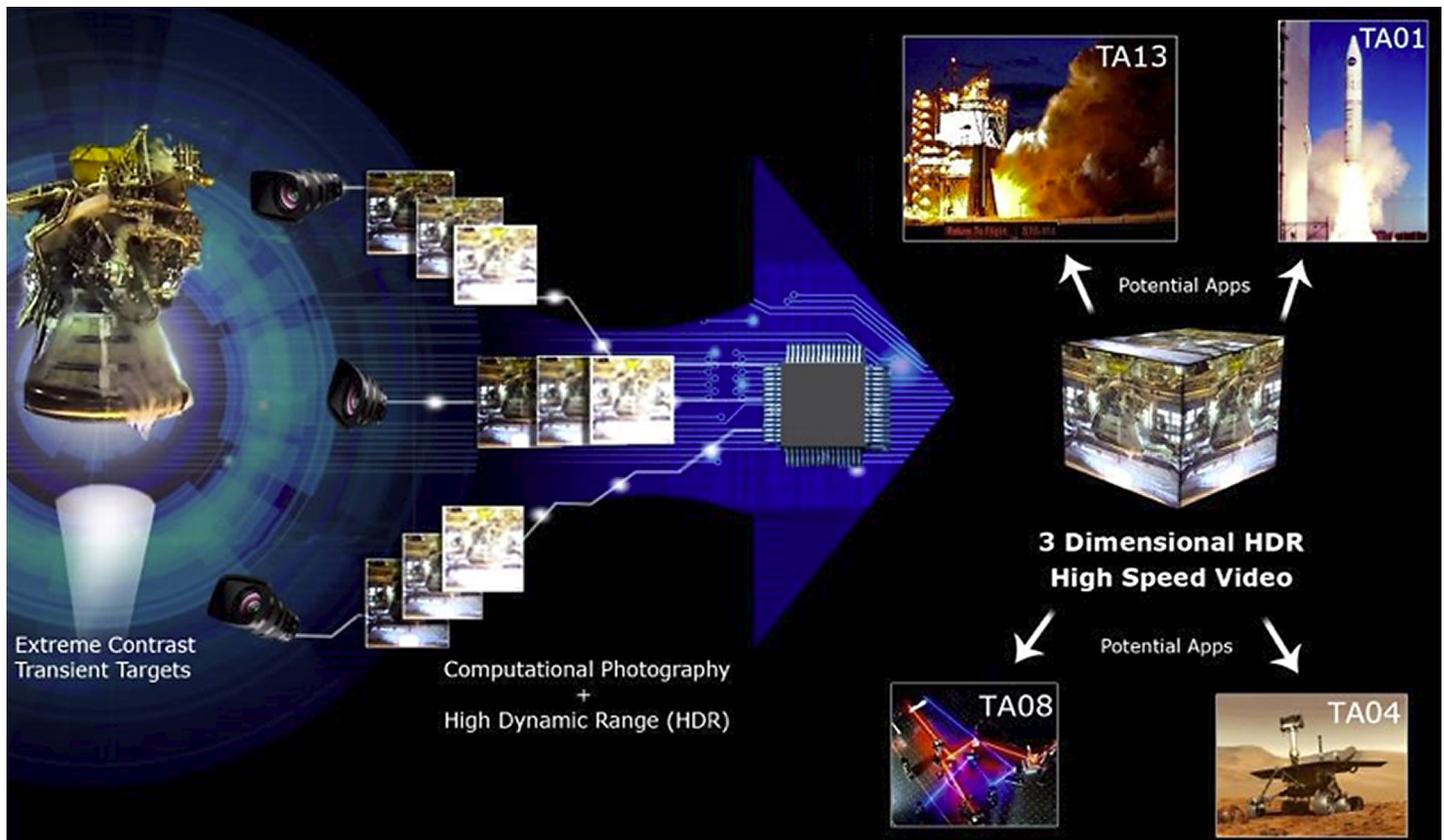
Howard Conyers, project manager for HiDyRS-X, is drawing on the existing advancements and people at SSC to build this high-speed video imaging system he believes



HiDyRS Project Manager Howard Conyers discusses building the hardware to enclose the technology used for testing the propulsion facility high-speed video imaging.

will revolutionize propulsion testing. “We are going to address high dynamic range issues to bring visualization to testing,” he says, “and to test the technology on uses beyond engine testing.”

Partnering with HiDyRS-X is Innovative Imaging and Research, a small technology company co-located at SSC specializing in imaging and optics. During the first year of research and development, the team wants to establish HDR software functionality for use on multiple cameras and demonstrate proof-of-concept before demonstrating the capability on one camera. The technology has promising applications for use on propulsion test stands and various Human Explorations Operations Missions Directive activities.



Artist's concept diagramming merging the imaging technologies into one novel concept with potential to support multiple NASA missions.



Small Business and NASA Work Together to Get Humans to Mars

NASA Administrator Charles Bolden, seen here with Bally Ribbon Mills Chief Ray Harris, got a firsthand look at work being done on advanced woven thermal protection systems used on the agency's Orion spacecraft during a visit to Bally Ribbon Mills (BRM) in Bally, Pennsylvania Friday, Jan. 9.

BRM President Ray Harries took Mr. Bolden on a tour of the mill, during which the administrator learned more about BRM's diverse product portfolio, ranging from military honor ribbons to spacecraft insulation systems.

New woven composite materials are an advanced space technology that mark a major milestone toward development of the space systems that will enable extending human and robotic presence throughout the solar system. As a manufacturer of high-performance multidimensional (3D) woven materials, BRM is weaving the multifunctional

thermal protection system padding used to insulate and protect NASA's Orion spacecraft. Orion, which recently completed its first flight test, will carry astronauts to Mars and return them safely to Earth with the help of this technology.

BRM's work on the advanced thermal protection system for Orion is being conducted under the auspices of NASA's Space Technology Mission Directorate in Washington. The work is managed by the agency's Ames Research Center in Moffett Field, California. The directorate continues to seek industry and university partnerships to assure the agency has the capabilities it needs, while helping America maintain its leadership in the technology-driven global economy.

*Sourced from: Bally Ribbon Mills online news archive.
Image credit: The Philadelphia Inquirer's website philly.com*

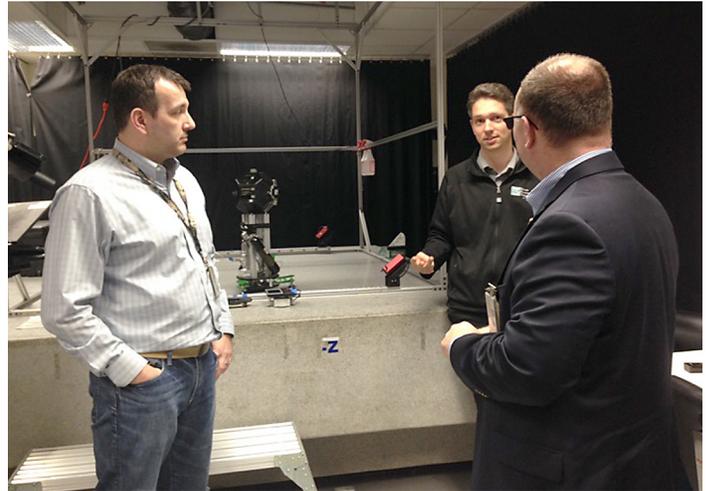
First-Quarter Review

The Game Changing Development Program Office traveled to NASA's Ames Research Center to conduct its First Quarter Review with project managers and NASA Headquarters representatives. The 3-day review focused on the technical, financial and schedule statuses of more than 50 technologies. Representatives from NASA industry

partners Lockheed Martin and Orbital-ATK were also in attendance. During the visit, members of the Program Office had the opportunity to tour facilities where work is being done on the following technologies: biomembrane, astrobee, coronagraph and nanotechnology.



(L to R) ESM Project Manager Mike Wright, GCD PE Ryan Stephan, GCD PM Steve Gaddis and GCD Integration Manager Mary Beth Wusk go over the tour stop agenda while at NASA Ames in January. The Program Office visits a different NASA center during each of its four reviews so the team can meet face to face with project managers and get to see the technology in person.



Program Manager Steve Gaddis talks with members of the Human Exploration Telerobotics project about Astrobee.

ESM Team Members Recognized

A team of researchers including Entry Systems Modeling (ESM) project members Rich Jaffe, Yen Liu, and Marco Panesi received the 2015 Physical Modelling Award at the 8th European Symposium on Aerothermodynamics for Space Vehicles in Lisbon, Portugal.

demonstrates the impact that ESM funded aerothermal modeling R&D is having on the international community," said ESM project manager Mike Wright.

The award is in recognition for their contributions to modeling non-equilibrium hypersonic flows and comes on the heels of their latest published work, "A Reduced-order Modeling Approach to Enable Kinetic Simulations of Non-equilibrium Hypersonic Flows." The aim of their current effort is to greatly improve fidelity of simulation of high temperature, non-equilibrium flows by eliminating restrictive assumptions on the distribution of excited states in the gas.

A key innovation of this work is to group certain excited states in such a way that the total number of simulated states is greatly reduced and the problem is made tractable. "This award not only highlights the high quality of the work being done by Rich Jaffe and his coauthors, it clearly



GCD Welcomes New Team Members

When a team member begins a new job or freshly assigned role within an organization or company, the feeling can be similar to that first day of the new school year we all felt as kids. It can be a challenge to become familiar with new office surroundings, job responsibilities, and different coworkers.

With Game Changing, our team members are important to us and our program cares about their successes and their professional and personal goals. We are delighted to see our newest team members getting settled in and comfortable. Please welcome aboard Julie Fowler, Nancy Hornung, and Rebecca Ernst.



Julie Fowler, Program Analyst

Julie's kaleidoscope work history with NASA demonstrates she is one who accepts change easily. "I am a team player whose focus is on the success of the people I support," she says. "I have excellent resource management skills to bring to the team that will keep the planning and execution of funding running smoothly."

Julie joined GCD in October 2014, but began working at Langley Research Center in 1978 as a co-op for the

Programs and Resources Division. In 1984, Julie left to become a full time mother, eventually returning to support the Center in temporary positions across multiple offices and divisions. In 1998, she returned full time working with the Office of Director in many different efforts through that assignment. From there, Julie continued variable assignments that included Advanced Planning and Partnerships Office and Aeronautics Research Directorate projects such as Supersonics, Rotary Wing, Subsonic Fixed Wing, the Environmentally Responsible Aviation, and Aeronautical Sciences. In 2011, a 1-year detail to the NASA Science Mission Directorate Resources Management Office to support Earth Science and Astrophysics. After once again returning to Langley, Julie worked on the ASCENDS, TEMPO, MISSE-X and SAGE III missions with Flight Projects before coming on-board with GCD.

"We are excited for Julie to become a part of the team. She has a great deal of experience from ARD," said Steve Gaddis, GCD program manager. "We need her experience and she will be a valuable asset to the team. She is a pleasure to work with and has already hit the ground running. She is a good fit. It feels like family."

Having worked at both the project and mission directorate levels, Julie looks forward to learning the GCD process, the various projects and their elements of the program, and connecting with other team members so she can effectively support GCDP.



Nancy Hornung, Program Analyst

Nancy’s official start with GCD was in December 2014, but with the holidays and wrapping up in her prior work she began her new duties in January 2015. Previously, Nancy supported the Aeronautics Research Directorate.

“We are thrilled to get Nancy and have her as an addition to the team. I know Rob needs the help and he is happy as well,” said Steve. “We expect good things from her. She is already off and running as well as being a good fit for the team. Glad she is on board.”

During her years in ARD, Nancy worked as a program analyst and supported several projects: Convergent Aeronautics Solutions, Airspace Systems Program, UAS Integration in the NAS Project, Aviation Safety Program, and Supersonics. Her role served to ensure the program manager’s success as they managed workforce, skill mix, funding levels, project plans, and milestones during project formulation, execution, and closeout. Prior to ARD, Nancy also worked in Procurement as a contracting officer.

Nancy says she brings to the table high energy, enthusiasm, creativity, technical capabilities and a quest to learn more and become an integral part of the team. “My early goals are to learn and understand the projects within GCD and become a proficient, “go to” member of the team.”

Nancy looks most forward to learning more about the GCD Program Office’s projects supporting space research endeavors.



Rebecca Ernst, Project Planner

Rebecca began her support of GCD in November 2014, previously working for a government contractor as a business development/proposal manager at the corporate office. Her work there specialized in DoD efforts.

“Rebecca comes to us from outside of NASA with a lot of experience,” said Steve. “She is helping in action item management, EPO, presentations, and Share Point implementation. We need her help. She is also a good fit and is coming up to speed very nicely.”

“I look forward to learning new and innovative things,” says Rebecca, who describes her greatest professional asset as a strong capability to “coordinate and manage large projects, and to implement and analyze data.”

Again, welcome aboard one and all!

Jurczyk Named Head of NASA Space Technology Mission Directorate

NASA Administrator Charles Bolden has named Steve Jurczyk as the agency's Associate Administrator for the Space Technology Mission Directorate, effective Monday, March 2. The directorate is responsible for innovating, developing, testing and flying hardware for use on future NASA missions.

Jurczyk has served as Center Director at NASA's Langley Research Center in Hampton, Virginia, since April of 2014. An accomplished engineer, he previously served as the deputy center director and in other leadership positions at the center prior to his appointment as center director.

"It's great to have Steve coming aboard to lead the technology and innovation engine of the agency," said Bolden. "Technology drives exploration and under Steve's leadership we'll continue the President's innovation strategy, positioning NASA and the aerospace community on the cutting-edge, pushing the boundaries of the aerospace with the technical rigor our nation expects of its space program"

Langley's current deputy director, Dave Bowles, will serve as acting director.

In May 2003, Jurczyk was named director of Systems Engineering. Before becoming Langley's Deputy Director, he previously served as director of Langley's Research and Technology Directorate.

Jurczyk began his NASA career at Langley in 1988 as an electronics engineer in the Electronic Systems Branch. While on detail to NASA Headquarters, he managed the Tropical Rainfall Measuring Mission and formulated the technology development strategy for the Earth Science Enterprise.

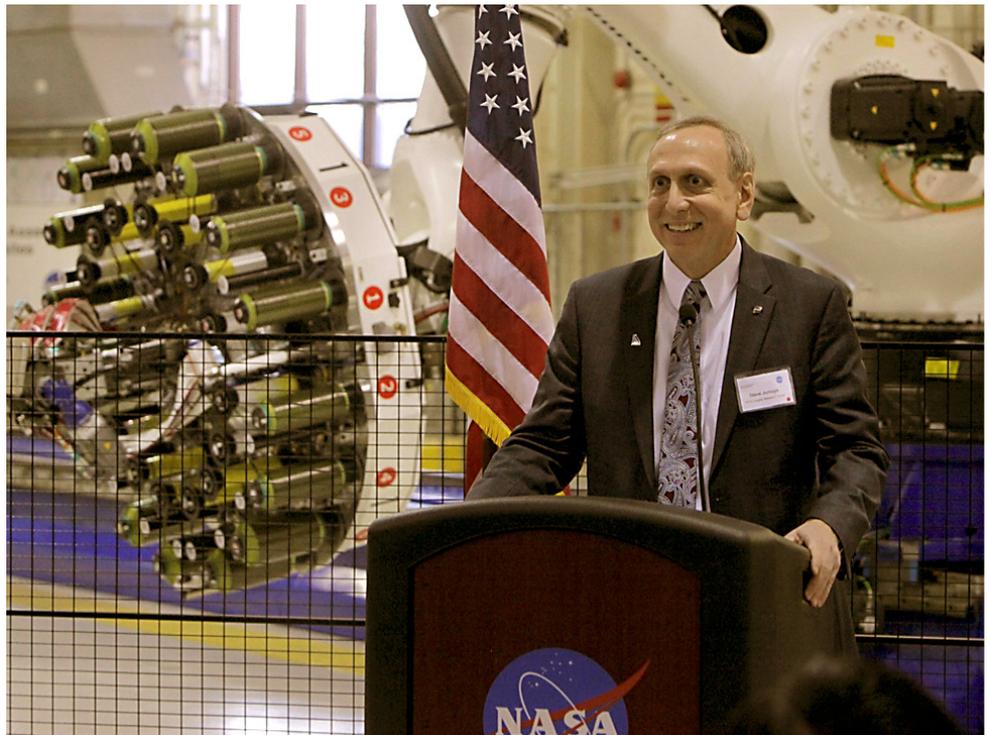
From 1994 to 1997, he was the Instrument Systems Engineer and later the Spacecraft Systems Manager for the Landsat 7 Project at Goddard Space Flight Center in Greenbelt, Maryland. He returned to Langley as head of the Electronic Systems Branch in the Aerospace Electronics Systems Division. In

2002, Jurczyk was selected as Deputy Director for Flight Systems in Langley's Systems Engineering organization.

Jurczyk earned bachelor and master of science degrees in electrical engineering from the University of Virginia in 1984 and 1986, respectively.

Jurczyk succeeds Michael Gazarik, who left this agency this month to become director of Technology at Ball Aerospace & Technologies Corp. in Boulder, Colorado.

"Mike's experienced leadership and commitment has been critical to building the strong foundation upon which our Space Technology Mission Directorate now stands," said Bolden. "Through his hard work and vision, he's developed an innovative, cross-cutting organization that creates the new knowledge and capabilities needed to enable our future missions. Mike's proven that technology drives exploration and is a critical component of our journey to Mars. His tireless work and dedication to fostering innovation at NASA will be sorely missed.



NASA's Steve Jurczyk addresses an audience during a manufacturing event in Hampton, Virginia, last month.

Image Credit: NASA/Gary Banziger

“Within our Game Changing team, members contribute to the STMD mission of ‘building, flying, testing’ in everything they do. Each month we are recognizing a GCD Employee of the Month, one who embodies the strong STMD ‘can do’ attitude.” — Steve Gaddis, GCD program manager

GCD Employee of the Month: Anne Rhodes

Anne Rhodes has been the Game Changing Development Program Office graphics artist for about 2.5 years. She holds a bachelor’s degree in art from Virginia Tech and has worked at Langley as a contractor since 1978. Anne’s responsibilities include designing print and display products for public outreach as well as any other graphics support as needed.

“Anne is 100% dedicated to the Space Tech mission and endlessly supports all we do in Game Changing,” said Program Manager Steve Gaddis. “Over the holidays and even recently during a time of personal loss she came in to work and kept our publications and graphics moving forward. That’s real dedication. She is a pleasure to work with and we are glad for her support.”

Because Anne’s response to our regular interview questions was so fabulous, we won’t spoil this interesting read reshaping it in anyway. Congratulations Anne on a well-deserved recognition!

GCDQ: What do you most like about your job and the people you work with?

I enjoy the new creative opportunities and challenges that are available to me working for GCD. For most of my career at Langley, the bulk of my work has been technical figures, NASA documents, and PowerPoint presentations. Now, I design and produce an annual magazine, bimonthly newsletter, fact sheets, posters, displays and other outreach materials.

I like working in a smaller office where every person, whether civil servant or contractor, is considered part of the team. I also value the appreciation and the support that they give each other.

GCDQ: Please tell us about your family.

I grew up in Yorktown with three younger brothers and a younger sister.

My father was a “NACA Nut,” who retired from Langley in 1980 after almost 40 years of service. My mother worked as a secretary at NACA until I was born. My siblings and I attended Walsingham Academy in Williamsburg, and four of us graduated from Virginia Tech.

I met my husband George 13 years ago during a Court House Players (CHP) production of *Annie*. The CHP is a community theatre organization that serves Gloucester, Mathews and

Middlesex. I was playing Daddy Warbuck’s housekeeper, and he was working backstage. We celebrated our tenth anniversary in July and are still involved with CHP. George is technical director in charge of lighting, sound and special effects, and I’m still helping out behind the scenes in various capacities and occasionally appearing on stage.

George owns his own retail business, Office Supply, located on Main Street in Gloucester. We have a daughter Amber and son Gus (actually George III). Amber works for George in his store as a picture framer. She has an 11-year-old son Landon and is expecting a daughter in June. Gus has his own drywall business and recently became engaged.

GCDQ: What are your favorite hobbies/activities?

I’ve been a member of CHP for over 20 years. I was active in drama in school, but hadn’t really been involved as an adult until I saw a CHP audition notice for *Oliver*, one of my favorite musicals and landed a part in the chorus. Since then, I’ve performed in the chorus of a dozen CHP musicals and have had speaking roles in several comedies.

After several years of assisting other costumers with sewing, I decided to try costume design and have costumed many shows over the last few years. This year, I have to a tough decision to make because CHP’s fall musical will be *Mary Poppins*—a show that I would love to both audition for and costume.

I’ve worked in many other backstage positions for CHP, and I’m in charge of all of CHP’s graphics, including poster and ad design and program preparation for three shows each season. In the past, I’ve produced CHP’s membership newsletter and served on CHP’s executive board as public relations chair.

George is the owner of a 2003 Anniversary Edition Harley Davidson (that Gus now rides) and a 2009 BMW touring bike. After we married in 2004, our honeymoon was a 3 ½ week cross-country tour sponsored by the Harley Owner’s Group through every state west of the Mississippi River with 600 other Harley riders. The second leg of the tour was the following summer when we rode through all of the eastern states. More recently, we’ve been traveling around Virginia and up and down the East Coast on the BMW.



Education & Public Outreach

Members of the Game Changing Development Program Office hit the ground running in 2015 by supporting several conferences and outreach events. Program Manager Steve Gaddis participated in panel discussions at both the Big Sky Conference in Montana and Aerospace Days in Richmond, Va. Communications Manager Amy McCluskey supported the AIAA SciTech event in January, as well as the ARPA-E Energy Innovation Summit in February and the first Low TRL Workshop held by STMD in March.

Spring promises to be just as busy with additional conferences and outreach events such as Tech Day on the Hill in April and the San Mateo Maker Faire and Composites Materials and Manufacturing Technologies for Space Applications Technical Interchange Meeting in May.

Upcoming Events

- April 29** Tech Day on the Hill, Washington DC
- May 5-7** The Human to Mars Summit 2015, Washington DC
- May 6-7** Composites Materials and Manufacturing Technologies for Space Applications Technical Interchange Meeting, New Orleans, La.
- May 15-16** San Mateo Maker Faire, San Mateo, Calif.



NASA Edge continued filming in February for a Game Changing Development Program show that focuses on nanotechnology. Here, Franklin Fitzgerald interviews material research scientist Mia Siochi at NASA Langley.



NASA Space Technology Mission Directorate's Low TRL Workshop was the first of several workshops the directorate plans to hold this year. This workshop focused on work in the areas of helio and astrophysics.



Game Changing Development Program Manager Steve Gaddis (far right) visited Del. Bill DeSteph's office in Richmond, Va., during Aerospace Day, Feb. 4.

NASA Holds Media Day at Mezzo

NASA's Space Technology Mission Directorate (STMD) held a media day at Mezzo Technologies in Baton Rouge, La., Feb. 24. NASA and Mezzo Technologies are working together to build advanced heat exchangers as part of the Phase Change Material Heat Exchanger project. Ryan Stephan, program executive for the Game Changing Development Program, attended the media day and talked with reporters about how STMD and small business work together on unique specialized technological capabilities that will further NASA's current and future exploration

plans. Two local Baton Rouge television stations (WAFB, WBRZ) and a reporter from The Advocate, the city's local daily newspaper, attended the media day to learn more about Mezzo's diverse product portfolio, ranging from spacecraft heat exchangers and systems used on the International Space Station to advanced technologies being planned for future deep space missions.



Image Carl Howat/NASA

Mezzo Technologies President Kevin Kelly speaks with a reporter from The Advocate during a NASA media day.



Image Credit: Bill Feig/The Advocate

GCD PE Ryan Stephan and Rubik Sheth, PCM project manager, inspect a heat exchanger during a visit to Mezzo Technologies.



Game On!

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National Aeronautics and Space Administration
Langley Research Center
 Hampton, VA 23681
www.nasa.gov



For more information, contact
 Amy McCluskey
 Communications Manager
 Game Changing Development Program Office
 NASA Langley Research Center
 757-864-7022
amy.leigh.mccluskey@nasa.gov