

# HDTV enhances station communication

## Farewell to analog

High Definition (HD)TV has dramatically increased the quality and speed of global communications with the International Space Station.

Dylan Mathis, Mass Communications lead in the International Space Station External Integration Office, explained that with the advent of HDTV, NASA can communicate with synchronous audio and video in a live or played-back mode to bring to life the story of the station with significantly increased audio quality. Prior to using this type of system, audio and video were totally separate and not included in the video. HD resolution is nearly five times that of traditional TV.

"Basically, HD and digital TV are here to stay, and analog TV is going away," said Carlos Fontanot, chair, station Imagery Working Group. "Analog TV is much more forgiving than digital TV. With rabbit ears, you would move the antenna and the signal might come in noisy and snowy. With digital TV, either it's there or it's not."

## Partnership with JAXA

In partnership with the Japanese Aerospace Exploration Agency (JAXA), NASA has done two major HDTV downlink projects.

With the first project, NASA made TV history by producing the very first live HD broadcast from the station to Earth on Nov. 15, 2006.

For the second project in 2007, "we partnered with JAXA again to do a Station Detailed Test Objective (SDTO)," Mathis said. "We put semi-professional (prosumer)-sized HD camcorders and hardware on orbit, giving us

the capability to downlink from multiple locations within the United States On-orbit Segment."

To explain the partnership, Fontanot said the Japanese, in the advent of launching their module quite a few years ago, developed their own HD system, the Multi-Protocol Converter (MPC). They developed it in parallel to the system we had, the Space Video Gateway, and the Japanese system turned out to be very "swift, agile, (and) required less bandwidth to downlink. They



*A view of the Earth from station.*

NASA/PHOTO

were very interested in testing it onboard."

Fontanot said the Imagery Working Group facilitated the launch, deployment and testing of JAXA's MPC SDTO, which are experimental systems. It was very successful, to the point of "becoming the preferred system. We are now having to backfill, develop and make the infrastructure more robust on the ground to declare it operational, but it is a Japanese system."

## A world of possibilities in communications

"Imagery is a very important part of communicating what goes on aboard the International

Space Station, whether it's for operations, training (or) payloads," Mathis said.

To date, more than 200 hours of HD video have been downlinked from the station. The video has included a variety of activities and special messages from the crew.

"Because of this technology, we get to see live in-flight events that are managed by (the Office of Communications and) Public Affairs here at Johnson Space Center," Fontanot said.

News media are able to

"We've got a spacecraft going 17,500 mph that has to send a signal to a satellite in space, then to the ground in White Sands, NM, then via fiber-optic cable to JSC, and finally to the public. All of this is done in milliseconds," Mathis said.

## What the future holds

Mathis said that "we've taken this technology and we've worked with the (Space) Shuttle Program to provide them with the capability, as well. They should be getting downlink on the STS-119 flight and for the remaining shuttle flights. We will use this system to downlink HDTV."

"This provides the possibility of seeing station fly-arounds in real time, or near real time, in HD so that we can show the world what we're doing and make them a part of it," Mathis said.

As for upcoming ventures, Mathis said the next phase after the shuttle mission is that "we are also looking up multiple possibilities for live external HD cameras to show Earth views. Then we will explore the latest video compression technologies that allow us to downlink higher quality with less data. This has a direct application to the Constellation Program."

The IMAX will fly on the STS-125 repair mission to the Hubble Space Telescope, currently scheduled for May. Using external cameras in the shuttle cargo bay, the crew will capture video of the Hubble being repaired. Then IMAX will incorporate in-cabin scenes to the final product. This is just one example of the many exciting things to come with HD technology and the space exploration program.

conduct interviews with the crew. It is also used for special events. For instance, the crew onboard can downlink special messages for holidays.

The technology is also used for in-flight educational events in which astronauts can interface with students to demonstrate experiments, or during the repair of a broken treadmill, or to capture hours of Earth views and visiting vehicles to the station docking and undocking, either live or recorded.

## Speedy delivery

Mathis said it is tremendously complex to send any data, such as video, from the station to the ground.



NASA/PHOTO

Russian Progress vehicle shortly before docking.



NASA/PHOTO

The International Space Station is behind Space Shuttle Endeavour during STS-126, shortly after undocking.



NASA/PHOTO

Space Shuttle Endeavour during STS-126, as seen from the station.



NASA/PHOTO

A torn space station solar array that was eventually fixed during a spacewalk.



These photos are HDTV screen shots, utilizing the most current technology available today.

# Space Invasion: **Texas style**

By Victor Scott

**Space Week Texas 2009** was a space exploration celebration as big as the Lone Star State, featuring out-of-this-world space exhibits, educational presentations for students, astronaut appearances, legislative resolutions and the chance to touch a 3-billion-year-old moon rock. NASA turned 50 last year, and the International Space Station turned 10. This summer, America celebrates the 40th anniversary of the Apollo 11 lunar landing. Space Week celebrated all these space exploration milestones and also gave participants the chance to see what NASA's next giant leap will be. The initiative was organized in collaboration with the Bay Area Houston Economic Partnership and aerospace industry partners.

The shining star event was Space Day at the Capitol, and it blasted off on March 5. Space Week Texas 2009 ran March 4 to 8 in Austin, Texas, and March 9 to 12 in College Station, Texas. Venues for the celebration included the University of Texas campus, the Texas Capitol, the Lyndon Baines Johnson Presidential Library and Museum in Austin and the George Bush Presidential Library and Museum in College Station. Space Week offered thousands of students, teachers and members of the public the chance to join NASA's exciting and inspirational space exploration journey.

*Astronauts are cool! NASA mascot Cosmo provides shade from the hot sun on the Capitol lawn for a young space fan.*



NASA/HARNETT JSC2009E053388

For more Space Day at the Capitol photos, visit: <http://www.jsc.nasa.gov/jscfeatures/>



NASA/PHOTO JSC2009E053424

*Space invasion: Hundreds of Austin-area students invade the Texas Capitol for Space Day.*



NASA/PHOTO JSC2009E053383

*Hear ye! Hear ye! NASA is recognized by the Texas Legislature for its economic, educational and inspirational contributions to the Lone Star State.*



NASA/PHOTO JSC2009E053383

*Robots, robots, robots! Students are entertained and educated by the mechanical mysteries of robots.*

# Breakthroughs in laser peening bring Johnson Space Center to the forefront

By Brandi Dean

**Most** of the time, Omar Hatamleh is the subsystem manager for the shuttle wings and tail. But on the side, he's helping Johnson Space Center become a worldwide authority on laser peening.

Laser peening is a process that uses high-energy pulses from a laser to increase the resistance of metals and alloys to fatigue and improve their strength. It's not a new idea—the process was invented in the 1960s—but only in the last two decades have the power of lasers required become feasible. Even now, there are only two commercial laser-peening facilities in the United States. But the concept, which also helps prevent cracks from forming and stop those that have formed from getting worse, is starting to catch on. Hatamleh thought that JSC should get in on the action.

In particular, he thought that laser peening could be used to



NASA/PHOTO isc2008e155437

*Omar Hatamleh discusses laser peening at a conference at JSC.*

strengthen welds on future space vehicles. Stronger welds mean you can use less material to begin with, saving weight in the vehicle and freeing up weight for cargo.

The Constellation Program is already looking at using friction stir welding, a process that uses the friction from a cylindrical-shouldered tool to heat the metal, causing it to soften without reaching the melting point. The conventional fusion welding process welds the material by melting it, which weakens it. Friction stir welding is already being used in several NASA applications, including the external tank. Although it is a welding process with many advantages, there's always room for improvement.

That's what gave Hatamleh the idea. A few years ago, he was working a beam that had been friction stir welded but developed cracks due to tensile stresses, or stresses that pull two sides of something apart.

"I kept thinking about, 'Okay, the friction stir weld doesn't have as much stress as a fusion weld, but it still has some stresses,'" Hatamleh said. "So what about if we tried to further reduce those stresses? That's how I started thinking about bringing the two together."

After some testing, he found that laser peening a friction stir weld not only strengthened it by 50 percent, it also significantly increased the time it took to develop cracks and the time it took for cracks to get larger. This is good news for friction stir welding, since the heating cycle the material



NASA/PHOTO

*Friction stir welding is being used in many NASA applications.*

experiences during welding and the clamps used can put residual stresses on the weld.

And those are only the preliminary results. Hatamleh believes that with some optimization, laser peening might be able to further strengthen welds beyond the levels achieved so far.

"Once you start tinkering with these kinds of things and see how much

improvement you can get, it becomes addicting," Hatamleh said.

He also started looking for more sources of information on laser peening and found that it wasn't easy to come by. There had never been a laser peening conference before—laser peening had only been tagged onto conferences on other subjects. Since interest in the subject has been growing recently, Hatamleh thought it was time, and so did others.

In December, Hatamleh organized the first International Conference on Laser Peening in Houston, bringing most of the prominent scientists from nine countries to JSC to talk about industrial applications for laser peening.

"It went very well," Hatamleh said. "Everybody asked us to put together another conference for next October."

But laser-peening enthusiasts weren't the only ones to benefit from the conference.

***"Once you start tinkering with these kinds of things and see how much improvement you can get, it becomes addicting."***

"Not only did we gather and talk about laser peening," Hatamleh said, "but holding the conference will also help situate NASA at the forefront of this technology and establish JSC as the center of gravity for propelling this novel industrial application forward."

Hatamleh now gets e-mails and phone calls, on a regular basis, from people asking for his opinion. That's not exactly unusual for a NASA engineer, but as JSC isn't primarily a research center, Hatamleh wasn't expecting it. He does, however, appreciate it.

"When people are looking at laser peening and the NASA name keeps popping up in this area," Hatamleh said, "that's good for NASA."

# Spotlight Tim Reynolds

Supervisor, Operations Control Center in the Space Vehicle Mockup Facility

Time at Johnson Space Center: 13 years



MASA/PHOTO

**Q: What is the coolest part of your job?**

**A:** To get to work with all the great people at JSC, from the trainers, support staff and, of course, the flight crews on a job that so few people in the world will ever have a chance to experience.

**Q: What are your favorite hobbies or interesting things you do away from the office?**

**A:** Skiing, snow-shoeing, backpacking and scuba diving.

**Q: What would you be doing if you weren't in your current job at JSC?**

**A:** I really don't know what I would be doing, but I would hope to be doing it in Colorado or New Mexico. NASA was my dream job since I was 9 years old.

**Q: What would people be surprised to know about you?**

**A:** That I have been playing guitar for over 30 years.

**Q: Favorite quote or motto?**

**A:** "And we stand and watch the gods and idols fall as the blameless ones go blindfold to the wall." – R. Trower

**Q: Favorite sport?**

**A:** America's Cup yacht racing.

**Q: Last good book you read?**

**A:** "Adrift: Seventy-Six Days Lost At Sea" by Steven Callahan.

**Q: Best music in your collection?**

**A:** "Feeding Frenzy" by Jimmy Buffett.

**Q: Who are your heroes?**

**A:** My father. Second would be growing up with the space program and seeing the astronauts perform incredible feats in space month after month. I always thought the Gemini Program was awesome because we learned the basics of (spacewalk) and rendezvous.

**Q: What does JSC mean to you?**

**A:** What NASA and JSC mean to me is that it is such a privilege to get to work on the (human spaceflight) program in the first place. (My) best memories are made all the time watching astronaut candidates come in and getting to know them, then watching as they move closer and closer to flying a few years later (and) then talking with them after their flight. It's great to have been able to see so many go through the process and achieve their dreams, and it's a pleasure to work with them every day.



MASA/PHOTO

## WANTED!

Do you know a JSC colleague or team that does something extraordinary on or off the job? Whether it's a unique skill, interesting work, special professional accomplishment, remarkable second career, hobby or volunteerism, your nominee(s) may deserve the spotlight!

The Roundup shines the light on one special person or team each month, chosen from a cross section of the JSC workforce. To suggest "Spotlight" candidates, send your nomination to the JSC Roundup Office mailbox at [jsc-roundup@mail.nasa.gov](mailto:jsc-roundup@mail.nasa.gov). Please include contact information and a brief description of why your nominee(s) should be considered.

# Center Scoop

## EARTH DAY, APRIL 22, REMINDS US TO BE SMART WITH OUR RESOURCES

**Johnson** Space Center employees are doing a fantastic job of recycling mixed office paper. But have you thought about how to make a difference before recycling? The three Rs stand for Reduce - Reuse - Recycle. Ideally, we should reduce the amount of material needed to do a particular job. Set up printers and copiers to automatically print double-sided. You can still print a particular job single-sided if need be, but we can substantially reduce the amount of paper used at JSC by printing double-sided. Also, think twice before printing that e-mail or document. Can it be reviewed or edited electronically without printing it? Last year, JSC spent \$1.4 million to purchase office paper. Reducing paper use saves money as well as natural resources like trees, water and oil.

## DID YOU KNOW THE STARPORT CAFÉS COMPOST?

**Since** December, both Starport Cafés in Buildings 3 and 11 have participated in a compost project. Food service employees sort food preparation scraps and coffee grounds for compost on site. Food scraps include vegetables, fruits and grain products that would otherwise be thrown away during the meal preparation process for breakfast and lunch. JSC has three compost barrels—situated by Building 42—that produce nutrient-rich compost for use around site.

This project is proving to be quite successful and is growing. Watch for more sustainable practices around site as JSC moves to the “greener side.”



NASA/PHOTO ISS015E22276

*Earth Day reminds JSC team members to be smart with resources to help care for the planet.*



## NASA NIGHT WITH THE HOUSTON ROCKETS

**The** Feb. 24 Houston Rockets game featured pre-game recognition of astronauts Patrick G. Forrester and Charles O. Hobaugh, the frequent inclusion of JSC’s mascot, Cosmo, court-side during the game and an astronaut autograph session for fans. The event reached an audience of 17,515 in the Toyota Center, with a record number of over 700 JSC team members attending the special NASA Night.

*Astronauts Charles O. Hobaugh (left) and Patrick G. Forrester participated in NASA Night at the Houston Rockets.*

## Roundup

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# Texas Independence Trail Ride

makes a special stop at the center



**A touching reminder of wild-west history clip-clopped through the present as the Texas Independence Trail Ride made a special stop at Johnson Space Center on Feb. 24.**

JSC team members came out along the parade route near Rocket Park and 2nd Street as the trail ride wound its way to the Gilruth Center. A few riders, as well as Remi the rodeo clown, swung by the JSC Child Care Center to entertain and educate the kids. The trail riders then got a taste of JSC hospitality as they camped out at the Gilruth Center overnight