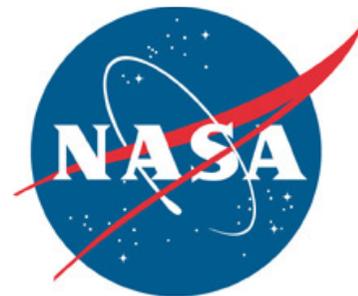


# Spaceport News



John F. Kennedy Space Center - America's gateway to the universe

## NASA helps get OPF-3 a new commercial user

By Steven Sicheloff  
Spaceport News

The Boeing Co. will set up Orbiter Processing Facility-3 at Kennedy Space Center to manufacture and assemble its CST-100 spacecraft for launches to the International Space Station under a newly signed agreement with NASA and Space Florida. And that deal could provide a glimpse of how Kennedy's unique facilities will be used in the future.

"It's a clear sign that NASA will continue to be an engine for growth," said Lori Garver, the agency's deputy administrator, in announcing the deal during a ceremony Oct. 31 at OPF-3. "Together we're going to win the future right here."

This deal, expected to produce 550 jobs by 2015, may be the first of several affecting other Kennedy facilities as the center sorts through what it needs for the future and what can be turned over to others. The retirement of the space shuttle fleet earlier this year made a number of facilities available for future use.

"Kennedy is moving forward," said Bob Cabana, the center's director. "Partnerships are going to be key."

The White House also praised the agreement in a statement released Oct. 31. "My administration will be pressing forward, in partnership with Space Florida and the private sector, to create jobs and make sure



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NASA/Kim Shifflett

Frank DiBello, president of Space Florida, speaks to the audience after announcing the signing of an innovative agreement between NASA and Space Florida in Orbiter Processing Facility-3 (OPF-3) at Kennedy Space Center on Oct. 31. NASA announced a partnership with Space Florida to occupy, use and modify Kennedy's OPF-3, the Space Shuttle Main Engine Processing Facility and Processing Control Center. Space Florida has an agreement for use of the OPF-3 with the Boeing Company to manufacture and test the company's Crew Space Transportation (CST-100) spacecraft. The 15-year use permit deal is the latest step Kennedy is making as the center transitions from a historically government-only launch complex to a multi-user spaceport. For more, click on the photo.

America continues to lead the world in exploration and discovery," President Barack Obama wrote.

The agreement was held up as an example of public and private enterprise cooperation.

Under the deal, NASA turned over the facility, which had been used to process space shuttles for launch, to Space Florida, an aerospace economic development agency of the state. Space Florida, in turn, agreed to let Boeing use it.

It was a deal that took about a year to complete, according to Florida Lt. Gov. Jennifer Carroll, who also is the chairwoman of Space Florida.

"I think we have it just right, that this is a true partnership," Carroll

said, "that all have an equal part in this and an equal opportunity in this and we can move forward with other companies that want to come in and have a public, private partnership with us."

Officials indicated there will be such agreements coming up.

"This is just the first of much to come," said Sen. Bill Nelson of Florida. "You just wait until you see what's coming here to the Kennedy Space Center in the future in the way of public/private partnerships."

In OPF-3, the immediate future involves removing the infrastructure of work platforms and ground systems that were used to service space shuttles that returned for orbit

and were being prepped for another flight. That should take about a year, said Boeing's John Mulholland.

After that, fixtures tailored to the CST-100 will be moved onto the floor, which, at some 29,000 square feet, is large enough to accommodate several CST-100 capsules at once as they go through the assembly.

The CST-100, which stands for Crew Space Transportation, is a reusable, capsule-shaped spacecraft built to ferry seven people into Earth orbit. Working with NASA's Commercial Crew Program, Boeing envisions the first missions carrying astronauts to the space station, possibly as soon as 2015.

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# Sensor RESOLVES to find water beneath moon surface

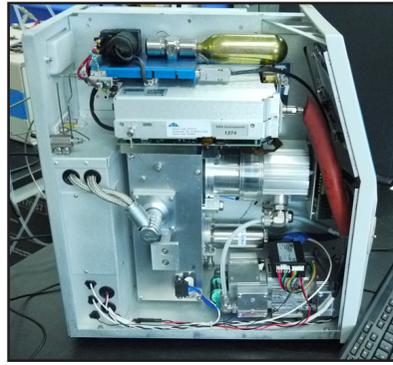
By Linda Herridge  
Spaceport News

When NASA's Lunar Crater Observation and Sensing Satellite (LCROSS) impacted the moon's surface Oct. 9, 2009, it sent data back to Earth that indicated there was water beneath the surface. Could that water be harvested for life support or to help fuel rockets on interplanetary missions?

To investigate the possibilities, a group of Kennedy Space Center engineers are leading the second of three Advanced Exploration Systems (AES) projects at the center. This one is entitled, Regolith and Environment Science & Oxygen and Lunar Volatile Extraction (RESOLVE) for Robotic Lunar Polar Lander Mission.

RESOLVE, in its third generation, is a miniature drilling and chemistry laboratory about the size of an extra-large suitcase packaged onto a medium-sized rover. It will collect and analyze soil for volatile components such as water or hydrogen that could be used in human exploration efforts.

Kennedy's RESOLVE Project Manager Dr. Jacqueline Quinn said the three-year project's goal is to contribute to a mission that will land a rover and analyzer near the south pole on the moon's shadowed side



NASA/Gianni Woods

Inside a laboratory at the Operations and Checkout Building, a commercial off-the-shelf unit is being evaluated for use in the RESOLVE project.

where ice may exist from meteor impacts millions of years ago.

"The goal is to search for and find water and other volatiles just below the moon's surface," Quinn said.

According to RESOLVE's Volatiles Analysis Lead Janine Captain, all of the work to develop the fluids and ground control system, electronics and software package will culminate in a field demonstration planned for July 2012 in Apollo Valley in Mauna Kea, Hawaii. Following the field test, the RESOLVE team will proceed towards developing a vacuum-rated version with hopes that it will become a payload onboard either a NASA or commercial lunar lander as early as January 2015.

"The field test location in the

middle of the largest Hawaiian island is barren and desolate and its terrain best mirrors conditions on the moon," Captain said. "Although not easy to travel to, it is an ideal location to demonstrate in situ resource utilization."

During the field test, the rover containing the RESOLVE unit will be deployed and its systems will be autonomously controlled. Team members will monitor the progress from a remote location near Apollo Valley and from Firing Room 1 in Kennedy's Launch Control Center.

Software Lead Tom Moss said that the biggest challenge for the software team is to communicate with and coordinate the operations of each of the different subsystems from NASA and RESOLVE partner,

the Canadian Space Agency (CSA). "The other challenge is to find the right balance between complete autonomy while still providing the scientists the capability to tweak the operation as necessary to answer the fundamental science questions," Moss said. "This has been the most fulfilling work I've ever done in my career with NASA."

Contained in RESOLVE are a gas chromatograph and mass spectrometer, which together will separate and analyze gases. The fluid system will take the water (from a

gas) and make a water droplet by condensing the water on a cold plate. The water droplet will be photographed and the image sent back to the Earth for all to see.

Captain said RESOLVE also has the ability to make oxygen from the lunar soil using a process called hydrogen reduction. The fluid system will recirculate hydrogen gas that is used to extract the oxygen from the lunar soil during oxygen production.

"The design of the fluid system required us to push toward a flight-like system while making sure the system would work for the field test," Captain said. "The droplet demonstration is an exciting aspect of the fluid system that everyone will be able to relate to."

According to Avionics Lead Curtis Ihlefeld, the avionics system consists of two computers provided by CSA and uses software developed at Kennedy to control the various heaters, valves and motors while RESOLVE gathers pressures, temperatures and other measurements.

CSA also will provide a drill and sample handling subsystem. The drill will use two types of bits to simulate digging, a coring bit and an auger bit.

"My sincere hope for the Hawaiian lunar analog site is a flawless, uneventful operation," Ihlefeld said.

## KEA: Planning can make for a smooth Space Act Agreement

By Steven Siceloff  
Spaceport News

Space Act Agreements are a critical element of business at Kennedy Space Center, so the Office of the Chief Counsel offered a primer for making the deals during a Kennedy Engineering Academy (KEA) session Nov. 9.

"If you do some pre-work, it'll go smoother for you," Penny Chambers, Kennedy's agreements manager, told the audience at Kennedy's training auditorium. "That's the big thing, that the requirements are met."

Recent agreements at

Kennedy have covered things from allowing the center to be used for filming "Transformers: Dark of the Moon" to transferring Orbiter Processing Facility-3 to Space Florida so it can be used by The Boeing Co. to manufacture and process its CST-100 spacecraft.

New projects including the Commercial Crew Program are using agreements, both funded and unfunded, to work through partnerships with private companies building their own spacecraft and rockets.

Although each Space Act Agreement goes through the Chief Counsel's office for

approval, much of the drafting is done by the person who wants the agreement. That's where the Space Act Agreement Maker, or SAAM, comes in. Yes, there's an app for that.

Working with SAAM, the person setting up the agreement should set up clearly what NASA is going to be obligated to do and what the partner has to produce in the deal.

"If you've done all your homework, you will have what you need to answer the questions, Chambers said.

The chief counsel's office tries to review each new agreement within 30 days,

Chambers said. If there is a question, she said she consults the attorneys in the office who apply their own experience and specialization.

"Anytime it looks like something NASA should be buying (instead of making an agreement for), the bells and whistles go off," said Tracy Lee Belford, an assistant chief counsel who helps review agreements.

A host of reference materials and the SAAM application are available at the chief counsel's link on Kennedy's internal Web site. Chambers pointed would-be agreement makers to the

site as the starting point for rounding up what is needed to see an agreement through to completion.

"Read as much as you can," Chambers said.

Established in May 2007, the KEA was established to provide Kennedy's engineering community with an institution for the sharing of technical knowledge across programs; manage learning resources within the Engineering Directorate; and develop a culture of engineering excellence in which to learn continuously, inquire constantly, and share openly within and beyond the engineering community.

# Mars Science Laboratory uses 'fancy power supply' to do its job

By *Steven Sicheloff*  
*Spaceport News*

About the size of a small SUV and weighing as much as some cars, the Mars Science Laboratory "Curiosity" is being asked to conduct the most intensive examination of the surface of the red planet ever attempted. It carries cameras, a robotic arm, drill and even a laser to vaporize bits of rock at a distance.

That's too much work for solar panels to power, so NASA is fueling the rover with a plutonium-powered battery of sorts called a multi-mission radioisotope thermal generator, or MMRTG. Loaded with 10 pounds of the material, the power source is expected to generate electricity for a mission lasting at least two Earth years.

"It requires a fancy power supply in order to do the job," said Dr. Pam Conrad, deputy principal investigator for MSL. "This enables

us to make measurements all day, every day, at night, in the winter."

Before researchers get a taste of groundbreaking research about Mars, the launch team at NASA's Kennedy Space Center in Florida is focusing on its responsibility to safely launch the spacecraft and its power source.

Even if there were an accident and a release of plutonium, something officials put at a 3-tenths of one percent chance of happening, the material would most likely remain on federal property either at Kennedy or Cape Canaveral Air Force Station, the mission's launch site.

However, preparation has been the foremost thought for NASA officials and the launch team will be beefed up with officials from the Lawrence Livermore National Laboratory in Calif., specifically the National Atmospheric Release Advisory Center, or NARAC, a team that models plumes to

predict radiation hazards.

Ron Baskett, an atmospheric scientist for NARAC, said a network will be in place on launch day to feed critical information to the Livermore lab to generate the models if there is a release of radioactive material.

Even the network to collect that data will be strengthened a bit over the usual launch day measures. The National Weather Service's Melbourne office will focus some of its instruments on Cape Canaveral Air Force Station on the day of launch, now targeted for Nov. 25.

For its part, NASA and the Air Force's 45th Space Wing have 46 towers to collect wind data and two more detailed instruments that collect information about conditions more than 20 miles above Earth.

"We believe we have the right team put together, with the right people and all the control and functions that you might expect for this



CLICK ON PHOTO

NASA/Kim Shifflett

The Mars Science Laboratory Curiosity, shown here on Oct. 31, is the largest rover to be sent to the red planet and it needs a more powerful source of energy than solar panels. That's why NASA approved a radioisotope thermal generator, or RTG, to power the spacecraft as it moves across Mars and conducts experiments with its 10 instruments. For more on the mission, click on the photo.

type of launch," said Steve Brisbin, coordinating agency representative for Kennedy.

Officials expect a normal launch day, culminating in a United Launch Alliance Atlas V lifting Curiosity off the Earth and on a path to Mars.

"If you see a plume, it does not mean there's been an accident," said Dr. Frank Merceret, director of research for Kennedy's weather office.

Most launches produce a plume of some sort, he said,

and even an accident would not necessarily indicate any radiation has leaked from the spacecraft.

NASA has used the power units in the past many times, including the Apollo moon landings and on the Viking landers. Also, the Pioneer, Voyager and Galileo spacecraft used the power units. More recently, NASA also used the generator for the New Horizons mission to Pluto in 2006.

All were launched safely.

# The Gator Nation is everywhere, including space

By *Stephanie Covey*  
*Spaceport News*

If you live in Florida, you've probably heard the University of Florida's slogan "The Gator Nation is Everywhere." "Everywhere" will now include Kennedy Space Center as The University of Florida (UF) recently partnered with NASA with the signing of a Space Act Agreement.

NASA entered into a five year partnership with a Non-Reimbursable Umbrella Space Act Agreement (SAA) and a three year Initial Annex agreement with UF's Department of Astronomy. This collaborative effort is for Kennedy to provide technical assistance to the department to assemble, test and integrate small,

cost-effective satellites, thus making academic research more viable.

The long term vision for the partnership is to establish a Florida institute that will work with Spain's National Institute of Aerospace Technology (INTA), to facilitate the integration of small satellites onto spacecraft for future government, commercial customers and educational purposes. With the potential of serving a large customer base, future partnerships would be covered under separate reimbursable SAA agreements.

Looking to the future, the satellites potentially have numerous applications, to include, quick-response communications in times of disaster and improved environmental scanning, such as monitoring crop health

or an oil spill. With the capability to be launched and coordinated into constellations, the satellites may provide better coverage and faster communications, possibly at lower cost.

These compact, rapidly deployable satellites will be more efficient with a wider range of uses than previously available. Also, the satellites' applications have the potential to be used by government agencies, commercial entities, and in science, technology, engineering and mathematics (STEM) education initiatives.

Janice Lomness, project manager at Kennedy, said part of the academic attractiveness for the satellites is that college students, who often are only able to work on a portion of a big project, will now get the full ex-

perience from conception to launch, before graduation.

"The small satellite effort provides a good opportunity for The State of Florida, UF, and other Florida universities to get into the business of small satellites, while using Kennedy's expertise of space systems" said Janice Lomness.

Throughout this partnership, Kennedy will provide technical expertise and support for UF to launch the spacecrafts and payloads on commercial and government reusable launch vehicles and expendable launch vehicles.

In the future, Kennedy will host workshops to provide short courses for undergraduate students, graduate students and aerospace professionals to study small satellites in-depth.

# Scenes Around Kennedy Space Center



NASA

## Cyclists ride through spaceport to help veterans

About 200 cyclists, including disabled American veterans and their supporters, rode through portions of Kennedy Space Center and Cape Canaveral Air Force Station (CCAFS), Oct. 27, as participants in Ride 2 Recovery (R2R), an organization that assists wounded veterans overcome mental and physical obstacles.

The six day Florida Challenge originated in Jacksonville. The riders' route on the Space Coast included entry at State Road 402 to Playalinda Beach, then south on Phillips Parkway, past Kennedy's Launch Complex 39 and on to CCAFS.

The cyclists made one stop at CCAFS for a photo opportunity before continuing on to State Road 401, then State Road A1A.

"The 45th Space Wing and Cape Canaveral Air Force

Station are both proud and humbled to be able to play a small part in this Ride 2 Recovery effort," said Col. Rory D. Welch, 45th Space Wing vice commander. "They are real life heroes in our opinions, and it was a thrill for our cyclists to ride a few miles with them. What an inspiring group of folks to be around."

R2R is produced by the Fitness Challenge Foundation, in partnership with the military and the Veterans' Administration (VA) Volunteer Service office, to benefit rehabilitation programs for the country's wounded veterans.

Thousands of cyclists hold R2R events in cities throughout the country to raise money to support Spinning Recovery Labs and outdoor cycling programs at military and VA locations around the country.



NASA/Kim Shillett

CLICK ON PHOTO

Two tugboats move the Pegasus Barge through the Banana River near Kennedy Space Center on Nov. 10. The 266-foot-long and 50-foot-wide barge will be towed by NASA's Freedom Star ship to deliver space shuttle main engine (SSME) ground support equipment to Stennis Space Center near Bay St. Louis, Miss. Since being delivered to NASA in 1999, Pegasus sailed 41 times and transported 31 shuttle external fuel tanks from Michoud Assembly Facility near New Orleans to Kennedy. To the right is Launch Pad 39A. The barge is leaving Kennedy, perhaps for the final time. Both the barge and shuttle equipment will remain in storage until their specific future uses are determined. The SSMEs themselves will be transported to Stennis separately for use with the agency's new heavy-lift rocket, the Space Launch System. The work is part of the Space Shuttle Program's transition and retirement processing. For more information about Shuttle Transition and Retirement, click on the photo.

## Pegasus barge bids farewell to spaceport on Nov. 10

By Stephanie Covey  
Spaceport News

Pegasus was pulled out of the Vehicle Assembly Building (VAB) Turn Basin and into Port Canaveral by two tugboats on Nov. 10 as it headed for NASA's Stennis Space Center filled with parts of the space shuttle main engines ground support equipment.

Two tugboats were hooked onto the barge to pull it out of the basin because Pegasus has no engines or steering capability.

"Driving the Pegasus is a challenge," said John Fischbeck, chief pilot of the Pegasus. "We have to contend with wind, visibility and the two tugs that drive our barge along the Banana River between the VAB and Port Canaveral."

As Pegasus started down the river, manatees swam alongside, as it passed Launch Pad 39A. Fischbeck coordinated the two tugs carefully because the tail tug was responsible for guiding

the barge, although it could not see around Pegasus.

"(The tugboat) Lou Anna we can go full ahead," he radioed as Pegasus passed pad A. "We just went from 3.6 to 3.9 knots boys and girls. Hold onto your hats."

Throughout the four-and-a-half hour trip, Fischbeck reminisced about the 31 years he has spent at Kennedy. He talked about the shuttle days when he hauled external tanks inside the Pegasus and trips to retrieve the solid rocket boosters.

Everything was very calm onboard until Pegasus neared the lock. Then the pace picked up. Pegasus passed through the lock and the four crew members prepared to hook the barge up to Freedom Star.

After Pegasus was connected, all but four crew members headed back to shore. Freedom Star and Pegasus began their voyage to Gulf Port, Miss., at noon and the passengers said goodbye to Pegasus perhaps for the last time.



NASA/Kim Shillett

One of the many speakers discusses innovative ideas with NASA and partners Nov. 11 during a three-day LAUNCH: Energy forum Nov. 11-13 in the Operations Support Building (OSB) II at Kennedy Space Center. This third in a series of forums is part of an ongoing initiative to identify, showcase and support innovative approaches to sustainability challenges. LAUNCH allows NASA to propel innovative solutions that help those outside the agency make the connection between our lives on Earth and how we live and work in space. Through the U.S. Agency for International Development (USAID)'s involvement, LAUNCH places a special emphasis on accelerating innovations poised for large scale impact in improving the lives of people in the developing world. During the forum, 10 international participants will showcase new innovations that could address energy problems on Earth and in space. NASA, USAID, Nike Inc., and the U.S. Department of State are LAUNCH founding partners. The partners all contributed to planning the forum, selecting innovators and recruiting other event participants.



NASA/Dimitri Gerondidakis

Kennedy Space Center's Protective Services and Fire/Rescue personnel conducted a training exercise Nov. 2 at the MILA Operations Building off of Space Commerce Way. Training included a "hostage situation" which had to be negotiated by the team.



CLICK ON PHOTO

NASA/Gianni Woods

The environmental management branch of Kennedy offered free school supplies to public and charter school teachers from the surrounding counties at the Miracle City Mall in Titusville from Oct. 31 to Nov. 4. Kennedy's contractor community collected and distributed enough office supplies to fill 3,300 feet of store space at the mall during the event, said Annie Williams, Kennedy's Recycling Coordinator. Sia Stevens, the on-site property manager at the Miracle City Mall, was recognized with a "Catch an Environmentalist" award in appreciation of her generosity and support of the outreach program. The branch also is having an electronics and alkaline battery collection in the industrial area, the VAB and on non-NASA property on Nov. 15. For more on the 2011 America Recycles Day, click on the photo.

# Center earns GreenGov award for energy efficiency

By Linda Herridge  
Spaceport News

Kennedy Space Center recently was a co-recipient of the 2011 GreenGov Presidential Award from the White House Council on Environmental Quality in the “Lean, Clean, and Green” award category for NASA.

The award recognized Kennedy’s efforts in completing the Propellants North Facility in the Launch Complex 39 area, which also is the center’s first Leadership in Energy and Environmental Design (LEED) Platinum facility. Other centers recognized were Langley Research Center in Hampton, Va., and Johnson Space Center in Houston.

Kennedy Center Operations Director Mike Benik said it is always gratifying to be recognized

for an outstanding achievement.

“This award demonstrates the exceptional nature of what we have been able to accomplish at Kennedy in the Propellants North Facility,” Benik said.

Frank Kline, LEED project manager in Center Operations, represented the center at the awards ceremony, Nov. 1, in Washington, D.C.

Kline was the project manager for the Propellants North Facility construction, tending to all of the details and requirements needed for the facility to qualify for LEED Platinum designation.

“I am truly blessed to be given the opportunity to be part of the team this award recognizes,” Kline said. “From the inception of this project, the team just followed NASA’s rich heritage of

continuing to push the envelope.”

GreenGov Presidential Awards honor exceptional Federal personnel, teams, projects and facilities, and programs that exemplify the president’s charge to lead by example in sustainability.

The Lean, Clean, and Green Award recognizes outstanding organizational achievement in building or fleet energy efficiency or renewable energy development and deployment.

The Propellants North Facility was designed with a focus on energy and water efficiency, promoting Kennedy’s alternative fuel vehicle program, low-cost maintenance and material reuse and recycling. The building was designed to be more than 40 percent more efficient than the established standards for commercial facilities.

Denise Thaller, the Environmental Management Branch chief, said that Center Operations and the NASA Construction of Facilities Division deserve a lot of kudos for supporting the design and construction of the facility.

“Creating an energy efficient facility that honors NASA’s Space Shuttle Program through the reuse of historic aspects of the Launch Control Center and integrates Kennedy’s first ever rain water harvesting system to reduce the use of water are just two of the innovative aspects of the facility’s design,” Thaller said.

“It is a huge honor for me to represent a great team and accept this award for Kennedy Space Center and NASA,” Kline said. “In the words of our Center Director Bob Cabana, ‘this is just the beginning.’”

## Feeding wildlife at Kennedy a no-no . . . even for Bob the bobcat

By Melanie Carlson  
Spaceport News

One of the many great things about working at Kennedy Space Center is being able to enjoy the wildlife that surrounds us. Where else can one see bald eagles circle overhead as rockets soar into the sky? At Kennedy Space Center, technology and nature co-exist.

Recently, a bobcat, nicknamed Bob, has taken up residence in front of the Headquarters Building. Bob mostly hunts at night, but has on occasion been spotted during the day. Not as big as panthers, bobcats are about the size of a medium-sized dog and are most easily identified by their short tails.

Dorn Whitmore, supervisory ranger at the Merritt Island National Wildlife Refuge (MINWR) said, “Bobcats are one of the top predators at KSC, filling an important niche in control-



NASA file/1998

A young, male bobcat balances gingerly on telephone pole cables next to the south-bound lane of Kennedy Parkway in 1998.

ling small mammals such as mice and rabbits. We have a healthy population of bobcats at KSC which may help to explain why this particular bobcat took up residence in such a public area by Headquarters.”

The bobcat is a carnivore feeding on small mammals, reptiles and birds. In Florida, 68 percent to 72 percent of their diet consists of rabbits and rats. The other 28 percent to 32 percent of their diet does not consist of chips or bologna sandwiches.

In 1962, NASA acquired 140,000 acres of land, water and marshes adjacent to Cape Canaveral to establish

the John F. Kennedy Space Center. Kennedy’s first director, Kurt H. Debus, arranged for a large portion of the center to be designated as a wildlife refuge. MINWR managed by the U.S. Fish and Wildlife Service, was established in 1963 to manage lands and waters not being used directly by the space program.

The refuge provides a habitat for more than 500 species of wildlife, 16 of which currently are listed as federally threatened or endangered. The space center also borders the Canaveral National Seashore, established in 1975, which

provides an important nesting area for sea turtles.

It might not be illegal to feed other types of wildlife, but it’s not a good idea to provide food to any wildlife. Whitmore said, “Bobcats, or any wild animal, should never ever be fed.”

People tend to believe they are helping animals when they throw out their stale bread or left-over lunch, but in reality, human food is generally a poor substitute for the nutritional needs of wildlife and can cause serious health problems.

Nutrition is not the only concern about feeding wildlife. By providing food, it causes animals to lose their natural fear of people. They become easy targets for those who mean to harm them. When alligators associate people with food, they have to be removed from the area and sometimes destroyed. Sandhill cranes attracted to humans for food handouts are put at greater risk as they walk across roads. Raccoons and other scavengers become

nuisance problems by getting into garbage cans or entering facilities looking for food.

Feeding wildlife also may impede an animal’s natural behavior. Parent animals dependent on humans for food may not teach their young proper foraging techniques to feed themselves. Additionally, if food is provided year-round, species such as ducks and geese may alter their normal migration patterns.

Whitmore added, “Do not put out food for the animal. Doing so can lead to a change in the animals behavior and result in serious consequences for the animal. If it should approach you, back away. This is not normal and could mean it is sick. If you see people leaving food or witness unusual animal behavior contact the refuge. Our advice: enjoy this unique opportunity to view this normally reclusive animal, keep a safe distance and do not leave food where the bobcat can find it.”

## Remembering Our Heritage

# Kennedy's GMRO Lab continues Gemini, Apollo research

By Kay Grinter  
Reference Librarian

There was much cause for celebration in Kennedy Space Center's Granular Mechanics and Regolith Operations Lab on Nov. 11, the 45th anniversary of the launch of Gemini 12.

Dr. Phil Metzger, the lab's founder and champion, recently was notified that NASA's Science Mission Directorate has awarded the lab a \$400,000 grant in its Lunar Advanced Science and Exploration Research (LASER) program.

Project Gemini, in its time, was the advanced exploration research program. Gemini mission objectives were formulated with one primary goal: to prove the hardware that would make NASA's first lunar landing possible.

Throughout the project, orbital rendezvous was accomplished 10 times and docking, nine.

Gemini 12 was the 10th and last crewed Gemini flight. After a successful docking with their Agena target vehicle, astronauts James Lovell and Buzz Aldrin completed 59 Earth orbits.

Proving the hardware was important, but only part of the preparations for a lunar mission.

Studies under way by the staff of the Granular Mechanics and Regolith Operations (GMRO) Lab take research into the lunar landscape even further. "Regolith" refers to all the unconsolidated material on the surface of a planet or moon.

The lab is focused on how rocket exhaust of landing vehicles affects lunar science missions, including the creation of a temporary



NASA/Jim Grossmann

On Nov. 8, Dr. Philip Metzger examines a piece of the Surveyor 3 spacecraft returned from the lunar surface on the Apollo 12 mission in 1969. Metzger is founder of the Granular Mechanics and Regolith Operations Lab in the Space Life Sciences Laboratory at NASA's Kennedy Space Center in Florida. Metzger and his team are studying the effects rocket blasts have on the surface of the moon and Mars.

lunar atmosphere, the sandblasting of instruments with soil and dust ejecta, and the disturbance or contamination of soil beneath the lander.

Metzger received his doctoral degree in physics from the University of Central Florida in 2005 with a specialty in granular physics, a subfield of soft condensed matter theory.

"The reason I focused on granular physics is because I wanted to develop technologies for the surface of the Moon and Mars," Metzger explained. "When you explore a planet or moon, you have to land on granular materials, drive on them, dig in them, extract resources from them and build with them.

"I got my first funding working on a team to extract oxygen from lunar soil," Metzger said. "My part of the work was to develop predictive models of the

soil's mechanics. How would it behave when excavated and poured into a reactor? Eventually, I had enough funding to start the GMRO Lab."

The lab grew quickly and now comprises three physicists, six mechanical or aerospace engineers and several technicians. Their current projects include developing lunar excavators; inventing methods to transport soil in and out of chemical reactor units in low gravity where it doesn't flow well; designing self-cleaning, dust-tolerant mechanisms; and explaining the physics of rocket exhaust blowing soil and how to create landing pads on the moon or Mars.

"Much of my time is spent coordinating the other researchers' efforts, acting as the lead of the lab to make it safe and bring in enough funding to cover everybody, and strategizing for the future," Metzger said.

"However, I try to spend at least half my time on my own area of research: rocket-blast effects."

"The rocket blast effects problem is very challenging," Metzger explained. "When a rocket lands on another planet, the rocket exhaust might fluidize the soil and create a deep crater or it might fail to dig a crater and instead simply scour the surface.

"On the moon, the scoured material is blown laterally at high velocities, even exceeding lunar escape velocity. This becomes a "sandblaster on steroids" which would cause severe damage to any hardware in the vicinity of the landing site. Therefore, we must learn to control the spray if we are to build a lunar outpost."

Much of the effects of a rocket blast must be simulated at locations such as NASA Ames Research Center's Planetary Aeolian Facility, a ten-story vacuum chamber intended to simulate Martian conditions; in a desert location north of Flagstaff, Ariz.; or at Complex 20 on Cape Canaveral Air Force Station.

However, the lab also has been given the unique

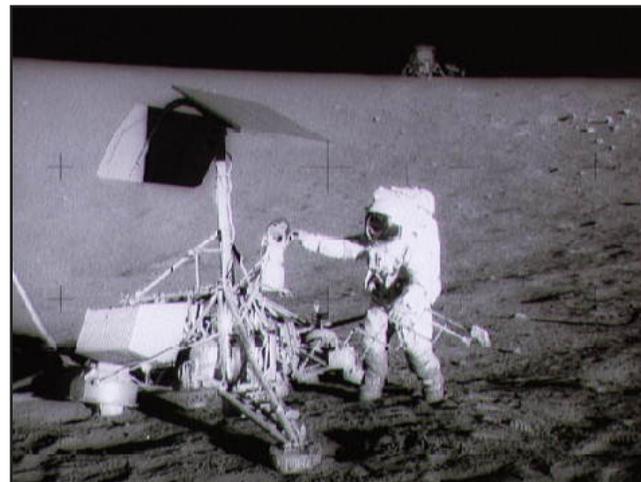
opportunity to study the real thing -- pieces of the Surveyor 3 lunar lander brought back on the Apollo 12 mission.

In 1969, Intrepid touched down in the moon's Ocean of Storms, pelting the Surveyor lander that preceded it to the region in 1967 with the surrounding regolith.

"We are planning to interview Alan Bean about the collection of the Surveyor 3 samples," Metzger said, "in hopes of putting what we are observing about them in the lab into context."

The technologies developed in the GMRO Lab may be needed in the near future. NASA announced Nov. 8 that an uncrewed flight test of the Orion spacecraft in early 2014 will be added to its contract with Lockheed Martin Space Systems.

Exploration Flight Test-1, or EFT-1, will support the new Space Launch System, or SLS, the agency's new heavy-lift launch vehicle. NASA is developing the Orion spacecraft to launch astronauts to asteroids, the moon, Mars and other destinations atop SLS.



NASA file/1969

View of two U.S. spacecraft on the surface of the moon, taken during the second Apollo 12 extravehicular activity. The Apollo 12 Lunar Module Intrepid is in the background. The uncrewed Surveyor 3 spacecraft is in the foreground.

## NASA Employees of the Month: November



NASA/Tony Gray

Employees for the month of November are, from left, Matthew J. Verdier, Information Technology and Communications Services; Patricia S. Lynn, Center Operations; Thomas Howard Smith, ISS Ground Processing and Research Project Office; Alan Alemany, Safety and Mission Assurance Directorate; and James S. Bolton, Ground Processing Directorate. Not pictured are John L. Rigney, 21st Century Ground Systems Program Office; Mark E. Lewis, Engineering Directorate; Jennifer G. Morgan, Engineering Directorate; Joseph M. Bell, Procurement Office; and Jorge L. Piquero, Launch Services Program.

## Looking up and ahead . . .

\* All times are Eastern

### 2011

Nov. 25                      Launch/CCAFS (SLC-41): Atlas V, Mars Science Laboratory; Launch: 10:25 a.m. EST

### 2012

Under Review	Launch/CCAFS (SLC-40): SpaceX Falcon 9, Dragon C2/C3; Launch window: TBD
No Earlier Than Jan. 19	Launch/CCAFS (SLC-37B): Delta IV, WGS 4; Launch window: TBD
No Earlier Than Jan. 23	Launch/Wallops Flight Facility (Pad 0A): Orbital Sciences Corporation, Taurus II, Launch window: TBD
February	Launch/CCAFS: Atlas V, MUOS; Launch window: TBD
No Earlier Than Feb. 3	Launch/Kwajalein Atoll: Pegasus XL, NuSTAR; Launch window: TBD
No Earlier Than Feb. 23	Launch/Wallops Flight Facility (Pad 0A) Orbital Sciences Corporation, Cygnus/Taurus II, Launch window: TBD
No Earlier Than April 27	Launch/CCAFS (SLC-41): Atlas V, AEHF 2; Launch window: TBD
June	Launch/CCAFS SLC-37B): Delta IV-Heavy, NROL-15; Launch window: TBD
No Earlier Than June 12	Launch/CCAFS (LC-41): Atlas V, Tracking and Data Relay Satellite-K (TDRS-K); Launch window: TBD
No Earlier Than Aug. 23	Launch/CCAFS (LC-41): Atlas V-401, RBSP; Launch window: TBD

# WORD ON THE STREET

*With all the recent announcements at Kennedy Space Center, such as the Space Launch System, mobile launcher, use of Orbiter Processing Facility-3, where do you foresee Kennedy in the future?*



*"We're going to have a lot of private industry out here and it's good. We have plenty of space. I'm looking forward to a lot more collaboration"*

**Kari Heminger,**  
with NASA

*"The integration of commercialization and current Kennedy culture needs to be managed well to be an effective community in the future."*

**Ernest Tonhauser,**  
with URS Corp.



*"Since the space shuttle has flown out we need as many commercial customers on board as we can get. The jobs they will bring will be good for all."*

**Deborah Andrade-Trask,**  
with Innovative Health Applications

*"I think Kennedy will become a commercial spaceport and I see deep space exploration becoming the focal point for the agency in the future."*

**Greg Lee,**  
with Abacus Technology Corp.



*"Hopefully we get back into space sooner than later. I think it's great to work as a team, Let's go!"*

**Diane Bent,**  
with NASA



John F. Kennedy Space Center

## Spaceport News

Spaceport News is an official publication of the Kennedy Space Center and is published online on alternate Fridays by Public Affairs in the interest of KSC civil service and contractor employees.

Contributions are welcome and should be submitted three weeks before publication to Public Affairs, IMCS-440. E-mail submissions can be sent to KSC-Spaceport-News@mail.nasa.gov

Managing editor . . . . . Candrea Thomas  
 Editor . . . . . Frank Ochoa-Gonzales  
 Copy editor . . . . . Melanie Carlson  
 Editorial support provided by Abacus Technology Corp. Writers Group.  
 NASA at KSC is on the Internet at [www.nasa.gov/kennedy](http://www.nasa.gov/kennedy)  
 USGPO: 733-049/600142