# **Spaceport News**

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



# Visitors dig Atlantis' permanent home

By Anna Heiney Spaceport News

ith space shuttle Atlantis' 25-year spaceflight career in the history books, its next mission -- to inform and inspire generations of visitors to the Kennedy Space Center Visitor Complex -- is one step closer to reality. A groundbreaking ceremony Jan. 18 officially launched construction of a new 65,000-squarefoot exhibit at the complex's Space Shuttle Plaza, where NASA's fourth space-rated orbiter will be the main attraction.

"It is an honor to create the home for space shuttle Atlantis and to work with NASA to tell its story to the world," said Jeremy Jacobs, chairman and chief executive officer of Delaware North Companies, which operates the visitor complex for NASA.

Participating in the event were Jacobs; Janet Petro, Kennedy Space Center deputy director; Chris Ferguson, who commanded Atlantis on its final mission. STS-135: Bill Moore, chief operating officer of the Kennedy Space Center Visitor Complex; and Florida Lt. Governor Jennifer Carroll. Wearing hard hats and gripping shovels, they made the ceremonial first turn of the soil at the construction site.

From October 1985 to July 2011, Atlantis helped carry the nation's



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During a ceremony Jan. 18 in the Space Shuttle Plaza at the Kennedy Space Center Visitor Complex (KSCVC) in Florida, state and local dignitaries break ground for the future home of space shuttle Atlantis. From left are KSCVC Chief Operating Officer Bill Moore; Kennedy Space Center Deputy Director Janet Petro; Florida Lt. Governor Jennifer Carroll; Jeremy Jacobs, chairman and chief executive officer of Delaware North Companies; and STS-135 Commander Chris Ferguson. Delaware North Parks and Resorts, in partnership with NASA's Kennedy Space Center, broke ground for the 65,000-square-foot exhibit that will house Atlantis at the visitor complex. For more information, click on the photo.

astronauts and payloads on journeys into low Earth orbit. The spacecraft was the first to dock with the Russian space station Mir and aided in the construction of the International Space Station. From Atlantis' payload bay, NASA deployed the Magellan and Galileo planetary probes, the Compton Gamma Ray

Observatory and other satellites. Atlantis also was the last shuttle to fly a servicing mission to NASA's Hubble Space Telescope.

It's a legacy NASA is eager to share through the new exhibit, which is expected to open in 2013.

"It's very fortunate we can celebrate this milestone, fortunate we

had the foresight and the resources to preserve Atlantis to serve as a reminder of the limitless potential of the citizens of the United States of America, and inspire those who will come after us," Ferguson said.

The vehicle will be displayed as if

See ATLANTIS, Page 6



Page 4

Page 6



A truck delivers an F-104 Starfighter to the hangar Jan. 19 at the Shuttle Landing Facility at NASA's Kennedy Space Center where Starfighters Inc. operates.

NASA/Frankie Martin

## Supersonic research, microgravity training fleet grows

**By Steven Siceloff** Spaceport News

The final pieces of a unique squadron of supersonic fighters arrived at NASA's Kennedy Space Center on Jan. 19, where they will be reassembled and put to work with a private company aiming to use them for research and microgravity training.

The new planes were part of a group of five F-104 fighters bought by Starfighters Inc. from the Italian Air Force. The company already had four of the aircraft, but that wasn't enough for the company to pursue a number of different opportunities.

With nine aircraft at his disposal, Starfighters owner Rick Svetkoff said there will always be aircraft available to fly missions for a variety of customers. As importantly, the company will have what it needs to fly two aircraft on a single mission, with one serving as a chase plane to photograph experiments.

"Now we're in a position where we can really start operations," Svetkoff said. "Before, we couldn't do a lot of things we wanted to do."

Starfighters operates out of a hangar at the Shuttle Landing Facility at Kennedy under an agreement with NASA. Svetkoff's main



Starfighters pilot and owner Rick Svetkoff in the cockpit of one of the Starfighters already in service with the company on Oct. 27, 2011.

goal is to fly research and development missions, ranging from experiments flown for universities to evaluating rocket and spacecraft components in high-stress environments including high-acceleration and microgravity.

Space Florida and Embry-Riddle University already have partnerships with the company.

Because the aircraft can soar to some 70,000 feet and speed past Mach 2, it can be used to launch small satellites into space. The 19-footlong, 900-pound rocket, about the size of a Sparrow missile, has already been tested in a series of taxi runs hanging from an F-104's wings.

Test flights carrying the rocket, but not launching it, will be conducted in the next month and the first launch is set to take place in the summer.

The rocket is meant to take small experiments into space, but not into orbit. Instead, the rocket will parachute back to Earth and be recovered from the ocean for reuse. Svetkoff expects to launch about 100 suborbital missions a year from the Starfighters.

In less than a year, though, Svetkoff said he expects to start launching nanosatellites into orbit using a similar approach. After all, an F-104 can match a rocket's launch performance in some areas.

The F-104 Starfighter is a decades-old, supersonic fighter design that was put into service during the Cold War to intercept Soviet aircraft. Known as "the missile with a man in it" because of its high speed and stubby wings, the fighter was developed by Lockheed Martin's Kelly Johnson, the aerospace icon who also developed the SR-71 and U-2 aircraft.

Able to reach a top speed of Mach 2.4 and fly to about 70,000 feet, the F-104 found a second career with NASA in the 1960s. It helped train astronauts for microgravity and to keep their skills up in the demanding world of high-speed flight.

"Anything an F-16 or an F-18 can do, we can do with

this aircraft, performancewise," Svetkoff said.

The Starfighters fleet includes a mix of single-seat versions and two-seaters, each playing specific roles for the company.

Research and development flights are expected to add another 100 missions to the Starfighters' log each year, Svetkoff said.

The experimentation is not expected to end with machinery and experiments, though. As private companies develop their own spacecraft to launch humans into space in partnerships with NASA, some of those companies are already talking about using the Starfighters to train for microgravity and other situations, just as NASA's astronauts did in past decades.

For the moment though, the attention is on getting the new aircraft cleaned and assembled. The engines and other components will be taken apart and cleaned, and then put back together. New avionics packages including digital displays will be added to the new aircraft, too. It will take about three months to complete the first one, but the squadron should be ready in six months.

"This shows a serious commitment," Svetkoff said.



with NASA. Svetkoff's main One of the existing fleet of F-104 Starfighters is joined Jan. 19 by not yet assembled jets the company just bought from Italy.

## Sustainability plan good indicator of green efforts

By Linda Herridge Spaceport News

ennedy Space Center continues to lead the way in its commitment to reuse, recycle and repurpose resources in order to reduce its footprint and conserve the environment, and recently went another step further by creating its first-ever Sustainability Plan.

In line with the federal government's mandate and NASA's Strategic Sustainability Performance Plan, Kennedy recently released the plan which includes 12 goals or areas of concern and hundreds of ways to meet these goals. The plan could possibly serve as an example for other NASA centers, as well as the external community.

"In support of the center's Sustainability Program, we commit to balancing environmental, social and economic concerns with the center's mission obligations as the nation's gateway to space," said Kennedy Director Bob Cabana.

The plan was created by more than 100 NASA and contractor workers, led by Kennedy's Center Operations Directorate and the newly formed Sustainability Steering Committee. Throughout 2011, teams were formed to develop short- and longterm goals as well as strategies and projects to achieve The Quick those goals. Response

"It is exciting to witness how sustainability is being embraced by center leadership," said Olga Dominguez, NASA's as-

sociate administrator for the Office of Strategic Infrastructure. "Kennedy Space Center has a great team working sustainability and is a leader for the agency."

The Sustainability Plan goals are to: reduce greenhouse gas emissions; design and build sustainable buildings, facilities and infrastructure; conserve and manage water resources; minimize waste and prevent pollution; purchase sustainable products and services; manage electronic equipment and data centers responsibly; and integrate sustainability into local and regional planning.

Also, the goals aim to: increase work force satisfaction, promote sustainable food services, conserve and improve the resiliency of our natural resources, effectively communicate the center's sustainability initiatives; and conduct pilot

sustainability projects. "Getting people to talk about how the center can save our precious resources was the real benefit as the plan was taking shape," said Denise Thaller, chief of Kennedy's Medical and Environmental Management Division in Center **Space Center** Operations. **Sustainability** 

**The Quick** 

Response

code (QR

Code) for

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Kennedy

**Space Center** 

Frank Kline is Envi-Plan ronmental Management Branch lead and worked with multiple teams to develop sustainability plans, with a concentration on the environment and infrastructure.

Kline said one of the ideas related to waste management and recycling would be to use smart phones that can use Quick Response (QR) codes. These QR codes would be placed on waste/recycling containers. Employees would scan the codes with their phones to indicate

> when service is actually required.

"The use of these codes would eliminate 'milk runs' where recycling vendors walk around and check each can once a week, and replaces it with a system that will make all Kennedy team members responsible for their sustainability," Kline said.

Benjamin Bryant is the chief technology officer for Kennedy's Information Technology and Communication Services. His main area of focus was electronic stewardship and data centers.

"Our largest effort with the largest payback in terms of energy conservation is data center consolidation," Bryant said. "Data centers are one of the largest consumers of energy in any organization, company or



NASA file

Kennedy has excelled in the decrease of petroleum consumption in its government fleet since Fiscal Year 2005 by 2 percent each year. This effort is in line with an executive order calling for reductions in greenhouse gas emissions. Sixty-one percent of the 1,406 vehicle fleet uses alternative fuel, such as bio-diesel, electricity, compressed natural gas and ethanol.

government agency. If we are successful in consolidating data centers down to one, then our energy savings would be significant.

"It has become obvious that if we do not do something to reduce the consumption of our natural resources, then future generations will be without," Bryant said. "I believe it is the responsibility of all of us, especially the government, to set an example, and who better to set the example at NASA than the center that sits in the middle of a national wildlife refuge."

Thaller said the communications group is developing an awareness campaign that will help get the word out about sustainability efforts and what we all can do to contribute.

"The challenge will be to engage the work force and keep the momentum up over time," Thaller said.

"Kennedy is in a transition phase, and if we hope to remain the premier launch facility in the U.S., we all need to realize that sustainable economics, efficiency and service are our new mission," Kline said.



NASA/Jim Grossmann

NASA's first large-scale solar power generation facility was unveiled in November 2009 at Kennedy Space Center. Representatives from NASA, Florida Power and Light Co., or FPL, and SunPower Corp. formally commissioned the one-megawatt facility. The facility was the first element of a major renewable energy project at Kennedy. The completed system features a fixed-tilt, ground-mounted solar power system designed and built by SunPower, along with SunPower solar panels. A 10-megawatt solar farm, which SunPower built on nearby Kennedy property, supplies power to FPL's customers.

## Plaque left in Atlantis a tribute to shuttle workers

**By Steven Siceloff** Spaceport News

simple, plastic plaque left inside space shuttle Atlantis following the last mission of NASA's shuttle program is a priceless tribute to the work force, said one of the managers who worked with the spacecraft for more than 20 years.

"I was just overwhelmed with joy, first that they left it, and humbled that they thought of us," said Walter "Buddy" McKenzie, who manages the forward and midbody sections of Atlantis for United Space Alliance, or USA.

The plaque was carried into orbit with astronaut Chris Ferguson, who commanded STS-135, the final flight of the Space Shuttle Program's 30 years of missions. It's an 8-inch by 8<sup>1</sup>/<sub>2</sub>-



NASA/Ken Thornsley

The crew of STS-135, the final flight of the Space Shuttle Program, left this plaque on the flight deck of Atlantis after they left the spacecraft following the shuttle's landing in July 2011. The plaque is displayed inside one of the shuttle's processing hangars at Kennedy and will be put on public display with Atlantis.

inch plaque, sized precisely to fit over the center display in the cockpit. Ferguson placed it there before he left the shuttle following its July 21, 2011, landing at NASA's Kennedy Space Center in Florida.

challenged the

group to begin

connecting

health and

wellness to

safety and

mission assur-

"We need

to begin to think about the whole

said. "When the whole person is

Garzon, who is HPI's senior

vice president of executive training

and director of nutrition, said most

Americans are stuck in a perpetual

"If all of a sudden one of your

out, wouldn't you?" Garzon asked.

what would we do with it? More of

"Most of us, if given more time,

the same stuff that we're already

doing . . . and that's the truth."

meetings was canceled, the first

thing you would do is go work

ter energy and better safety."

person," Team QNA's Steve Owens

connected, we get better focus, bet-

ance in 2012.

energy crisis.

"We wanted to thank the people who made it all possible," Ferguson said recently. "It wasn't a promotion, it was just a way for the astronauts who have used this vehicle for 30 years to go back and forth safely to space to thank the people who made it happen day in and day out. The bottom line is, it was a tribute to them who made it all happen."

The plaque remained inside Atlantis for about a week before it was taken out and put in a display case in Orbiter Processing Facility-2 for people who don't go inside the crew compartment.

"That's for everybody who participated and did the world-class jobs that they did," McKenzie said.

The plaque will go on display with Atlantis when the spacecraft is moved to the Kennedy Space Center Visitor Complex.

"It deserves (to be displayed) not because we put it there, but because of what it stands for, the men and women who spent a generation making the orbiters safe for astronauts," said Ferguson.

The plaque was not the first tribute placed in Atlantis. The crew for the STS-132 mission in 2010, flying what was then supposed to be Atlantis' last mission, put a mission decal inside the crew compartment and autographed around it with an inscription marking, as STS-132 Commander Ken Ham called it, the "first last mission."

McKenzie said every thank-you is welcome, no matter what form it takes.

"The payoff for us is that we get the vehicles ready and it takes everybody to do the job, and the astronauts get to go do their job up there," McKenzie said. "It's a tribute to the workers and it can't be said any better than what they did."

## Make 2012 the year to become fully engaged

**By Rebecca Regan** Spaceport News

ost of us wish we had more time in the day. More time to spend with our loved ones. More time to mark off our to-do list at work. More time to cook nutritious meals. More time to hit up the gym. More time to give back to our community. But what if the key to achieving our goals wasn't limited by the clock on the wall?

During Kennedy Space Center's first Executive Safety Forum of the year on Jan. 24, Raquel Garzon from the Human Performance Institute (HPI) in Orlando, Fla., told the center's leaders the key to reaching our peak performance as individuals and organizations is not about managing time, it's about managing our energy.

The contractor managing Kennedy's Engineering Services Contract (ESC), ESC-Team QNA, hosted this month's forum, which More information

To learn more about the Human Performance Institute and to take a short assessment to see how your energy levels measure up, visit https://www.hpinstitute.com/ assessment-tools. She came equipped with decades of scientific research to show that the human body is capable of growing physical, mental,

emotional and spiritual energy to combat this crisis.

"Each and every day we're given these moments, and it's the energy that you bring to these moments that really determines the outcome of your work, your relationships, the ability to inspire, to mentor, to create, to innovate and to make decisions," she said.

So, how do we expand our energy and become fully engaged in the things that matter to us? Well, Garzon said, it starts with breaking old habits by introducing experiences that will help you establish new ones.

"Your life serves as a training op-

portunity for you to build and invest in capacities that you are going to need," Garzon said.

Center Director Bob Cabana welcomed the challenge by saying, "It's a new year with new opportunities to excel."

Those opportunities include investing energy in the agency's Commercial Crew Program, building and upgrading the center's infrastructure for the Ground Systems Development and Operations Program, and continuing to process and launch complex scientific and robotic missions for the Launch Services Program.

It's the unique opportunities to advance the nation's mission acontinue to spark that energetic spirit of Kennedy's work force for decades to come.

"Energy without purpose is meaningless. But energy that is invested in our life's purpose can make extraordinary things happen," Garzon said.

## **Scenes Around Kennedy Space Center**



CLICK ON PHOTO

NASA/Randy Beaudoin, VAFE

Orbital Sciences Corp. engineers oversee the remating of stages 2 and 3 of the Pegasus rocket in processing facility 1555 at Vandenberg Air Force Base (VAFB) in California on Jan. 22. The rocket is being prepared to launch NASA's Nuclear Spectroscopic Telescope Array (NuSTAR) into space. After the rocket and spacecraft are processed at Vandenberg, they will be flown on the Orbital Sciences' L-1011 carrier aircraft to the Ronald Reagan Ballistic Missile Defense Test Site at the Pacific Ocean's Kwajalein Atoll for launch, targeted for no earlier than March 14. For more information, click on the photo.



NASA/Jim Grossmann

Denise Thaller, second from left, NASA Medical and Environmental Management Division chief, presented, from left, Gregory Grantham, Dave Sanborn and Robert Applegate with the Catch An Environmentalist Award on Jan. 9 in Orbital Processing Facility-1. They were given this award for their support of the Surplus Office Supply Collection and Distribution to Public School event in November. At right is Kennedy Space Center Recycling Coordinator Ann Williams. The award is given to individuals who go above and beyond the call of duty to help the Environmental Program at Kennedy.

### 2012 NASA Day of Remembrance



Left: A blue sky is reflected in the massive granite Space Mirror Memorial at the Kennedy Space Center Visitor Complex where a large wreath was placed during Kennedy Space Center's NASA Day of Remembrance on Jan. 26.

**Top right:** NASA Kennedy Space Center civil service and contractor workers, along with visitors, gather at the Space Mirror Memorial.

Bottom right: Kennedy Space Center Director Robert Cabana, forefront, Deputy Director Janet Petro, right, and United Space Alliance Vice President for Aerospace Services/Florida Site Director Mark Nappi place a wreath at the Space Mirror Memorial.

The Day of Remembrance honors members of the NASA family who lost their lives while furthering the cause of exploration and discovery, including the astronaut crews of Apollo 1 and space shuttles Challenger and Columbia. Kennedy civil service and contractor employees, along with the general public, paid their respects throughout the day.

The visitor complex provided flowers for visitors to place at the memorial.

Photos by NASA/Kim Shiflett







Artist rendering courtesy of PGAV Destinations for Delaware North Parks and Resorts

The shape of the new home for Atlantis at the Kennedy Space Center Visitor Complex incorporates hues of orange and gold to represent the heat and the bright colors of re-entry. Special gray-colored tiling has been incorporated into the building's design to represent the space shuttle tiles that protected the orbiter from the heat generated from entry into the Earth's atmosphere. A groundbreaking ceremony for the exhibit was held Jan. 18. For more information on this and other exhibits at the visitor complex, click on the photo.

#### From ATLANTIS, Page 1

in flight with its payload bay doors open, offering a view of its 60-foot-long cargo area.

Additionally, a variety of simulators and interactive elements will offer visitors the chance to experience the challenge of grappling a satellite or move through a model of the International Space Station.

"This is not just a story about the hardware," Moore said. "This is really a true story of hardworking people who worked together -thousands of people -- to do amazing things."

NASA Administrator Charles Bolden announced on April 12, 2011, that Atlantis would stay at the Florida spaceport following its retirement. The welcomed news came on the 30-year anniversary of the first space shuttle flight.

Atlantis flew nearly 126 million miles during a total of 307 days in space. It returned to Earth for good on July 21, 2011, its main landing gear kicking up dust for the last time on Kennedy's shuttle runway with a predawn touchdown at 5:57 a.m. EDT.

"This coming Saturday does mark six months since the final landing of Atlantis out here, about three miles behind me," said Ferguson. "With that final landing, the shuttle program came to a conclusion after 30 years of discovery and exploration. At times we had to lick our wounds, at times there were joyous moments, but by the grace of God we concluded the program just the way we wanted to, very safely."

After undergoing standard post-mission processing, Atlantis entered into its longer "transition and retirement" phase. Each vehicle's trio of main engines will be replaced with mock-ups; the real engines are being saved for use on a new heavy-lift rocket, the Space Launch System. The orbital maneuvering system (OMS) pods and forward reaction control system, which used toxic propellants, will be cleaned and deserviced at White Sands Test Facility in Las Cruces, N.M. Ultimately, the engines in the OMS

pods will be replaced with replicas.

Although Atlantis will remain close by, the other spacecraft in the shuttle fleet will go to new exhibits outside of Florida. Shuttle Discovery is destined for the Smithsonian's National Air and Space Museum Steven F. Udvar-Hazy Center in Chantilly, Va., and Endeavour will be displayed at the California Science Center in Los Angeles. Enterprise, used in approach and landing tests at the advent of the Space Shuttle Program, will move to New York's Intrepid Sea, Air and Space Museum.

"For 30 years, the orbiters have been a part of our family. We've cared for them, we've protected them, and we've watched them soar. We've marveled at the similarities between them, and the differences that only 'family' could identify," said Janet Petro, deputy director of Kennedy Space Center. "Atlantis' new home is beautifully designed to showcase her as the true engineering marvel that she is."

# Stanley Cup visit rouses hockey fans

#### **By Frank Ochoa-Gonzales** Spaceport News

ccording to National Hockey League (NHL) tradition, owners and coaches of the hockey championship's winning team are awarded 24 hours to spend with the championship trophy, and in this case, it's the Stanley Cup, the oldest professional sports trophy in North America.

In 2004, the cup paid a visit to Kennedy Space Center, thanks mostly to the triumph of the Tampa Bay Lightning, the team that won the NHL championship that year.

Kennedy workers scrambled to get a look at the trophy, and many waited for an opportunity to have their pictures taken with the shiny treasure during what seemed like a once-in-a-lifetime opportunity.

Make that twice-in-a-lifetime.

In 2011, the Boston Bruins captured the title of champions. The Bruins are owned by Delaware North Parks and Resorts Chairman and Chief Executive Officer Jeremy Jacobs. And much to the delight of hockey fans at Kennedy, Jacobs thought the cup should make one more visit as a way of saying "thank you" to the many workers who have done such a great job supporting the space program.

Delaware North has operated the Kennedy Space Center Visitor Complex since 1995.

"It's awesome," said Mary Butler, an employee with United Space Alliance (USA). I can't believe I had the chance to see the Stanley Cup."

Alan Shinault, a devoted Bruins fan, saw the cup when it visited in 2004.

"As a fan, I've waited nearly 40 years for this," the USA worker said. The Bruins last won the cup in 1972. "This is one of the best days ever."

Lord Frederick Stanley of Preston purchased the cup for 10 guineas in 1892, equivalent to about \$50 then. It is valued at more than \$1 million today.

Because the cup is the only professional sports trophy on which the name of every member of the winning team is inscribed, bands often are retired to make room for the names of new champions.

It takes 13 years to fill the bottom ring with names of winners. According to the NHL, a new ring will be added in six years. Once a ring is full, another one is removed from the top of the base and retired to the Hockey Hall of Fame in Toronto.



The Stanley Cup is placed inside space shuttle Atlantis' fight deck on Jan. 18. For more on the Stanley Cup, click on the photo.

### **Remembering Our Heritage**

## **Despite moon miss, Ranger 3 an engineering success**

By Kay Grinter Reference Librarian

he moon ... so near, yet so far away. Fifty years ago, placing a spacecraft anywhere in its vicinity was the challenge.

NASA's Project Ranger aimed not only for the moon, but to conquer the technological roadblocks along the way.

When Ranger 3 lifted off Jan. 26, 1962, there already had been nine American moon flight failures, the first two Ranger flights among them.

Ranger 3 was the first flight of the project's Block 2 vehicles and held great promise for the first success.

Getting the Atlas-Agena rocket off Space Launch Complex-12 on Cape Canaveral Air Force Station proved to be the first hurdle.

The launch team hit a snag Jan. 19, just days before the opening of the launch window from Jan. 22 through Jan. 26, chosen for the optimum photographic lighting conditions predicted on the lunar surface during this phase of the moon.

Following loading of the kerosene fuel aboard the Atlas, a leak was discovered between the fuel and liquid oxygen tanks.

Normally, the Atlas would be returned to its hangar for repairs and the launch reset for February, but a more novel approach would support liftoff before the January window closed.

Was it possible for the repair to be made on the pad from inside the rocket?

In the next few days, engineers disconnected the center engine of the Atlas and lowered it into the pad's flame trench. A prefabricated wooden framework was passed through the engine hole at the base of the fuel tank and assembled inside the 10-foot-diameter tank by technicians wearing oxygen packs and masks.

Working around the clock, members of the General Dynamics Astronautics/Rocketdyne team removed and replaced the ruptured bulkhead in time for a launch attempt on the last day of the window.

#### More information

For more on NASA's early lunar missions, see the NASA History "Lunar Impact: A History of Project Ranger" at http://history.nasa.gov/SP-4210.

For more information on the Mars Science Laboratory and the Curiosity rover, go to http://www.nasa.gov/msl or http://mars.jpl.nasa.gov/msl.

Liftoff came at 3:30 p.m. EST after a flawless countdown.

Before Ranger 3 was out of sight, though, controllers knew something was awry.

Commands radioed to the Atlas went unacknowledged, and it continued to ascend under the control of its autopilot. The rocket's airborne radio guidance system had failed.

Without engine shutdown at the precise times, the spacecraft's lunar trajectory would have to be adjusted. Even so, Ranger 3 would pass

the moon at a great distance.

The next morning, three stored commands defining Ranger 3's midcourse correction maneuver were radioed from the Goldstone tracking station in California. After the spacecraft confirmed their receipt, a command to initiate the maneuver was transmitted

Ranger 3 executed the desired roll and pitch, and the midcourse engine fired at the appointed moment for the proper duration. The attitude control system then reacquired the sun and the Earth, returning the spacecraft to its former attitude, and normal cruise operations resumed.

Although Ranger 3 missed the moon by about 23,000 miles and continued into solar orbit, for the first time an unmanned spacecraft altered its course in flight on commands from Earth, a procedure vital to deep-space missions today.

For example, just this month, NASA's Mars Science Laboratory spacecraft successfully refined





The Ranger fleet of spacecraft, launched in the mid-60s, provided for the first time live television transmissions of the moon from lunar orbit. These transmissions resolved surface features as small as 10 inches across and provided more than 17,000 images of the lunar surface. These detailed photographs allowed scientists and engineers to study the moon in greater detail than ever before thus allowing for the design of a spacecraft that would one day land humans on its surface.

its flight path on Jan. 11, with the biggest maneuver planned for the mission's journey between Earth and the Red Planet.

The three-hour series of thrusterengine firings accomplished two aims: to put the spacecraft's trajectory about 25,000 miles closer to encountering Mars and to advance the time of the encounter by about 14 hours, compared with the trajectory following the mission's Nov. 26, 2011, launch.

The mission's second trajectory correction maneuver, expected to be about one-sixth the magnitude of the first one, is scheduled for March 26. Up to four additional opportunities for fine-tuning its trajectory are scheduled, if needed, before its arrival at Mars on Aug. 6.

The Mars Science Laboratory mission will use its car-size rover, Curiosity, to investigate whether the selected region on Mars inside Gale Crater has offered environmental conditions favorable for supporting microbial life and favorable for preserving clues about whether life existed.

In the 50 years since missing the moon by 23,000 miles, NASA plans to place Curiousity within a 12-mile landing ellipse.





## Kennedy Space Center Calendar

Mondays Jan. 30, Feb. 6, 13, 27	Financial Management and Retirement Planning KSC Training Auditorium, Room 111 on Jan. 30 or Room 112 in February; 1:30 to 4 p.m. POC: Walt Hersing, 867-7398 or <b>walter.s.hersing@nasa.gov</b>
Feb. 1	"An Article of Hope" documentary Headquarters, Room 3201, 10 a.m. to noon. POC: Lisa Allen, 867-0640 or <b>alicia.g.allen@nasa.gov</b>
Feb. 10	Forklift Safety Training Headquarters, Room TBD, 11 a.m. to 2 p.m. POC: Chris Weaver, 861-9324 or <b>christine.l.weaver@nasa.gov</b>
April 14	KSC All-American Picnic KARS Park I POC: Derrick Bailey, 861-6162 or <b>william.d.bailey@nasa.gov</b>

## Looking up and ahead . . . \* Launch windows to be determined

2012

No earlier than Feb. 16	Launch/CCAFS (SLC-41): Atlas V, MUOS Launch window: TBD
No earlier than March 14	Launch/Reagan Test Site Kwajalein Atoll: Pegasus XL, NuSTAR Launch window: TBD
No earlier than late March	Launch/CCAFS (SLC-40): SpaceX Falcon 9, Dragon C2/C3 Launch window: TBD
No earlier than April 27	Launch/CCAFS (SLC-41): Atlas V, AEHF 2 Launch window: TBD
No earlier than May	Launch/Wallops Flight Facility (0A): Cygnus /Taurus Launch window: TBD
June	Launch/CCAFS (SLC-37B): Delta IV-Heavy, NROL-1 Launch window: TBD
No earlier than Aug. 23	Launch/CCAFS (LC-41): Atlas V-401, RBSP Launch window: TBD
No earlier than September	Launch/CCAFS (LC-37B): Delta 4, GPS 2F-3 Launch window: TBD
Dec. 1	Launch/VAFB: Pegasus XL, Interface Region Imaging Spectrograph (IRIS) Launch window: TBD
No earlier than December	Launch/CCAFS (LC-41): Atlas V, Tracking and Data Relay Satellite-K (TDRS-K) Launch window: TBD

# WORD THE STREET

With the recent groundbreaking for space shuttle Atlantis' permanent home at the Kennedy Space Center Visitor Complex, what would you like to see as part of the future exhibit?



"A virtual-reality setup for kids that expands from the current shuttle launch experience . . . as if they were sitting in a real orbiter."

Randy Harris, NASA

"A LEGO area that has miniature mock-ups of everything at Kennedy . . . a room for kids to build space-related items out of LEGOs.'



Amy Zimmerman, Oklahoma State University at the Educator Resource Center

#### "A 3-D launch experience that takes the current ride to another level . . . maybe get to sit in a mock space shuttle cockpit."

Vinicius Ghedine, visitor from Brazil





Ellen Evans, Delaware North Parks and Resorts



"Something that is user-friendly for the kids . . . a well-rounded idea that speaks to the young and the youn<mark>g at heart."</mark>

Dennis Moore, NASA

#### John F. Kennedy Space Center



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